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FACULTY OF ENGINEERING SCIENCE AND MATHEMATICS

Institute of Sound and Vibration Research

The discomfort arising from exposure to low frequency rotational and translational vibration

by

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ABSTRACT
FACULTY OF ENGINEERING SCIENCE AND MATHEMATICS
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The discomfort arising from exposure to low frequency oscillation is a matter of some interest in many forms of transport. However there is a dearth of knowledge about the discomfort which arises from exposure to vibration at low frequencies. This thesis investigates the effects of frequency, magnitude and direction arising from the exposure of seated passengers to roll, pitch, fore-and-aft and lateral oscillation at frequencies between 0.2 and 1.6 Hz.

The objectives of this research were to investigate whether:

- the discomfort arising from low frequency rotational and translational oscillation could be satisfactorily predicted based on knowledge of the acceleration in the plane of the seat;
- the presence of a backrest would exacerbate discomfort during both rotational and translational oscillation;
- the adoption of different postures during vibration would affect the reported discomfort.

Achieving these objectives required determination of the frequency-dependence and magnitude-dependence of discomfort arising from exposure to rotational and translational oscillation at frequencies less than 1.6 Hz.

The investigations used the psychophysical method of magnitude estimation to determine the rate of growth of discomfort with increasing vibration magnitude, and contours of equivalent discomfort. Four studies within-axes contributed new information about the effect of vibration frequency on the discomfort arising from exposure to rotational and translational oscillation. A series of smaller studies determined the relationship between the discomfort arising within different axes, and a study investigated the effect of posture. Each study employed 12 subjects.

At frequencies greater than 0.4 Hz, exposure to motion in the rotational axes caused greater discomfort than the equivalent motion in the translational axes. At lower frequencies, the acceleration in the plane of the seat was a good predictor of the discomfort experienced irrespective of whether oscillation was in the rotational or translational axes, except when the discomfort arising from fore-and-aft and pitch oscillation on a seat with no backrest was compared. It was found that the presence of a backrest exacerbated discomfort during rotational oscillation at frequencies greater than 0.4 Hz but reduced discomfort during fore-and-aft oscillation. The presence of a backrest increased the incidence of discomfort arising at the head-neck interface. The ability of subjects to voluntarily control their posture was found to be low, except at the lowest frequencies. The sensitivity of subjects to angular displacement increased at approximately 6 dB per octave at frequencies greater than 0.4 Hz, whereas during translational acceleration on a flat rigid seat the rate of increase in sensitivity was lower at approximately 3 dB per octave. When subjects were seated on a rigid seat with backrest and exposed to translation acceleration the discomfort arising from motion was approximately independent of frequency over the range 0.2 to 1.6 Hz. The observed effect of vibration magnitude on the frequency-dependence was small, but variations in the rate of growth of discomfort with frequency indicate this magnitude-dependence would be important in settings where a greater range of accelerations was present.

Existing standardised methods of prediction (e.g. BS 6841) were compared to the results with minimal modification (linear extension of the asymptotic frequency weightings). Where discomfort is dominated by oscillation in a single axis at a single input (e.g. fore-and-aft oscillation with no backrest) the prediction was considered sufficient for many practical purposes. However, where the presence of a backrest influenced discomfort the quality of prediction deteriorated markedly and the standardised method cannot be recommended.

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Chapter 1 Introduction

1.1 Discomfort arising from vibration

Vibration is an ubiquitous feature of human experience, whether self-induced, borne voluntarily for pleasure, tolerated as a consequence of mechanised transport and tools, or accepted as a result of the proximity of work and dwelling places to roads, airfields and railways. This thesis is not concerned with the forces that give rise to environmental oscillation, nor of itself the characteristics of the oscillating environment, but rather with the effects of such vibration upon its transmission to humans via their interface with that environment, be it a seat, bed, or floor.

These effects are wide ranging. Griffin (1990) suggested that they might be categorised as those which interfere with activity, affect health, or are detrimental to comfort. Within each category there are a wide range of physical and psychophysical investigations that offer insight into the effect of interest. Since the work of Jacklin and Liddell (1933) there has been a continuous process of research investigation into human response to vibration, albeit at widely varying rates. It has become apparent that useful characterisation of effects depends on detailed knowledge of the frequency, magnitude, direction and duration of the vibration exposure. In some areas research has amassed sufficient knowledge to permit the proposal of limited predictive models, and in some cases these have been encoded in national and international standards (e.g. BS 6841).

This thesis concerns the discomfort arising from exposure to low frequency rotation, and translation. The investigation is restricted to situations in which exposed persons are seated, and where the axis of rotation and the plane of the seat surface are co-incident. In such settings at frequencies below about 2 Hz the evaluation of such vibration is complicated by the interaction of acceleration vectors arising from rotational and translational oscillation, and the potential for differing response strategies among exposed persons. During low frequency rotational oscillation the movement of the seat surface through the gravity vector causes an acceleration, or a force corresponding to this acceleration, with magnitude $g \cdot \sin \theta$ (where g is the gravitational vector and θ is the angle of inclination) to arise in the plane of the seat. If the seat surface concurrently translates, the translational acceleration may add to, or subtract from, the apparent translational acceleration due to rotation. Hence knowledge of the discomfort arising from acceleration in the plane of the seat due to rotation, relative to that arising from exposure to translation may be necessary for accurate prediction of discomfort if the discomfort causing potentials of these two acceleration components differ. Present evaluation practice, as encoded in BS 6841 and ISO 2631, assumes that all acceleration in the plane of the seat can be treated as arising from earth-referenced translation in the appropriate direction. One objective of this

work is to test the hypothesis implied by this assumption: that the discomfort arising from acceleration in the plane of a seat depends on whether the generating oscillation is in the rotational or translational axes.

It is apparent that at very low frequencies the opportunity for subjects to respond in different ways during oscillation may be a more important factor in determining the degree of discomfort that arises during oscillation than it has been determined to be at higher frequencies. Therefore this work investigates the hypothesis that the maintenance of differing postures during oscillation affects the discomfort reported by those exposed. Equally, the presence of a backrest during low frequency oscillation may constrain subject response very considerably, exposing the head of exposed persons to large angular displacements (with the associated height dependent vertical and horizontal translation (h and c respectively) and the additional acceleration tangential to the arc of oscillation ($r\alpha$) (Figure 1-1) Accordingly, the effect of the backrest upon discomfort during oscillation was also investigated.

Previous investigators have noted that the effect of frequency is an important variable in the study of vibration discomfort. However the present standards only describe frequency weightings for the evaluation of discomfort at frequencies greater than 0.5 Hz, and assume that the effect of magnitude can be neglected. This research study will extend the state of knowledge concerning the frequency-dependence and magnitude-dependence of discomfort arising from single-axis discomfort in the roll, pitch, lateral and fore-and aft axes on seats with and without a backrest.

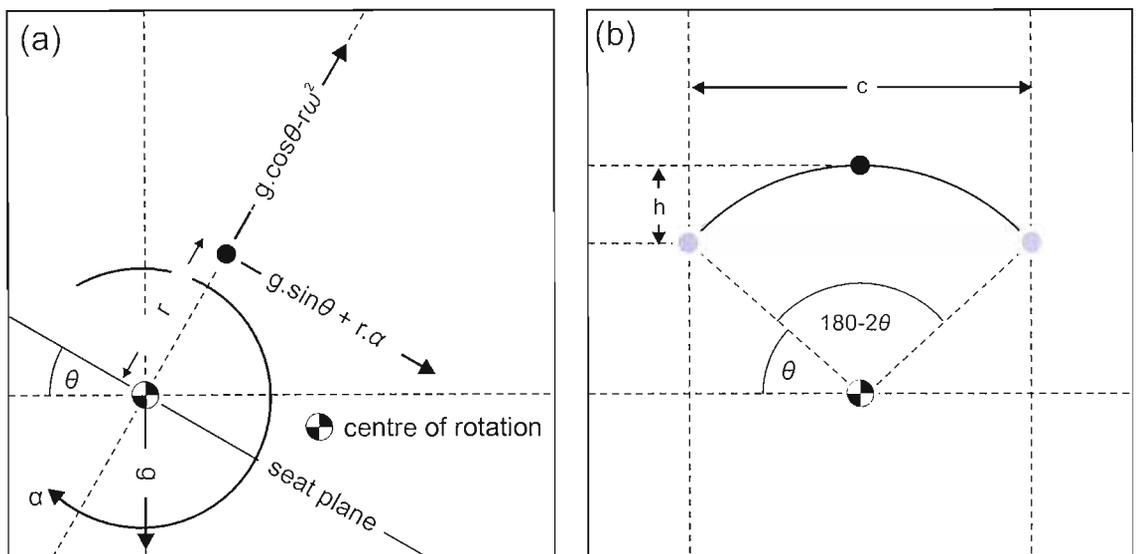


Figure 1-1 (a) acceleration components arising at a point separated by a distance r from the centre of rotation (b) The translational displacements of a point separated by a distance r from the centre of rotation during oscillation.

Description of the characteristics of vibrating environments where low frequency rotational and translational oscillation form important parts of the spectrum is explicitly not a part of this work. However it may be helpful to note as illustrations some civil and military applications where such oscillation might be detrimental to comfort:

- Agricultural tractors, quarrying machinery, forestry forwarders.
- High speed maritime craft, particularly when the sea state is moderate or rough.
- Armoured fighting vehicles and support vehicles when traversing rough terrain.
- Military aircraft, particularly when flying tactically at low levels.

1.2 Organisation of this thesis

This thesis is organised into nine chapters including this introductory chapter and 2 appendices

Chapter 2 – the literature review covers two main areas: a review of the psychophysical methods which permit the relation of the physical magnitude of a stimulus to its perceptual consequence, and the state of knowledge concerning the discomfort arising from rotational and translational oscillation.

Chapter 3 - here the operation, performance, and limitations of the three simulators used to generate motion in the course of this work are outlined. The capabilities of the accelerometers and other transducers employed are described. Finally the data acquisition system, analysis methods and statistical tests used are presented.

Chapter 4 - presents measurements of the discomfort arising from exposure to roll and lateral oscillation on seats with and without a backrest.

Chapter 5 – shows measurements of the discomfort arising from exposure to pitch and fore-and-aft oscillation on seats with and without a backrest

Chapter 6 – describes experiments in which the relative discomfort arising from fore-and-aft and lateral oscillation was determined and in which the effect of posture during rotational oscillation was characterised.

Chapter 7 – shows the results of a study investigating the relative discomfort arising from exposure to fore-and-aft and lateral oscillation at 0.5 Hz.

Chapter 8 – contains a general discussion of the whole work.

Chapter 9 – conclusions and recommendations for future research

Appendix 1 - samples of protocols used with subjects

Appendix 2 - median k and n data for each condition

Chapter 2 Literature Review

2.1 Scope of this review

This literature review is principally concerned with the discomfort caused by exposure to oscillation in the roll, pitch, lateral, and fore-and-aft axes at frequencies from 0.2 to 2.0 Hz. Because trends in the effect of frequency outside the range of immediate interest can be informative, in most cases figures reproducing the work of other authors have a frequency range of 0 to 10 Hz. Since much of the literature referred to in this review has as its primary focus the effect of vibration at much higher frequencies it is frequently the case that the review refers to small portions of previous authors' work. The manner in which national and international standards predict the discomfort arising from exposure to low frequency rotational and translational oscillation is also considered. In order to prevent frequent and burdensome discussion of the psychophysical methods throughout the review a section has been devoted to discussing the measurement of sensation. In that section methods are stratified according to the psychological operation which is thought to take place during their use.

2.2 Psychophysical methods

The determination of systematic relationships between the physical and perceptual magnitudes of a stimulus has been an activity demonstrably useful to civilisation from antiquity, since it is apparent that unit increment of physical magnitude does not always give rise to an unit increment in perceptual magnitude. One ancient example is the first surviving catalogue of 'apparent stellar magnitudes' (1833) for 850 principal stars compiled by Hipparchus of Rhodes (190 – 210 BC) This used a six point categorical scale to rate their apparent brightness: subsequent contemporary measurement of the star flux and range, showed that a unit change in the perceptual scale corresponded to an approximately logarithmic increase in physical brightness. As an example this scale highlights some of the major issues that have occupied investigators since, including the nature of the stimulus response function, the continuity of sensation as a psychological construct, and the operations permissible on perceptual scale values. A second example, a paper by Bernoulli (1738) translated (1954) in which the relationship between the physical and perceptual value of currency is discussed by Bernoulli as a logarithmic function, with a footnote by Cramer (Professor of Mathematics in Geneva – appointed 1729) who proposed that a power function better modelled the reality (Figure 2-1). This debate as to the mathematical function which is most appropriate to describe the physical: perceptual relationship has given rise to the two

major 'schools' of psychophysics remaining in existence today, those methods developing the work of Fechner (who adopted a logarithmic approach) and those following from the studies described by Stevens whose thesis was that the relationship was a power function.

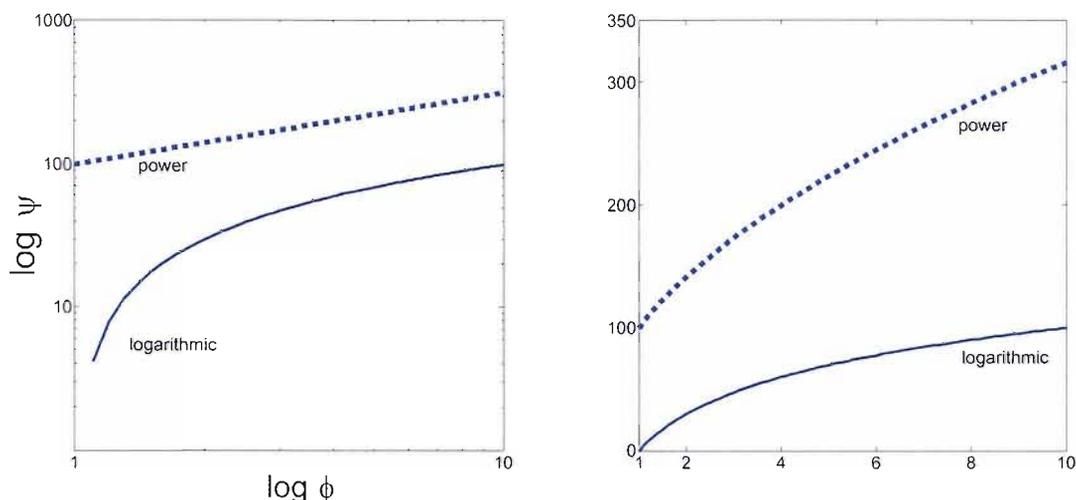


Figure 2-1 A comparison of the logarithmic and power functions proposed by Bernoulli and Cramer respectively as effectively modelling the relationship between physical and perceptual magnitude. Functions shown in log – log (left) and Cartesian (right) co-ordinate systems.

2.2.1 The nature of measurement

Stevens (1946) advanced the view that measurement occurred where any schema was applied to represent empirical operations and coined the phrase a “schemapiric enterprise” to denote this idea. This was not then a widely accepted viewpoint with many authors maintaining that nominal and ordinal systems of classification were not measurement (Heidelberger 1993). More than thirty years later Stevens’ view had, to a large extent, become widespread. Allen (1979) defined measurement as the “assigning of numbers to individuals in a systematic way as a means of representing the properties of the individuals.” The consequence of such a general definition of measurement is that the quality of information encoded in any given schema varies: and accordingly some or all mathematical operations on, or transformations of, data in a schema may be invalid. Table 1 summarises some characteristics of four fundamental scale types: nominal, ordinal, interval and ratio. Cliff (1993) showed that in some restricted circumstances the use of conjoint axioms permits the transformation of one type of scale to another.

Table 1 Levels of measurement adapted from Stevens (1975a)

| Scale | Operations performed | Permissible transformations | Some appropriate statistics |
|---------|----------------------|---|--|
| Nominal | Identify & classify | Substitution of any number for any other number | Number of cases Mode Contingency correlation |
| Ordinal | Rank order | Any change that preserves order | Median Percentiles Rank-order correlation |

| | | | |
|----------|---------------------------------------|--|---|
| Interval | Find distance or differences | Multiplication by a constant Addition of a constant | Mean Standard Deviation Product Moment Co-efficient |
| Ratio | Find Ratios Fractions or multiples | Multiplication by a constant | Geometric mean Percentage variability. |

Equational logic and measurement

Where measurements are supposed to be numbers in the mathematical sense, the fundamental rules of inference (syllogisms) of mathematics provide useful tools for investigating the quality of those measurements. Two syllogisms of immediately obvious utility are informally defined at Table 2.

Table 2 Informal definition of syllogisms useful in evaluation of measurement quality.

| | | |
|--------------|------------------------------------|--------------|
| Symmetry | $a = b \Rightarrow b = a$ | Equation 2-1 |
| Transitivity | $[a = b, a = c] \Rightarrow b = c$ | Equation 2-2 |

2.2.2 Stimulus response functions

While it is now generally accepted that the perceptual magnitude of a stimulus may be projected onto a physical continuum such as length, or the magnitude of a number, there continues to be investigation and debate surrounding the nature of the function describing the transform between the physical and reported perceptual magnitude: the 'stimulus response function'. Some authors, notably Marks and Gescheider (2002) maintain that the determination of sensation (ψ) in the course of any psychophysical investigation requires knowledge of the component parts of the stimulus response function (Figure 2-2). It has also been suggested by (among others) Zwislocki (1983) that the response function is an important source of inter-subject variability in psychophysical measurement.

The deconvolution of the stimulus response function is arguably only an important precaution where psychophysical tools are being used to investigate the neural processes involved in signal transduction and transmission. Where interest is in a population estimate for the perceptual magnitude of a given stimulus it is probably advisable not to deconvolve the response function since the inter-subject variability is an important part of the a population's behaviour.

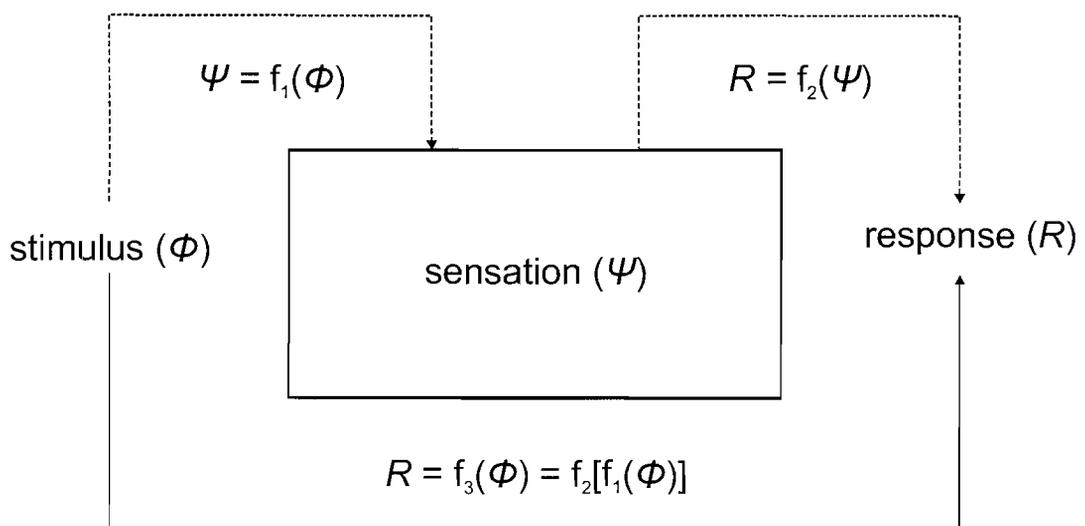


Figure 2-2 The stimulus response function proposed by Gescheider (1997) figure adapted from (Marks and Gescheider, 2002)

2.2.3 Psychophysical approaches involving scaling by sensory distance

2.2.3.1 The enabling works: Weber’s function and Fechner’s law

Weber (1834) was the first author to record the measurement of just noticeable differences (JND) with aural and tactile stimuli. His method had a minimal psychological component: the ability of a subject to discriminate between two stimuli. Weber found that the JND of successive pairs of stimuli increased in a geometric series when the magnitude of the stimuli increased in arithmetic series and described this relationship, now commonly known as Weber’s Law, as a generalisation of his empirical findings (Equation 2-3)

Weber’s Law $\Delta\phi / \phi = k_w$ Equation 2-3

where k_w is commonly referred to as the Weber constant, which, if Weber’s law is correct should be invariant at all magnitudes. However, Weber’s work did not refer to the concept of sensation strength being a continuum, and the apparently obvious question: what sensation is perceived when a JND is detected around some given magnitude remained unanswered.

Twenty six years after Weber’s work on JND, Fechner (1860) formed a hypothesis that the subjective interval described by every JND in a series was constant. His conjecture was that this subjective interval, $\Delta\phi$, might be used to form a scale relating subjective sensation to the physical intensity of the stimulus.

Fechner’s law was derived on the basis the observed relationship between the JND and ϕ remained true in the limit $\Delta\phi \rightarrow \partial\phi$

So $k\partial\psi = \partial\phi / \phi$

Integrating both sides $\int k\partial\psi = \int \partial\phi / \phi$

Fechner’s Law $\psi = k \log \phi$

Equation 2-4
 derivation attributable to Birnbaum (1994)

2.2.3.2 Practical methods relying on measuring sensory distance

Method of paired comparisons

The method of paired comparisons was first described by Thurstone (1927) who demonstrated its utility by establishing a scale of perceptual seriousness for various crimes. The method requires subjects to compare every stimulus in a set with every other indicating which is, in some defined dimension, greater. In consequence the number of trials (p) rapidly becomes very large for all but the smallest set of stimuli since for implementation with full reversal (i.e. a vs. b and b vs. a)) p is given by the permutation of unique ordered sets of two elements from the array of (n) stimuli (Equation 2-5).

$${}_n P_2 = \frac{n!}{(n-2)!} \quad \text{Equation 2-5}$$

Individual results yield ordinal data. However combination of the results of a set of subjects may allow inference of the sensory distance between stimuli based on the distribution of subjects' judgements transforming ordinal data to interval quality. The assumptions associated with the transformation mean that the method is vulnerable to violations of transitivity (Equation 2-1), and further, requires the distribution of judgements relating to n^{th} and $n^{\text{th}}+1$ pair to be overlapping

Conventionally in psychophysical methods involving the assessment of differences, the experimenter desires to determine the proportion of correct responses as the differences between two stimuli of known intensity. In the method of paired comparisons the situation is complicated because both the intensity and the distribution of judgments are unknown. However by making assumptions about the equality of the standard error of observation it is possible to produce a solution.

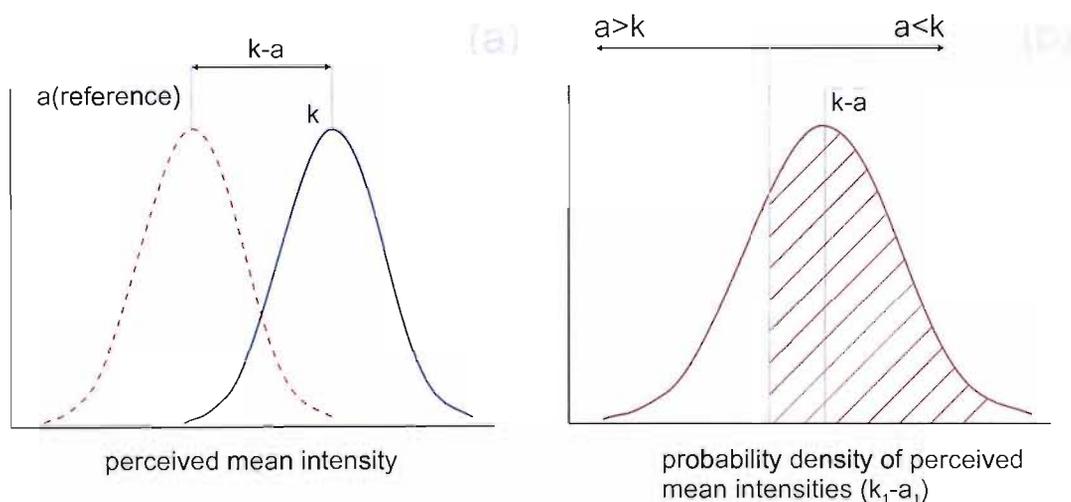


Figure 2-3 (a) Perceived mean intensity of two stimuli, a and k with the distribution of judgements about the mean for each stimulus, with the difference between means, $k-a$,

marked. (b) Probability density function of differences perceived by individual subjects: the true value is assumed to be the most probable value, with the shaded area representing judgements by n subjects where $(k_1 - a_1)$ is positive, while the unshaded area represents the portion of judgements where a is judged more intense than k . adapted from Figures 1 and 2 of Thurstone (1927)

Thurstone postulated that the decision making process about the relative intensity of two stimuli involved the projection of both the reference (a) and test (k) stimuli on to an internal psychological continuum. Where multiple subjects are asked to judge the intensity of the reference (a) and test (k) stimuli it was assumed that these judgements formed a normal distribution. This situation is illustrated in Figure 2-3(a). This approach rests on the assumption that stimuli are associated with "some unmeasured relative mean value" by all subjects. Because of this assumption the use of homogeneous subject sets is highly desirable. It can be seen that the standard error of observation (σ_{ka}) about each stimulus results in an overlapping region between the perceived intensities of the stimuli. The probability density function (Figure 2-3 (b)) yields the sensory distance ($x - a$) in terms of the standard deviation (x_{ka}).

Using these data, and the further assumption that the standard errors of observations are equal between all pairs of stimuli, it is possible to form a scale where the unit is σ_{ka} and the

intensity of the a^{th} stimulus is given by $a = \frac{\sum x_{ka}}{n}$.

If negative values are undesirable it is possible to assign an arbitrary zero point to the stimulus with the lowest intensity.

2.2.3.3 Method of constant stimuli

The method of constant stimuli requires observers to compare the perceptual magnitude of a randomised succession of stimuli to some reference stimulus judging on each presentation whether the test stimulus is greater (or lesser) than the reference. The resulting data are best envisaged as a cumulative distribution function where the percentage of responses where the test stimulus is greater (or lesser) than the reference are plotted against the physical intensity of the stimulus (Figure 2-4). The point at which there is a 50% probability that the test stimulus is greater (or lesser) than the reference is a probabilistic measure of the threshold where the perceptual magnitude of the test and reference stimuli are equal. As classically implemented the method of constant stimuli is non adaptive, meaning that trials remote from the threshold contribute little information to its determination (Watson and Fitzhugh, 1990). The thresholds determined using this method have been shown to be affected by whether the reference stimulus is presented before or after the test stimulus. This effect may be countered, at the cost of a further decrease in efficiency, by repeating trials with the order of the reference and test stimuli reversed. T

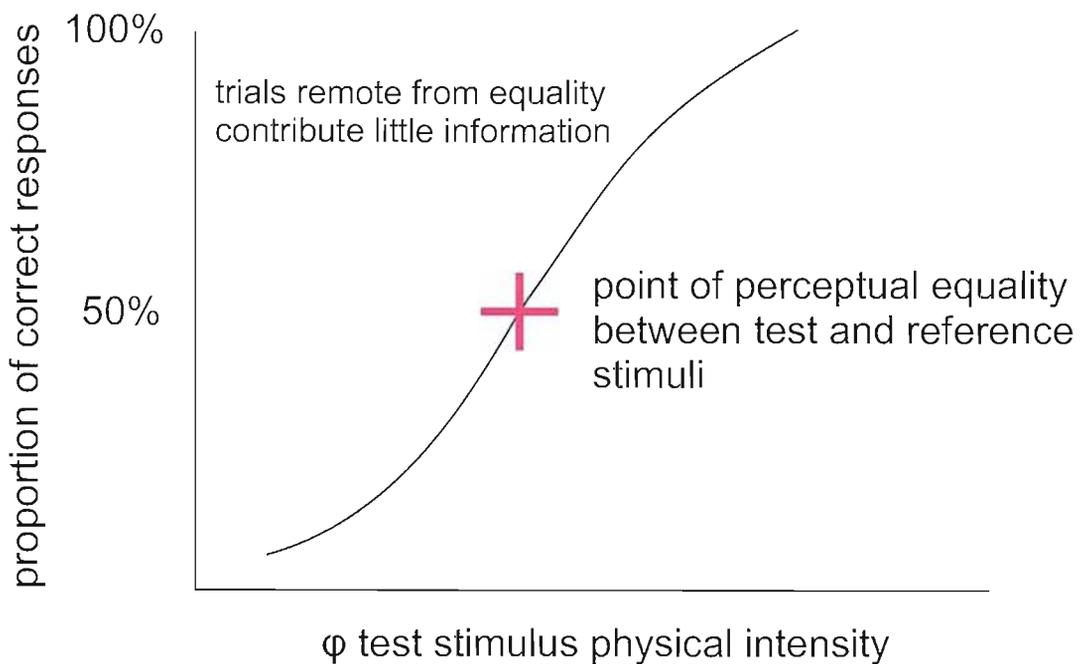


Figure 2-4 The cumulative distribution function describing the point of perceptual equality between test and reference stimuli as determined by the method of constant stimuli.

Categorical scales

Categorical scales require observers to assign stimuli into numerically or semantically labelled bins. In theory at least, these ubiquitous psychophysical instruments should be tools of great utility. Their claim to project the perceptual magnitude of a stimulus onto a scale, which in the case of numerically labelled bins appears to be of interval quality, is highly attractive. However this claim rests on the assumption that observers are able to maintain constant intervals of perceptual magnitude between different categorical bins. Stevens (1975b) maintained that this assumption was invalid on the grounds that observers when presented with a fixed range of categories into which to assign stimuli “lapse perforce into a partitioning operation.” Marks and Gescheider (2002) agreed stating “[there is] a strong tendency for observers to use the categories about equally often.” This typically results in a curvilinear plot when the rated category is reported against a ratio scale of physical magnitude (Figure 5). The implication of these observations for the use of categorical scales is clear: the observer’s response is biased as a function of the distribution of the stimulus set relative to the range of categories. In consequence it is usually inappropriate to treat numerical categorical response data as being measurement of interval quality. Where semantic category labels are in use the problem is compounded since the uncertainty as to what different observers understand by any given semantic label increases variability.

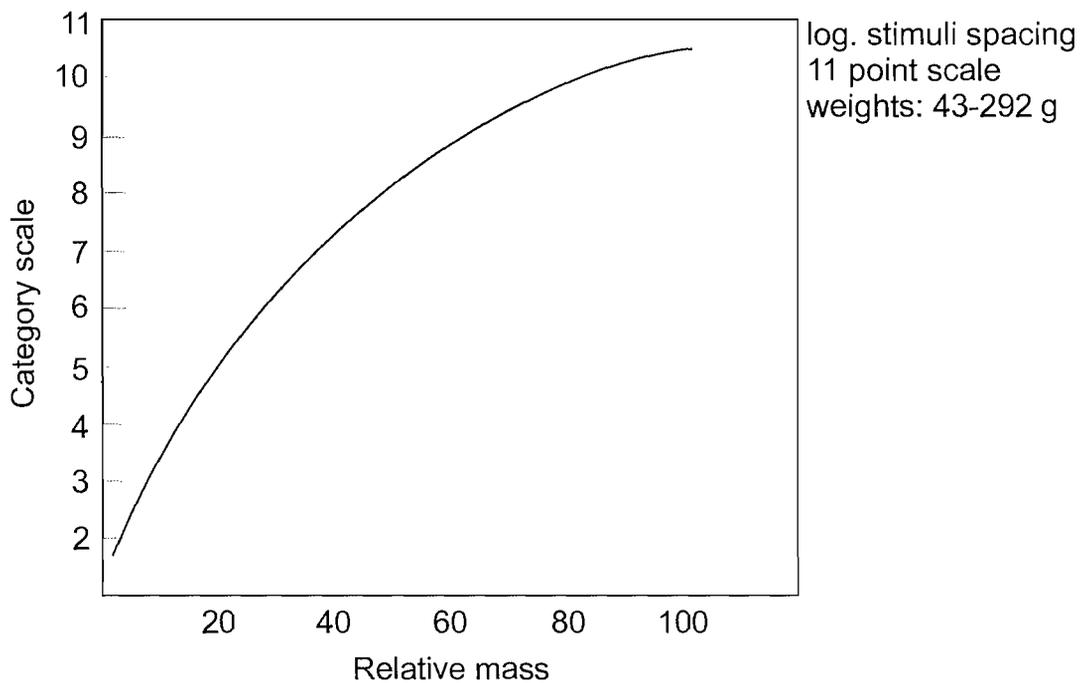


Figure 2-5 Category scale of weight with logarithmic stimulus spacing, showing the characteristic curvilinear trend when category is plotted against the ratio of physical stimuli, which is thought to arise from the tendency of observers to assign stimuli to categories approximately equally often. Adapted from Luce and Galanter (1963)

2.2.4 Psychophysical approaches involving scaling by magnitude

2.2.4.1 The enabling works: Merkel's discs, Stevens' conjecture and the consequent development of the power law.

Merkel (1888) was the first author to demonstrate that subjects were capable of altering the physical magnitude of a stimulus to produce equal ratios. The experiment concerned the brightness of a light observed through a screen. Subjects were required to adjust the intensity of the light (by the insertion, or removal, of ground glass discs which reduced the intensity of the light), until the brightness of the light was in some specified ratio to its original value. Merkel did not progress to develop these concepts into a scaling method. In Stevens' (1975a) words "[he] seems to have had no clear conception of how to construct a scale of sensation.

Very little further work in this area was carried out until the 1930's when a number of authors began to explore this capacity of humans to make ratio judgements using auditory stimuli. These experiments were made practically possible by the widespread availability of analog oscillators, associated with the arrival of telephony, which made precise control of the level of auditory stimuli possible for the first time. Successively more elaborate developments of Merkel's (1888) procedure were developed: Geiger and Firestone (1933) used an experimental method that employed a potentiometer to allow the subject to continuously

vary the level of the test stimulus showed that as well as being able to match levels of stimuli subjects were able to adjust the level of the test stimulus to fractions of the loudness of the reference stimulus both above and below the reference level. Among their conclusions they stated that “To the majority of observers fractional or multiple loudness values have as much meaning as does the equality of loudness between sounds of different complexity or frequency.”

In the 1940's Stevens began to develop a set of conjectures which ultimately led him to propose his power law of sensation. These were:

- a) that sensation (ϕ) was a continuum.
- b) ratio judgements of the perceptual magnitude of a wide range of stimuli were possible, thereby permitting the mapping of the subjective intensity of every stimulus in the set Y to the function $\phi_i(y)$
- c) Measurement of changes in perceptual magnitude were equivalent to measuring changes in sensation
- d) Cramer (as opposed to Bernoulli) had been correct to propose a power law

The power law (Equation 2-6) relates the physical magnitude of the stimulus to its psychophysical value. The exponent n gives the rate of growth of sensation with increasing physical magnitude of the stimulus. Stevens (1975) stated that the n value is an inherent property of the modality

Stevens' Power law $\psi = k\phi^n$ Equation 2-6

with threshold constant $\psi = k(\phi - \phi_0)^n$ Equation 2-7

Transformed $\log\psi = n\log(\phi - \phi_0) + \log k$ Equation 2-8

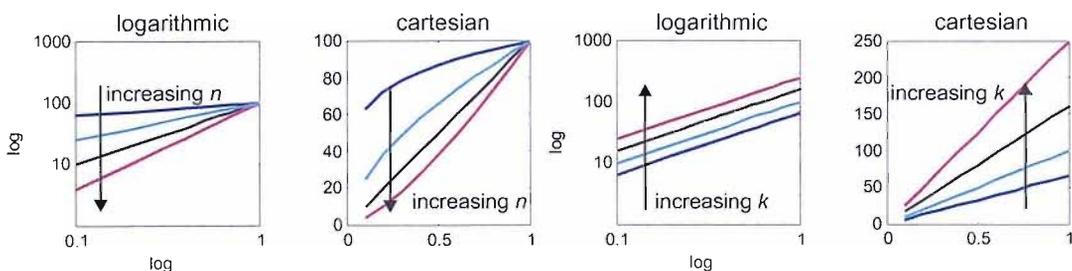


Figure 2-6 The effect on the rate of growth of perceptual magnitude of variation in the n value with a fixed k , and the variation of k with fixed n in log and Cartesian space.

Stevens observed the relationship between the perceptual and physical magnitudes of more than 40 quantities. He also showed that that psychophysical relationships remained describable by the power law when the perceptual magnitudes of stimuli were projected onto more than twenty different continua. This was the empirical base upon which Stevens

claimed wide validity for his model of the relationship between perceptual and physical magnitudes.

2.2.4.2 Practical methods involving scaling by magnitude

Magnitude estimation

Richardson and Ross (1930) were the first to describe magnitude estimation like experiments using telephone current as a physical, and subjective loudness as perceptual, variables. However the method did not come to prominence until the work of Stevens (1975b) who describes the methodological developments from their inception to subsequent use as a scaling method for abstract social constructs such as the social consensus surrounding the perceived severity of crimes. Stevens' thesis was that magnitude estimation directly relates the ratio of two perceptual intensities ($\psi_1:\psi_2$) of stimuli in the same domain (e.g. brightness) to the associated change in physical magnitude ($\Delta\Phi$) by the observer using 'mathematical' numbers to index their own inner perceptual scale. Depending on the variant of the method in use, the perceptual intensity (ψ_1) might be formally designated as the 'reference' or 'standard' stimulus, or each observer might arbitrarily choose to designate some perceptual intensity which seems appropriate to them as ψ_1 . Where the 'reference' stimulus was to be designated Stevens specified that it should lie in the centre of the perceptual range of stimuli being investigated. Since Stevens' death, a number of approaches that might be properly seen as derivatives of either the 'with designated reference' or 'without designated reference' methods have appeared (e.g. Absolute Magnitude Estimation (Zwislocki and Goodman, 1980), which save for the injunction "do not worry about numbers you have assigned to preceding stimuli" is practically identical to the 'without designated reference method) often without particularly convincing theoretical evidence for why improved validity should result from these derivative methods. Magnitude estimation, with or without 'designated reference' yields information about the $\Delta\psi / \Delta\Phi$, e.g. the rate of growth of brightness with increasing intensity, or the rate of growth of vibration discomfort with increasing acceleration. If Stevens' thesis as to the fundamental nature of the projection of perceptual intensity onto a numerical continuum performed by observers is correct, then the use of a designated standard associated with a known physical intensity anchors the scale makes it easier to extract absolute as well as relative differences.

Magnitude estimation suffers from one particular methodological limitation which has an important application where the perceptual magnitude of stimuli approaches the observer's perception threshold.

Magnitude production

In the method of magnitude production the experimenter specifies a 'reference' stimulus ψ_1 and a number q . Observers are then required to produce a stimulus ψ_2 with perceptual

magnitude q times greater (or lesser) than ψ_1 . One example of Stevens' own instructions to observers read

"I am going to present a tone (or noise) whose loudness (or softness or distance) will be called 10. Then I will present a series of numbers, one at a time. Your task is to adjust the tone (or noise) until its loudness (or softness, or distance) seems to you proportionate to the numbers I give" (Stevens and Guirao, 1962)

It is not necessary for ψ_1 and ψ_2 to exist in the same domain, but where they do not the boundary between magnitude production and cross modality matching becomes blurred. It is usual for magnitude production experiments to involve t trials each q_t times greater (or lesser) than ψ_1 . In the special case that $q = 1$, i.e. that observers are required to produce a stimulus $\psi_2 = \psi_1$ the method effectively reduces to the 'method of adjustment', and magnitude production shares some of the disadvantages of that method, notably that subjects are generally unwilling to expose themselves to noxious stimuli leading to the finding for a population that $\psi_{2n} < q_t \cdot \psi_1$ with the obvious undesirable consequences. The result is that the perceptual magnitude of the test stimulus considered equivalent to the reference is often, and sometimes substantially, lower than would be recorded with other psychophysical methods.

Cross modality matching

Cross modality matching is a measurement process whereby the perceptual magnitudes of two stimuli from different continua are matched, (as opposed to magnitude estimation where the stimuli are within one continuum). If the observers ability to judge magnitudes of sensations is in fact an inherent psychological property it is expected that this ability will be exercised in a consistent fashion in judging the perceptual magnitudes of stimuli from both continua. The implication of this is that the relation between two stimuli ψ_1 and ψ_2 can be shown to be $\log \psi_1 = n_1/n_2 \log \psi_2$ where $n_{1,2}$ are the exponents of Stevens Power Law for the first and second stimuli respectively.

In an experiment (Stevens, 1959) using the method of cross modality matching it was demonstrated that the exponents of three continua (loudness, vibration, and electric shock) displayed transitivity (Equation 2-1) (that is in this context: given knowledge of $\Phi_{loudness} = \Phi_{vibration}$ and $\Phi_{loudness} = \Phi_{shock}$, $\Phi_{vibration} = \Phi_{shock}$ was correctly predicted within the range of selected experimental stimuli.). The implications of this display of transitivity suggest that the matching process is internally consistent which is a persuasive indicator as to the reliability of the power law model of sensation.

2.2.4.3 Sources of error in magnitude scaling tasks

Commutation and multiplication

Stevens' descriptions of magnitude estimation and production were essentially empirical. More recently some authors, e.g. Narens (1996) have provided substantial theoretical foundations for the process of magnitude estimation. Addressing speculation as to the true

nature of observer's estimates he provided testable hypotheses that if the estimates given by observers were 'true scientific numbers' then they would conform to the normal mathematical axioms: commutativity and multiplicativity. Ellermeier and Faulhammer (2000) conducted magnitude production experiments intended to test these hypotheses, and found that observer's productions were reliably commutative, but not reliably multiplicative (Figure 2-7). The implication of this study, and replications in other domains is that magnitude productions (or estimates) are ratio judgements of sensory distance, but not always numbers upon which all arithmetic may be freely performed. Therefore, applications which rely only on commutation may be less prone to error than those which rely on both commutation and multiplicativity. Although Narens implies otherwise, it seems improbable that unconstrained cross modality matching would similarly be affected.

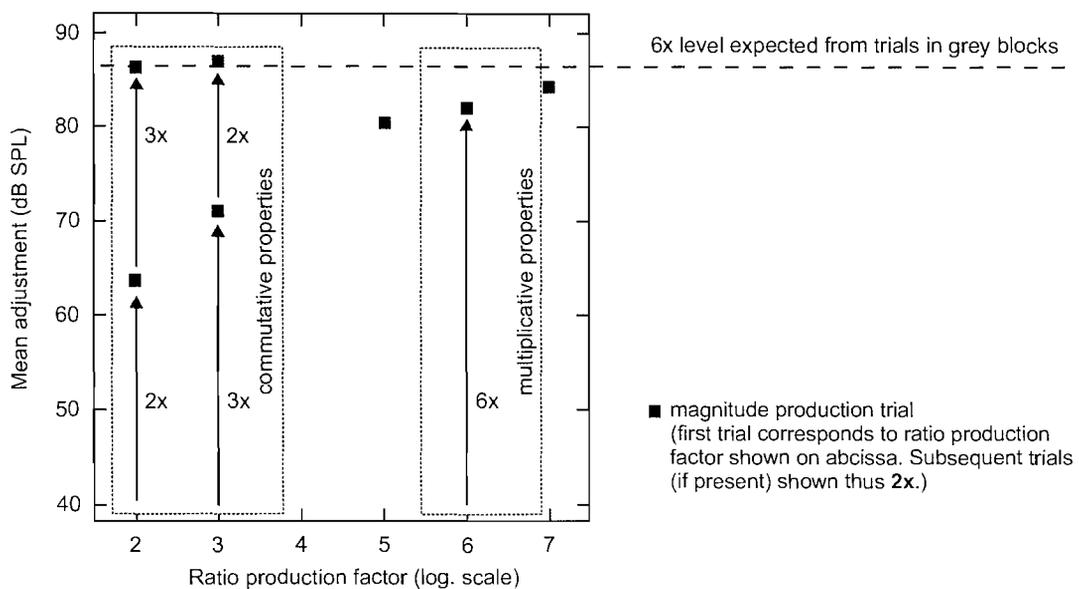


Figure 2-7 The differing results of commutative and multiplicative operations during magnitude production. Real numbers are commutative under addition, that is $x+y = y+x$, as well as supporting the property of multiplicativity, so in this case twice n added to three times n is the same as three times n added to twice n . This trial illustrates that magnitude estimates are approximately commutative. However as the ratio production factor increases to 6x and greater magnitude estimates increasingly fail to satisfy the criterion of multiplicativity. One subject's data which was representative of the median findings reported by Ellermeier and Faulhammer (2000).

Noise

Stevens (1975b) observed that in magnitude estimation trials of the loudness of sound the variability in the exponent was lower when the reference or standard stimulus was at the same frequency as the test stimulus, and greater when the two frequencies differed. One might reasonably suppose therefore that an investigation using reference and test stimuli which were of a similar frequency should, other variables being equal, be able to discern smaller effects than a study where the frequencies differed.

The effect of drawing responses from a restricted pool

Teghtsoonian *et al.* (1995) reported in greater detail on the observation Stevens (1975b) that the intra-subject correlation between physical and perceptual magnitudes in log space decreases when stimuli have closely spaced perceptual magnitudes. They described the relationship between the stimuli and judgements in these circumstances as 'sinuous'. The source of this intra-subject variability has been related by Stevens (1975b), and Baird and Elliot (1975) to the general preference of observers to choose estimates from restricted pool of responses: typically integers, and sometimes from a series with interval 5 or 10. This behaviour is one of the parameters which limits the operational resolution of magnitude estimation tasks, but provided that the investigated effect size is not very small it has little effect on the exponent determined from the grouped data of n subjects.

The effect of restricting or extending the physical range of stimuli in use

During magnitude estimation one might reasonably expect that the reported ratio between the perceptual magnitudes of two stimuli would be independent of the range of physical magnitudes in the set of stimuli in use. However, in fact the ratio between perceptual magnitude decreases as the range of physical magnitudes in the stimulus set increases. Huttel and Lockehead (1999) comment that "for sets of univariate stimuli... increased stimulus range results in poorer discrimination between fixed members of the sets". This effect might create difficulties in interpreting the data from different studies where the investigated range of physical magnitudes varied.

Stevens (1975b) discussed this effect in some detail and argued that the variability introduced by reasonable variation in the range of physical magnitudes in the stimulus set is much smaller than that associated with changing the modality. His view was that the concentration on the range of physical magnitudes in the stimulus set is misplaced, and that ensuring that the perceptual magnitudes in the set were consistent was both a necessary and sufficient defence against this effect.

Order

Stevens (1975b) observed that the order of stimulus presentation could affect the relative size of the perceived perceptual interval between them. He demonstrated that this effect had an analogous form to the hysteresis effect observed in physical materials subjected to stress.

Randomisation of stimulus order neutralises this effect for groups of subjects and minimises it for individuals particularly when the stimulus set is large.

2.2.5 Discomfort

Parameters of the environment (apart from vibration) shown to affect total comfort

Many environmental factors including temperature, acoustic conditions, and personal proximity have been shown to modify persons' perception of total comfort. It seems probable

that there may be interactions between the discomfort caused by these environmental factors and the discomfort arising from exposure to vibration, but information about the nature of such interactions is very sparse.

2.2.5.1 Thermal conditions

The implications for comfort of quasi-equilibrium changes in thermal conditions are relatively well understood. Fanger's (1970) conception of the role of the interaction of environmental parameters e.g. mean radiant temperature and air velocity, with biological factors such as metabolic rate to form an energy balance led to the widely used predictive tool 'predictive percentage dissatisfied'. More recent work e.g. Hensen (2006) has focused on evaluating response to non steady state conditions, and the recent revision to ISO 7730 (2005) incorporates guidance on these settings, and provides advice on assessing the local thermal discomfort which may arise from draughts, radiant asymmetry and other factors. Perception of thermal discomfort is highly dependent on setting, activity, and significant adaptation effects occur.

2.2.5.2 Aural conditions

It is known that excessive exposure to sound is ultimately harmful. Morgan *et al.* (1972) conducted a series of studies to determine loudness discomfort levels. The results showed that the discomfort level in dB SPL varied by frequency from about 130 dB SPL at 125 Hz to 110 dB SPL at frequencies between 1000 and 4000 Hz. There has been some investigation into the interactions between noise and vibration, one study investigated the relative effects of vibration and noise generated by the passage of trains Howarth and Griffin (1990), and it has been possible to show a boundary between sound in SEL (dB(A)) and vibration in vibration dose value ($\text{ms}^{-1.75}$) exposure levels, on one side of which it is preferred to reduce vibration, and on the other sound.

2.2.5.3 Social discomfort

The anthropologist Hall (1968), showed that the physical distances maintained between people in different settings were correlated with their social relationship. Violations of these preferred distances habitually occur in mass transit systems, together with vibration. In some cases vibration may directly cause persons to come into contact, presumably with attendant increases in social discomfort.

In the absence of detailed knowledge about the interactions of environmental parameters it is clear that studies of vibration discomfort should, so far as is practical, be constructed in controlled environments to avoid unintended measurement of interaction effects.

2.2.5.4 Parameters shown to affect ride quality

Ride quality is a term describing the overall experience which an exposed person forms of a moving environment. As such, a quantitative description of the term is usually impossible for

even the simplest real environment because of the very large number of independent and inter-related variables which affect the experience of exposed persons. A number of authors have proposed qualitative models describing the relationship between the moving environment and the exposed person's assessment of ride quality. Some salient features of Griffin's (1990) model are shown in Figure 2-8.

The breadth of factors which affect total comfort can complicate the interpretation of previous work where authors have attempted to investigate the combined effect of a wide subset of the factors contributing to discomfort and have described their dependent variable in broader terms (e.g. "riding comfort" (Jacklin and Liddel, 1933), "ride quality" (Brumaghim, 1967), and "total comfort.") Careful scrutiny of the meaning construed by the author is required to evaluate in what respects their findings may be partially or wholly explicable by environmental factors other than vibration.

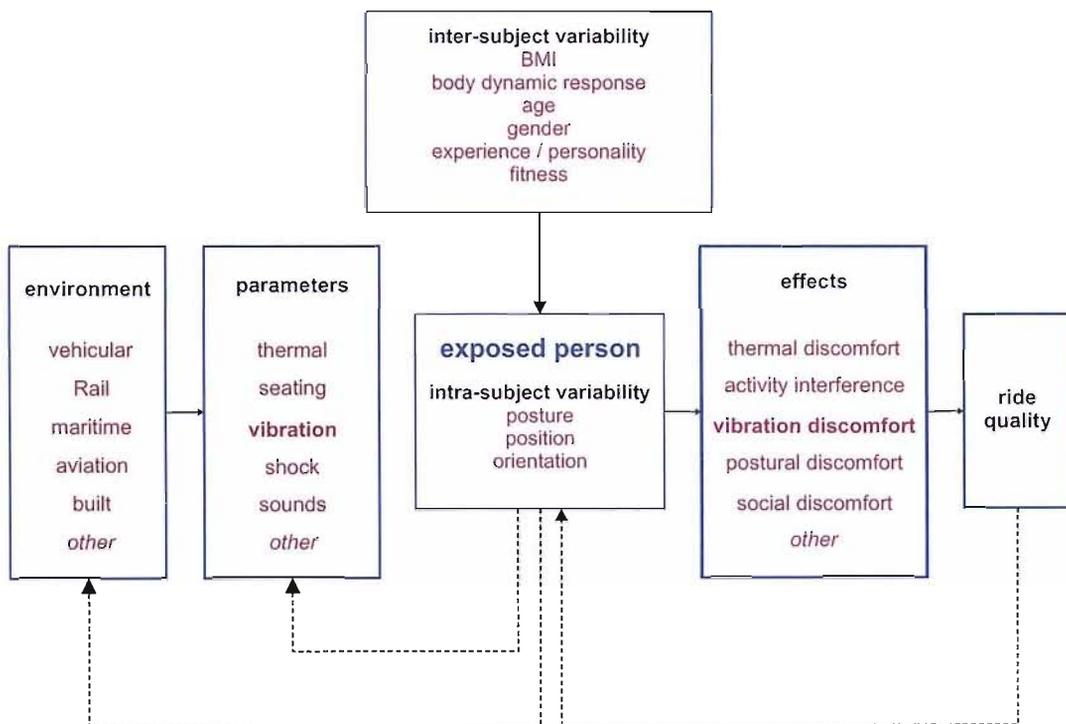


Figure 2-8 The relationship between ride quality and parameters of the moving environment. Adapted from Griffin (1990).

2.2.6 The distinction between static discomfort and vibration discomfort

2.2.6.1 A model of static discomfort

Helander and Zhang (1997) investigated the differences in office worker's concepts of the discomfort and comfort associated with static sitting. They conducted a classification analysis from 42 participants who sat statically in an office environment using 43 descriptors (which were selected using factor analysis from a questionnaire survey ($n = 104$)). The

participants rated the similarity of all 903 possible pairs of descriptors using a scale which ranged from 'very closely related' to 'not related at all'. The similarity scores of these pairs were used to create a 43 by 43 'similarity matrix'. The authors subjected this matrix to a multidimensional scaling algorithm which showed that there were a number of distinct groupings of terms. Helander and Zhang's (1997) suggest that the groupings 'fatigue' and 'pain – biomechanics' (Figure 2-9 left) are related to discomfort and that 'feeling relaxed' and 'impressions' are related to comfort.

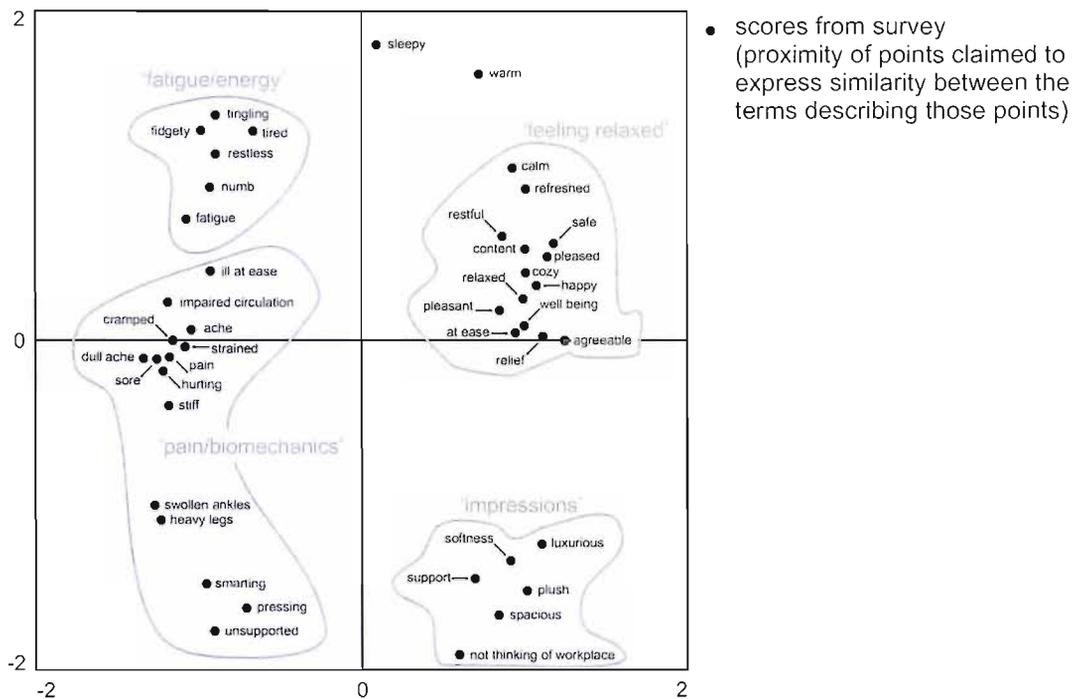


Figure 2-9 Plot of the 43 by 43 similarity matrix after treatment using the SAS (ASCAL (INDSCALE) multidimensional scaling algorithm with the author's chosen descriptions of groups of terms (grey borders). Adapted from Figure 1 Helander and Zhang (1997)

2.2.6.2 Interaction of static and dynamic discomfort

Because there are many factors which influence the comfort of seated persons it is possible that the factors which are the dominant cause of discomfort in one situation, may become subordinate in another setting. Ebe and Griffin (1994) reported one such case where the vibration dose value of the exposure was well correlated with an high magnitude exposure but poorly so when the magnitude was lower. Ebe and Griffin (2000a) proposed a qualitative model which describes this variation in the relative importance of static and dynamic factors. Their model shows that where seats have different static and dynamic discomfort causing potentials the relative discomfort caused by exposure on those seats may vary, and that the variation may change the rank order of discomfort (Figure 2-10). It was suggested that the stiffness of the foam was a key variable in determining the static discomfort causing potential of the seat. Ebe and Griffin (2000b) went on to produce a quantitative model which modified Stevens' power law by the incorporation of a term based

on the seat stiffness. The modified power law was shown to predict discomfort on cushioned seats than either the VDV or stiffness alone.

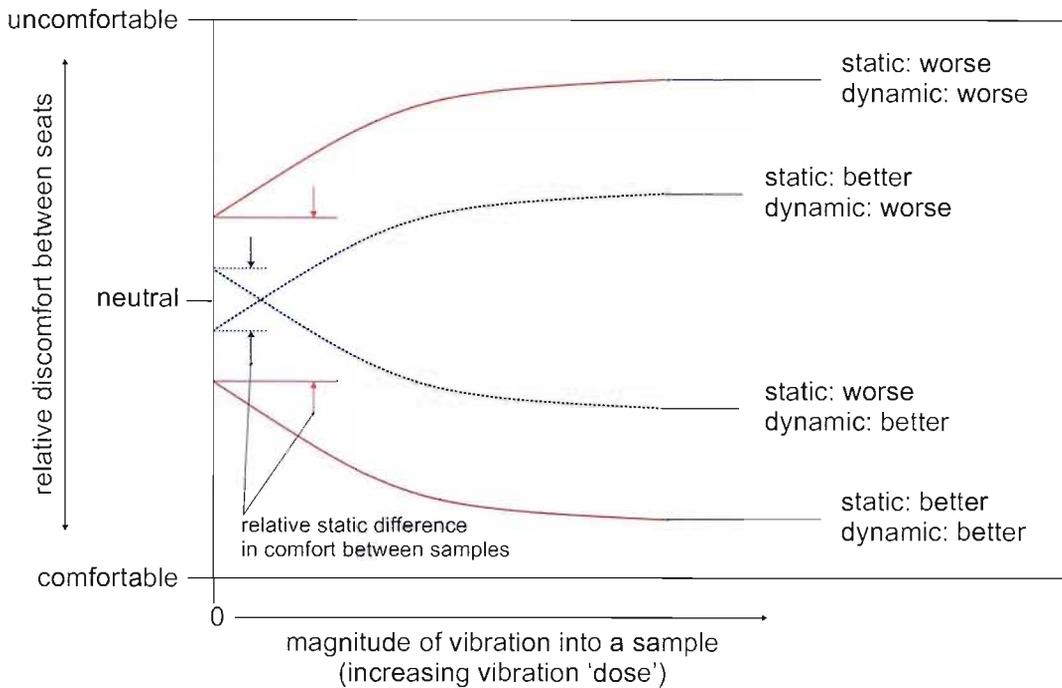


Figure 2-10 The relative overall seat discomfort within two pairs of samples (solid and dashed lines) with different discomfort causing characteristics in static and dynamic settings. Adapted from Ebe and Griffin (2000a) Figures 6 and 8

2.3 The discomfort arising from exposure to oscillation in a single axis

2.3.1 Exposure to translational oscillation

In order to remove the need for persistent repetition about methodological features of studies in the following sections, and to orientate the reader, Table 3 provides a summary of important details of the articles reviewed in this section. Readers with particular interest in studies before 1975 may find Griffin's (1975) review of ride comfort studies conducted in the United Kingdom helpful. There are also extensive summary tables in Appendices 2.1 and 2.2 of Parsons' (1979).

Table 3 Short summaries of articles pertaining to exposure to translational oscillation with coverage between near dc and frequencies < 10 Hz

| Citation | Freq (Hz) | Axes | Seating | Inputs | method | reference / scale | main output |
|---------------------------|------------|---------------|--|---|------------------------------------|--|---|
| Miwa (1967) | 0.05 - 300 | x,y | seated (flat rigid) | seat + back | limits | sinusoidal 20 Hz 0.0315, 0.10,0.315*,1.0 ms ⁻² | perception threshold equi. comfort contour |
| Brumaghim (1967) | 1.0 – 8.0 | Y | soft seat with back | seat back feet | semantic scale | | equi. comfort contour |
| Chen & Robertson (1972) | 0.07– 3.0 | x,y | seated standing 'walking' | seat feet feet | staircase? | not applicable | perception threshold |
| Shoenberger (1975) | | Z | seated | seat back feet | magnitude estimation | | rate of growth of disc. |
| Gundry (1978b) | 0.2 | X | review paper | review paper | Review paper | not applicable | perception threshold |
| Rao & Jones (1978) | | x,y,z | Seated | seat | | | |
| Parsons & Griffin (1978b) | 2 – 16 Hz | x,y ry ,rx | seated (flat rigid) | seat alone varied centre of rotation | semantic scale | very uncomfortable, uncomfortable, mildly uncomfortable, noticeable but not unconf | equi. comfort contour |
| Whitham & Griffin (1978) | 2- 64 | x,y,z | seated | seat alone | semantic Location of discomfort | very uncomfortable, uncomfortable, mildly uncomfortable, noticeable but not unconf. | location of discomfort |
| Entekhn et al. (1979) | 3-12 | Z | seated | seat feet | effect of phase | | effect of phase |
| Griffin et al. (1982) | 1.0 - 63 | x,y,z | seated (flat rigid) | seat alone | constant stimuli | sinusoid 10 Hz, 0.8 ms ⁻² | equi. comfort contour |
| Parsons & Griffin (1982) | 1-31.5 | ry ,rx,rz | seated (flat rigid)w | seat alone | constant stimuli | sinusoid 10 Hz, 0.8 ms ⁻² | equi. comfort contour |
| Parsons et al. (1982a) | | x,y,z | seated (flat rigid) rigid back/foot rests | feet alone back alone | constant stimuli | annoying, objectionable | equi. comfort contour |

Table 3 (continued)

| | | | | | | | |
|----------------------------|------------------------|-------------------------------|---|--|--|---|---|
| Griffin et al. (1982b) | | x, y, z r_y, r_x, r_z | review paper | review paper | Review paper | not applicable | efficacy of prediction |
| Donati (1983) | | x, y, z x, y | seated seated + low back | seat feet seat back feet | Intensity matching | z : sinusoid 4 Hz, 1.6 ms^{-2} x, y : sinusoid 2 Hz, 1.2 ms^{-2} | equi. comfort contour % effect of backrest |
| Corbridge & Griffin (1986) | 0.5- 5.0 | y, z | seated | seat back feet | constant stimuli | y, z sinusoidal 2 Hz 0.75 ms^{-2} | equi. comfort contour efficacy of prediction |
| Parsons & Griffin (1988) | 2-100 2-63 2-100 | x, y, z | seated (flat rigid) supine standing | seat alone back alone feet alone | signal detection adjustment | not applicable | threshold distribution perception threshold |
| Jang & Griffin (1999) | 4 | Z | seated | seet Feet | magnitude estimation | 4 Hz, 0.63 ms^{-2} seat & feet in phase | effect of phase on magnitude estimates |
| Jang & Griffin (2000) | 2.5 – 6.3 | Z | seated | seat feet | magnitude estimation | 2.5 - 6.3 Hz, 0.63 ms^{-2} seat & feet in phase | effect of phase on magnitude estimates |
| Price et al. (2006) | 0.5 – 16 | X | seated (flat rigid) rigid footrest rigid back | seat seat feet seat back feet | magnitude estimation | x | rate of growth of discomfort equi. comfort contour |
| Morioka & Griffin (2006) | 2-315 | x, y threshold x, y, z | seated (saddle) | seat | staircase (thresholds) magnitude estimation | 20 Hz, $0.5 \text{ ms}^{-2}(z)$, $1.0 \text{ ms}^{-2}(x, y)$ | perception threshold equi comfort contour |

2.3.1.1 Effect of frequency on perception of oscillation in the lateral and fore-and-aft axes

Three studies provide information on the effect of frequency on the perception threshold at frequencies less than 2.0 Hz, and one further study covers the region 2.0 to 10 Hz. The most extensive information at frequencies less than 2.0 Hz concerns a study which exposed sitting, standing and 'walking' subjects to oscillation in the fore-and-aft and lateral axes (Chen and Robertson, (1972)). Only in the condition during which subjects stood was the frequency dependence of the perception threshold reported, and then only as the 'horizontal threshold' defined by the author as the average of the lateral and fore-and-aft thresholds (Figure 2-11). The 'horizontal threshold' showed that sensitivity to oscillation increased rapidly at about 12 dB per octave between 0.07 and 0.3 Hz. During oscillation in sitting at 0.1 Hz subjects were reported to be less sensitive with the lateral sitting sensitivity being approximately 70% of the fore-and-aft sensitivity. If this relative sensitivity was preserved at 0.2 Hz then the threshold for lateral sitting might be expected to be of the order of 0.027 ms^{-2} r.m.s. a value compatible with that reported by Von Békésy [1939] cited by Gundry (1978b) where the results indicated that the perception threshold for lateral oscillation was between 0.01 and 0.02 ms^{-2} r.m.s. The report of this experiment was limited with much pertinent information missing, including details of the motion generation method, threshold detection technique, together with the number and type of subjects employed. Therefore this apparent concordance should be viewed with caution.

The frequency dependence of the perception threshold observed by seated subjects exposed to fore-and-aft oscillation was reported by Miwa (1967). His study showed that the threshold was approximately 0.012 ms^{-2} at 0.5 Hz and 0.098 ms^{-2} r.m.s at 4 Hz with the maximum sensitivity of 0.08 ms^{-2} r.m.s being reached at about 2 Hz (Figure 2-11). Three subjects exposed to lateral oscillation produced thresholds similar to those resulting from fore-and-aft oscillation, and on this basis Miwa judged that the frequency dependence of the perception thresholds arising from lateral and fore-and-aft oscillation could be modelled as a 'horizontal' threshold. Although statistically the grounds for this assertion are slight, later work by Parsons and Griffin (1988) found that at frequencies less than 10.0 Hz the frequency dependence of the perception threshold was not statistically significantly different whether the oscillation was in the lateral or fore-and-aft axes. The same study showed that seated subjects were more sensitive to oscillation than those who stood at frequencies between 2.0 and 10.0 Hz, a finding at variance with the relative sensitivity reported by Chen and Robertson (1972) at 0.1 Hz.

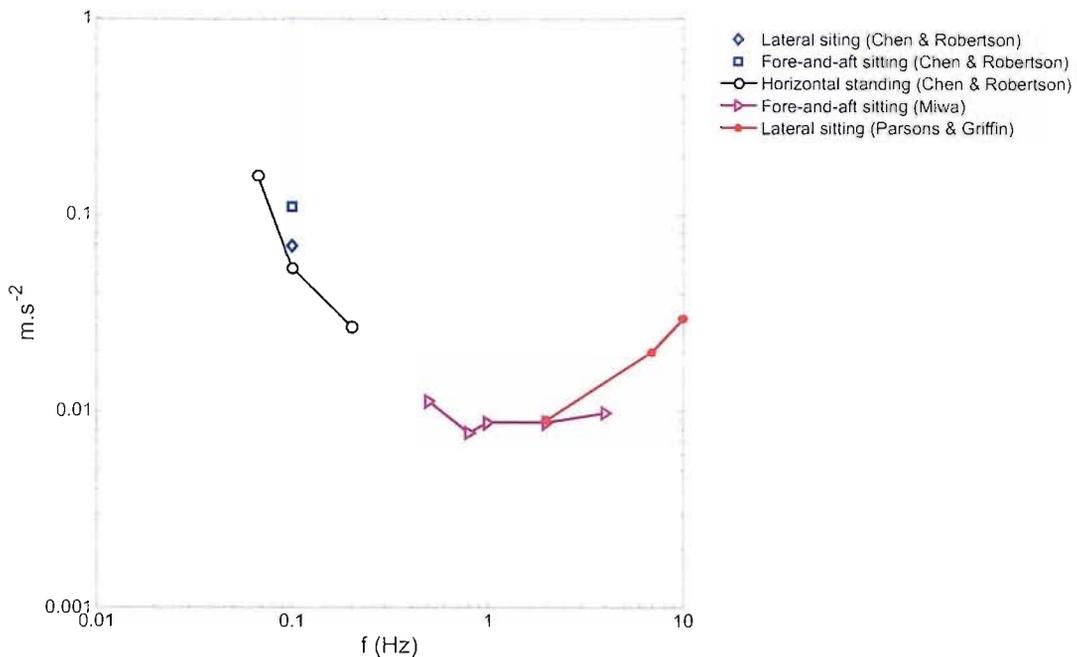


Figure 2-11 The frequency dependence of the perception threshold during lateral and fore-and-aft oscillation. Data from Chen and Robertson (1972) Miwa (1967) and Parsons and Griffin (1988)

2.3.1.2 Effect of frequency on the discomfort arising during supra threshold lateral oscillation

Brumaghim (1967) investigated the discomfort arising from exposure to lateral oscillation on a 'standard airline seat'. Subjects were exposed to oscillation nominally at frequencies between 0.45 and 7 Hz. However because the seat was not characterised, there is little certainty as to the frequency or magnitude of vibration to which they were actually exposed. Subjects' experience of the vibration was measured using a semantic scale with two labels 'annoying' and 'objectionable'. The study showed that the level of acceleration required to produce annoyance varied greatly. Deficiencies in the reporting of the study means that it is difficult to assess whether this variability was due to intra subject variability between trials, or to intentional changes in the backrest contact condition. The authors' conclusion was that there was a 'nearly linear decrease in sensitivity as the frequency of lateral vibration was increased from 2 to 7 Hz (Figure 2-12)

Rao and Jones (1978) exposed subjects to lateral and fore-and-aft oscillation at nine frequencies between 1 and 20 Hz. Subjects sat on a rigid seat with a foam pad in the pan that was reported to have unity transmissibility between 0 and 30 Hz. The method of adjustment was used to produce equivalent comfort contours. The reference stimulus was a 0.5 to 25 Hz random signal at one of four magnitudes. In the case of the contour shown in Figure 2-11 this was 0.85 ms⁻² r.m.s. (Figure 2-12) the frequency dependence of the median

equivalent comfort contours was similar whether the oscillation was in the fore-and-aft or lateral axes. Subjects' sensitivity to vibration was greatest at 2.0 Hz declining both above and below this frequency such that the level of the contour was 1.7 and 2.5 times that at 2 Hz at 1 and 20 Hz respectively.

Griffin *et al.* (1982) exposed subjects to seat vibration in the lateral axis. A contour was determined describing discomfort equivalent to 10 Hz 0.8 ms^{-2} r.m.s. sinusoidal vibration was constructed. This showed that discomfort was independent of frequency between 1 and 2 Hz. Above this frequency subjects' sensitivity approximately linearly such that at 10 Hz the acceleration equivalent to the reference stimulus was approximately 3.5 times that at 1 Hz. Displacement limitations on the electrodynamic vibrator in use meant that not all subjects were able to adjust the test stimulus to produce discomfort equal to the reference motion at frequencies below 2 Hz. Those subjects who were able to match were, by definition, less sensitive than those who could not. These low frequency results may also have been affected by relative motion between seat and feet. The contour shown in Figure 2-12 map the median values from this study as reported by Griffin *et al.* (1982) in the summary paper 'Vibration and comfort IV. – Application of experimental results'

Donati *et al.* (1983) exposed subjects on an upholstered seat and required to hold a steering wheel which contributed to the vibration input. The authors claim that the seat had a unity transfer function at less than 6 Hz. The equivalent comfort contours generated show that as the frequency decreases below 2 Hz subjects initially become less sensitive with decreasing frequency, and then that discomfort becomes independent of frequency.

Corbridge and Griffin (1986) used the method of constant stimuli with a reference of a 2 Hz, 0.75 ms^{-2} r.m.s sinusoid to determine an equivalent comfort contour for exposure to lateral oscillation. There were 11 frequencies investigated, at third octave centre frequencies between 0.5 and 5.0 Hz. The investigated magnitudes varied between 0.4 and 3.15 ms^{-2} r.m.s. The contour shows a maximum in sensation at around 2 Hz (Figure 2-12). Below this frequency sensitivity was observed to decrease at approximately 6 dB per octave, although the form of the contour became irregular.

Morioka and Griffin (2006) exposed 12 male subjects to vibration on a saddle like seat at frequencies between 2 and 315 Hz. The method of magnitude estimation with a sinusoidal reference stimulus at 20 Hz and a magnitude of 0.5 ms^{-2} r.m.s. was employed. The frequency dependence in this case shows a sensitivity decreasing steeply with increasing frequency. Although the lowest studied frequency was 2 Hz there is no evidence of the minimum displayed in other work. Morioka and Griffin attribute the differences to increased sensitivity arising from relative motion induced between seat, feet and hands (which grasped a handle in front of the body), and to the absence of thigh contact with the seat (because of its saddle form).

In summary these studies show that between 2 and 10 Hz the sensitivity of subjects' to acceleration in terms of the discomfort it produces, declines at approximately 6 dB per octave. However at frequencies between 1 and 2 Hz the frequency dependence of discomfort is less clear. In those studies where there was relative motion between the seat and the feet (i.e. where the seat oscillated and feet were placed on a static footrest) the trend is for sensitivity to be independent of or increase with decreasing frequency. In other studies where persons were exposed on a vibrating platform (e.g. Corbridge and Griffin (1986), and Rao and Jones (1978)) sensitivity was reported as decreasing with decreasing frequency. These differences and their potential significance are discussed in Section 2.3.1.6 below. Only one study Corbridge and Griffin (1986), extends knowledge about the frequency dependence below 1 Hz and this shows a continued decline in sensitivity. However the contour becomes uncharacteristically 'ragged'. It is unclear why this marked variability in sensitivity from one frequency to another should occur between 0.5 and 1.6 Hz.

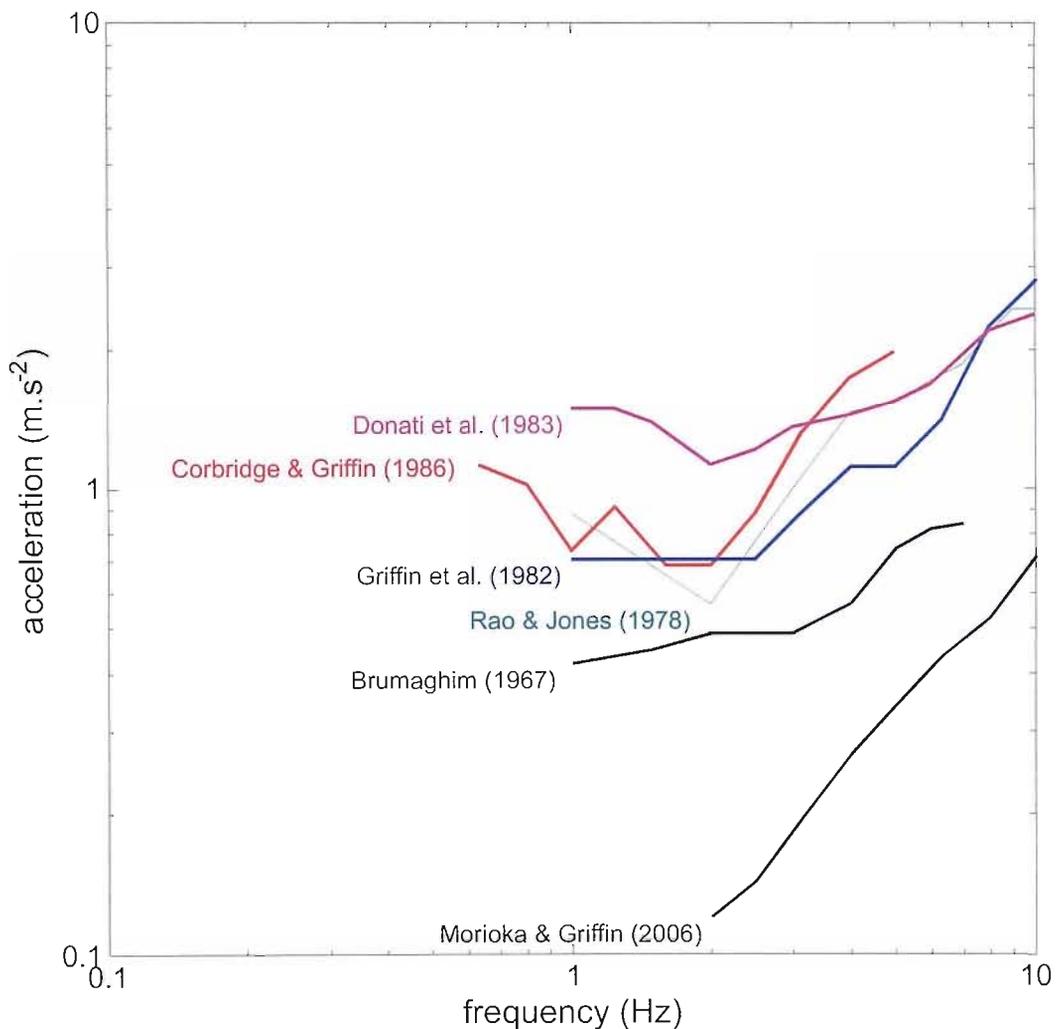


Figure 2-12 The discomfort arising from exposure to supra-threshold oscillation in the lateral axis. Seating conditions, experimental methods, and the magnitude of the contours shown all vary, so direct comparison of the magnitude of contours may not be appropriate.

2.3.1.3 Effect of frequency on the discomfort arising during supra threshold fore-and-aft oscillation

Miwa (1967) conducted a study of the effects of fore-and-aft oscillation on the discomfort arising from exposure to fore-and-aft oscillation at 0.5, 0.8, 1.0, and 10 higher frequencies less than 300 Hz, which was the highest frequency studied. The results showed that between 0.5 and 2.0 Hz subjects' sensitivity to oscillation was effectively independent of frequency (Figure 2-13). At these lower frequencies the period between alterations in the signal was six seconds. This implies that at 0.5 Hz subjects' exposure was only 3 cycles of oscillation, which given that the signals were untapered at start or end, means that it is possible that the start and end transients may have influenced subjects' discomfort judgments. Difficulty in determining the distortion at these lower frequencies also means that the possibility that judgements were influenced by higher frequency harmonics cannot be excluded.

Griffin *et al.* (1982) exposed subjects to seat vibration in the fore-and-aft axis. The resulting equivalent comfort contour was equivalent to the discomfort caused by exposure to 10 Hz 0.8 ms^{-2} r.m.s. sinusoidal vibration. Between 1 and 2 Hz there were indications that subjects' sensitivity decreased slightly with decreasing frequency. Above 5 Hz sensitivity decreased rapidly. The results below 2 Hz require some caution in their interpretation since displacement limitations on the electrodynamic vibrator in use meant that not all subjects were able to adjust the test stimulus to produce discomfort equal to the reference motion at frequencies below 2 Hz. Those subjects who were able to match were, by definition, less sensitive than those who could not. These low frequency results may also have been affected by relative motion between seat and feet. The contour shown in Figure 2-13 map the median values from this study as reported by Griffin *et al.* (1982) in the summary paper 'Vibration and comfort IV. – Application of experimental results'

Price *et al.* (2006) reported the results of an experiment which used the method of magnitude estimation to produce a family of equivalent comfort contours showing the discomfort arising from exposure to fore-and-aft oscillation where the seat, back, and feet moved in phase with one another. The contour (**Figure 2-13**) showing discomfort equivalent to the reference magnitude showed that subjects were most sensitive at frequencies between 1 and 2 Hz, and that below 1 Hz sensitivity declined continuously at approximately 3 dB per octave to 0.5 Hz which was the lowest frequency studied.

Morioka and Griffin (2006) produced a family of contours using magnitude estimation which report the discomfort arising from exposure to fore-and-aft oscillation on a saddle type seat with no backrest and a stationary footrest. Their results (**Figure 2-13**) show a steep linear decline in sensitivity with increasing frequency between 2 and 10 Hz, and there is limited evidence that their contour is reaching maximum sensitivity at or around 2 Hz, the lowest

frequency studied. The authors suggest that differences in the form of their contour might be attributable to the altered thigh support which the saddle type seat offered as compared with a flat rigid seat.

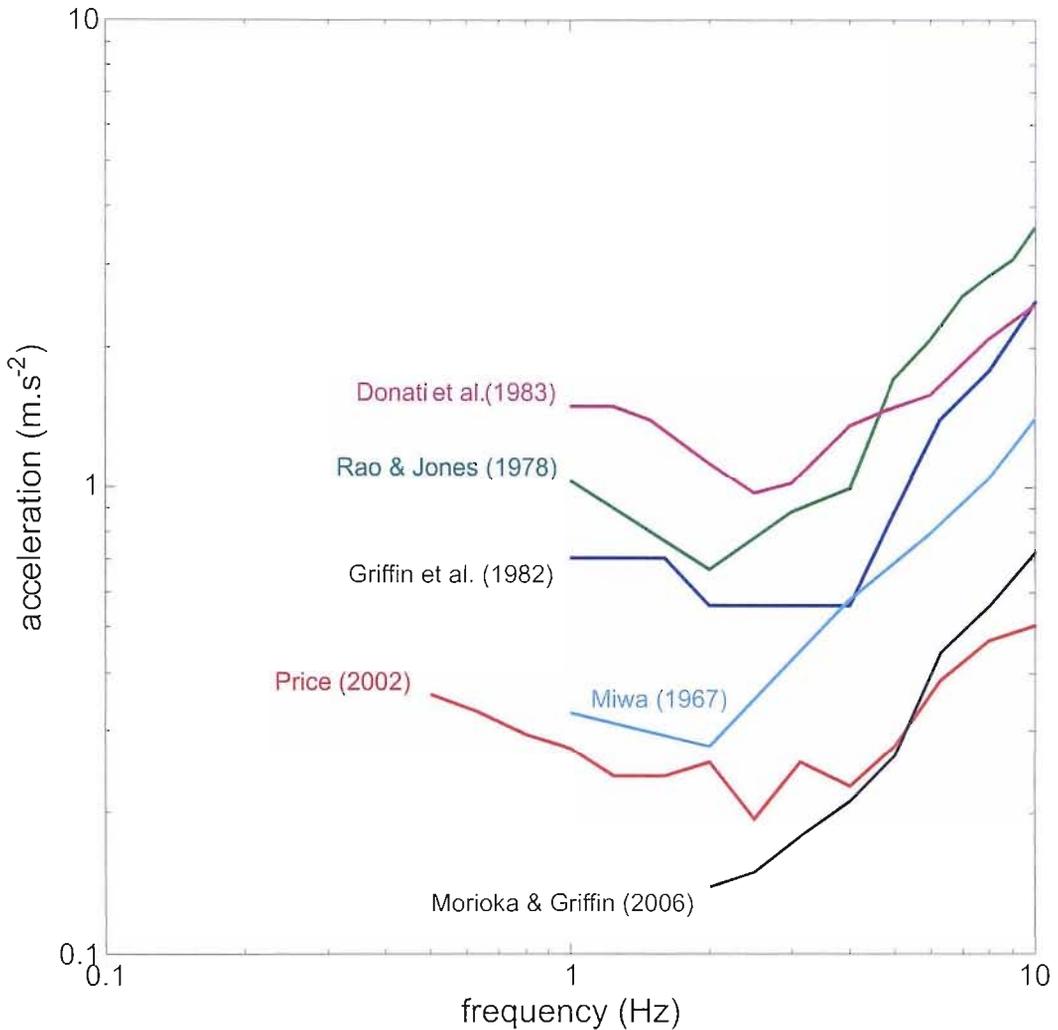


Figure 2-13 The discomfort arising from exposure to supra-threshold oscillation in the fore-and-aft axis. Seating conditions, experimental methods, and the magnitude of the contours shown all vary, so direct comparison of the magnitude of contours may not be appropriate.

2.3.1.4 Location of most discomfort during oscillation in the lateral and fore-and-aft axes

Whitham and Griffin (1978) conducted an investigation into the frequency and magnitude dependence of the principal location of discomfort of seated subjects exposed to vibration in the three translational axes. Subjects were seated on a flat rigid seat with no vibration at the feet and with no backrest. The frequency range was from 2 to 64 Hz and the study used sinusoidal vibration at octave centre frequencies. The results showed that there was no clear effect of magnitude, but that there were important frequency effects which varied between axes. Response to vertical acceleration indicated that at 2 Hz the principal location of

discomfort was predominantly located in the lower part of the body and the thighs. At the same frequency in the lateral and fore and aft axes discomfort at the ischial tuberosities dominated although there were incidences of subjects reporting discomfort at the level of their cervical spine and above. Above 2 Hz there was a region in the lateral axis (4-16 Hz) where discomfort was generally distributed across the body and in the head. At the highest frequency the principle location of discomfort was firmly localised at the ischial tuberosities in all three axes. At 2 Hz, the authors suggested that discomfort at the ischial tuberosities was likely to be attributable to the shearing of tissue between the ischial tuberosities and the rigid seat. Subject's feet were stationary during these experiments at the lowest frequency and highest magnitude the displacement of the vibrator was 0.013 m. In the context of other work investigating the effect of phase on discomfort e.g. Jang and Griffin (1999) it is possible that the relative motion between seat and feet may have affected discomfort. Whitham and Griffin (1978) also acknowledge that the introduction of vibration at the feet and back might have altered the distribution of discomfort in the body. The experiment included a cross referencing procedure which permitted comparison of the levels of equivalent comfort contours between seating conditions and this showed that at frequencies less than 0.8 Hz the presence of a backrest reduced discomfort, but at higher frequencies this effect was reversed.

Price (2003) studied of the location of most discomfort during exposure to fore-and-aft vibration on a flat rigid seat. There were six studied frequencies between 0.5 and 16 Hz, and three magnitudes of acceleration (between 0.2 and 0.8 ms⁻² r.m.s.). In this study during which the backrest moved in phase with the seat there was a higher incidence of the location of most discomfort being in the upper torso, or lower leg, than in the buttocks, hips, upper leg or knees at frequencies between 0.5 and 2 Hz, while at higher frequencies the opposite trend was evident.

At higher frequencies the literature reported in this review suggests that discomfort is mediated by one of two phenomena: a) discomfort localised at the input points arising from stress and strain in tissue between the skeleton, or b) at other anatomical structures (e.g. head, knees, and thorax) which are sensitive, perhaps because of their natural frequency, to transmitted vibration at the relevant frequency. Some evidence, e.g. Price (2003) suggests that discomfort is likely to be poorly localised with low frequency oscillation, but the reasons for this, and its implications for predicting passenger and operator experience are not well understood.

2.3.1.5 Effect of magnitude on the discomfort arising during oscillation in the lateral and fore-and-aft axes

The effect of magnitude determines whether the discomfort arising from exposure to vibration in a given axis can be effectively predicted for any acceleration from a contour determined at another acceleration, i.e. that the 'system' giving rise to discomfort is one where the principle of superposition is valid. The efficiency of different measurement methods in assessing the effect of magnitude varies widely. Fechnerian methods are generally much less efficient than those based on Stevens' work. There is therefore only limited information in the literature concerning the effect of magnitude on the discomfort arising from fore-and-aft or lateral oscillation, and at the frequencies of particular interest in this review (below 2 Hz) almost none. It is possible to infer from the data presented in Figure 2-12 and Figure 2-13 where the magnitudes of the matching accelerations in different studies varied as a consequence of differing reference conditions that such an effect should exist at frequencies below 2 Hz, however the investigation by Griffin *et al.* (1982), which studied the effect of magnitude on two contours equivalent to 10 Hz vertical vibration at 0.5 and 1.25 ms⁻² r.m.s. found that between 2 and 63 Hz a significant effect of magnitude was only observed at 4 Hz in the fore-and-aft axes.

However studies using the methods developed by Stevens' have shown that the rate of growth of vibration discomfort (n) varies by frequency at frequencies in around 2 Hz e.g. Shoenberger (Shoenberger, 1975) in the vertical axis and (Price, 2002) in the fore-and-aft axis which implies that there must be an effect of vibration magnitude in the resulting equivalent comfort contours.

Morioka and Griffin (2006) systematically investigated the effect of magnitude on the perception of vibration discomfort from threshold levels up to stimuli causing discomfort approximately three times as great as that elicited by 20 Hz 1.0 ms⁻² r.m.s. vibration (lateral and fore and aft). It was observed that the form of the contour became increasingly similar to that of the threshold as the magnitude decreased, and that the effect of magnitude was less in the lateral axis than in the fore-and-aft axis (Figure 2-14). The authors' conclusion was that no single frequency weighting could effectively model the discomfort arising from exposure to fore-and-aft and lateral vibration at frequencies between 2 and 300 Hz.

The effect of magnitude during oscillation in the fore-and-aft and lateral and vertical axes at 2 Hz reported by Morioka and Griffin (2006) means that is highly probable that such an effect exists at lower frequencies. Since there can be no effect of vibration magnitude when there is a zero rate of growth of vibration discomfort, in a static situation the effect of magnitude must be zero, however it is unclear whether the effect of magnitude reduces linearly with decreasing frequency, and if it does not whether variations in the effect are practically important.

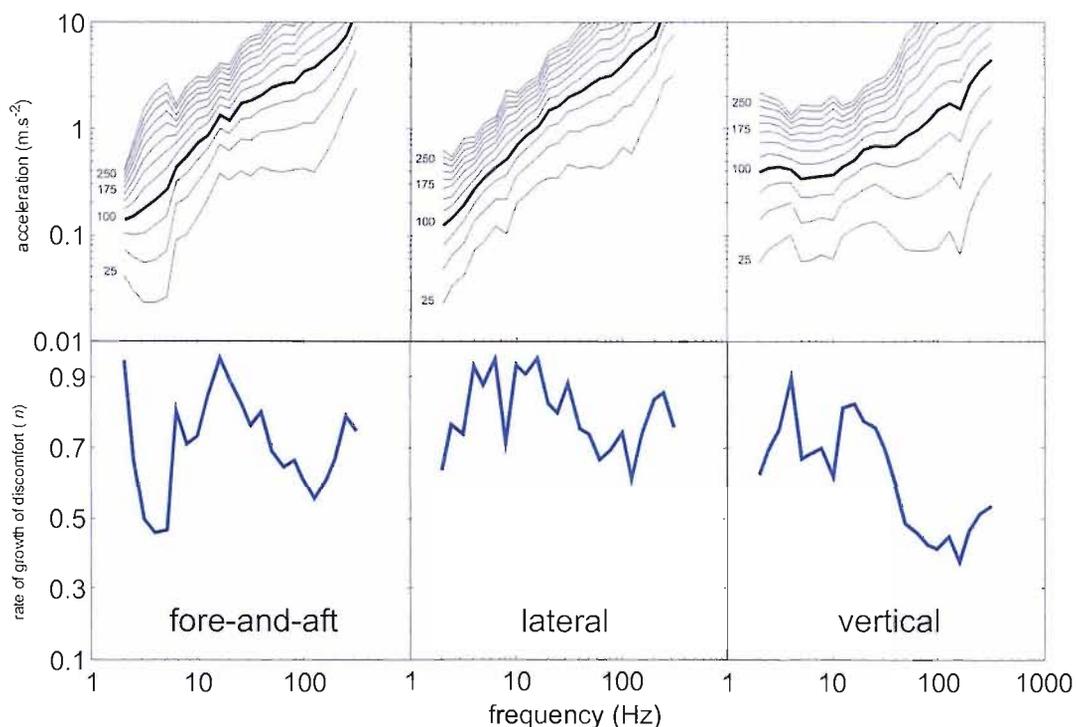


Figure 2-14 The effect of magnitude on the discomfort arising from vibration in the lateral, fore-and-aft and vertical axes, together with the associated rates of growth of discomfort (n values) in those axes. Adapted from Morioka and Griffin (2006)

2.3.1.6 Effect of phase on the discomfort arising during oscillation in the lateral and fore-and-aft axes

In a study of the preferences of subjects for a stationary or moving footrest Entekin *et al.* (1979) exposed subjects to vertical vibration. The frequency range of this study was from 3 to 12 Hz. One magnitude ($1.0 \text{ ms}^{-2} \text{ r.m.s}$) was studied, and there were three different phase relationships between the seat and the feet (0° , 90° and 180°). That study showed that at frequencies below 4 Hz subjects preferred a footrest which was oscillating in phase, and with the same amplitude, as the seat, and that most subjects could detect a 180° phase difference between the seat and the feet. At higher frequencies a stationary footrest was preferred.

In a more extensive study of the effect of differential vertical vibration at the seat and feet on discomfort, Jang and Griffin (1999) studied the effect of varying the relationship between the vibration subjects received at the seat and feet. One frequency (4 Hz) was studied, with two postures (with and without thigh contact), and five magnitudes of acceleration between 0.25 and $1.6 \text{ ms}^{-2} \text{ r.m.s}$. Seven different phase relationships between seat and feet vibration were investigated with the phase varying between 0° and 180° . The method of magnitude estimation was used to determine the rate of growth of vibration discomfort in each condition. The reference stimulus was a 4 Hz sinusoidal signal at $0.63 \text{ ms}^{-2} \text{ r.m.s}$. with 0° phase angle between seat and feet. The results suggested that subjects were more sensitive to differential vibration of the seat and feet at magnitudes of oscillation below 0.63

ms^{-2} r.m.s. It was also shown that subjects were more sensitive to phase differences when they were seated with full thigh contact than without. In general, increasing the phase angle increased discomfort. A further investigation by Jang and Griffin (2000) into the effect of phase used stimuli in the vertical axis. There were two phase relations (0 or 180 degrees) between seat and feet at frequencies between 2.5 and 6.3 Hz. Their subjects were most sensitive to the effect of phase at the lowest studied frequency, and the lowest investigated magnitudes (0.25 m.s^{-2} r.m.s.).

The effect of the relative motion between the seat and the feet on the discomfort perceived by seated subjects exposed to fore-and-aft vibration was studied by Price (2002). Twelve subjects were exposed to fore-and-aft vibration at 16 third octave centre frequencies between 0.5 and 16 Hz. At each frequency seven vibration magnitudes between 0.05 and 0.8 ms^{-2} r.m.s. were investigated. The method of magnitude estimation was used to measure the rate of growth of discomfort, using a reference condition of a 3.15 Hz, 0.2 ms^{-2} r.m.s. sinusoid with both seat and feet moving. There were two motion conditions a) seat and feet moving in phase and b) seat moving with feet stationary. The results showed that the rate of growth of vibration discomfort was significantly greater with feet moving than with feet stationary at 0.5 Hz. Although this effect was not significant at other frequencies the median rate of growth of discomfort with feet moving was greater than with feet stationary at all frequencies below 1 Hz. The author suggests that at the lowest frequencies "the greater relative displacement, combined with the lack of a backrest to support the body may have allowed the feet stationary position to stabilise the body" relative to the condition in which the feet moved in phase with the seat.

In an extension to the work described in Price (2002) Price *et al.* (2006) reported the effect of relative motion at the back, seat, and feet in the fore-and-aft axis with 12 male subjects. There were four seating conditions: a) seat back and feet moving simultaneously, b) seat and back moving simultaneously with feet stationary, c) seat and feet moving simultaneously with no backrest and d) vibration of the seat surface with no backrest and stationary feet. The resulting equivalent comfort contours and their complex inter-relations are shown in Figure 2-15

The effect of active postural control: similar to the effect of phase?

To the knowledge of this author the effect of active postural control has not been previously researched. However, a certain amount of information may be gleaned on the basis of previous studies investigating the effect of phase during low frequency oscillation, supposition made from observations made by experimenters in previous studies, and inference drawn from biodynamic studies at higher frequencies.

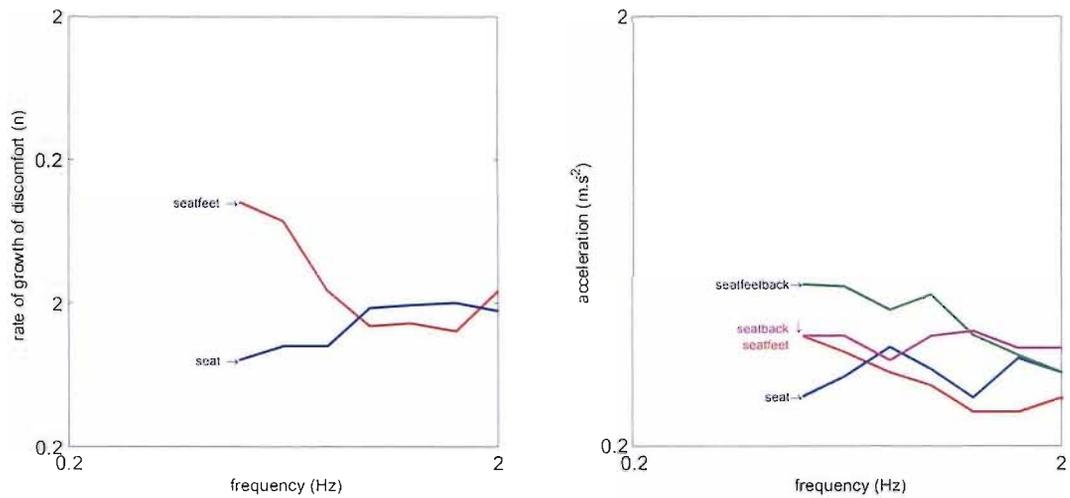


Figure 2-15 The effect of input phase between seat, feet and back, on the rate of growth of discomfort (a) and on the equivalent comfort contours (b) which show the discomfort approximately equal to a 2 Hz 0.315 ms⁻² r.m.s. sinusoid. Data in (a) from Price (2002) and in (b) from Price *et al.* (2006). The indications from these studies are that relative motion is an important variable which affects the discomfort arising from low frequency translational oscillation. Labels on plotted lines refer to elements of the seating which moved in phase, so 'seatfeetback' implies that the seat, the feet, and the back all moved in phase, while 'seat' implies that only the seat moved while the back and the feet were held earth stationary.

2.3.2 Exposure to rotational oscillation

Table 4 Short summaries of articles pertaining to exposure to rotational oscillation with coverage between near dc and frequencies < 10 Hz

| Citation | freq (Hz) | Axes | Seating | Inputs | Method | reference / scale | main output |
|------------------------------|----------------|-------------------------------|-------------------------|--|--------------------|--|--------------------------|
| Simic (1970) | 0.08- >10Hz | r_y | modified car seat | seat back feet varied centre of rotation | Limits | -n/a | Perception contour |
| Clark (1967) | | r_y, r_x, r_z | varied | varied | Varied | Varied | Perception contour |
| Shoenberger (1979) | 2.5-10 | r_x | | | Intensity matching | Vertical vibrations (same frequency as rotation) | equi. comfort contour |
| Parsons & Griffin (1978b) | 2 – 16 Hz | x, y r_y, r_x | seated (flat rigid) | seat alone varied centre of rotation | semantic scale | very uncomfortable, uncomfortable, mildly uncomfortable, noticeable but not unconf | equi. comfort contour |
| Shoenberger (1984b) | 0.315-8.0 Hz | <i>Pitch and fore-and-aft</i> | rigidised aircraft seat | seat, back, feet varied centre of rotation | Intensity matching | Vertical vibration | Matching accelerations |
| Shoenberger (1984a) | 0.315-8.0 | <i>Roll and lateral</i> | rigidised aircraft seat | seat, back, feet varied centre of rotation | Intensity matching | Vertical vibration | Matching accelerations |
| Pradko (1965) | 1.0-30 | r_y, r_x | tank seat. | seat back feet | Semantic | Difficulty of controlling AFV | Limit of control contour |
| Dempsey <i>et al.</i> (1979) | | | soft airline seat | seat back feet | | | |
| Parsons & Griffin (1982) | 1.0-31.5 | r_y, r_x | flat rigid seat | seat only | Intensity matching | 10 Hz z axis @ 0.5 or 1.25 ms ⁻² r.m.s. | equi comfort contours |
| Parsons & Griffin (1978b) | 1.6-31.5 | r_y, r_x | flat rigid seat | seat only | Semantic scale | | equi comfort contours |

2.3.2.1 The meaning of 'rotation' of interest in this and previous work

Rotation: 'The action of moving round a centre, or of turning round (and round) on an axis' OED (2004) is a general term which in normal use, which as the OED indicates does not imply any particular relation between the body being rotated and the centre of that rotation, save that at least some portion of the body describes a circular arc. Experiments in the field of human response to vibration have therefore legitimately reported results concerning experiments with rotational oscillations where:

- a) The centre of rotation was defined relative to arbitrary landmarks
- b) The axes of rotation were defined relative to arbitrary co-ordinate systems
- c) The rotational oscillation was implicitly combined with translational oscillation(s)

Somewhat more problematically, the literature does not always provide sufficient information to allow readers to investigate for themselves whether the implications of a,b, and c (above) affect the author's ability to test the proposed hypotheses. For the purpose of this work the literature of most interest was that which discussed rotation where the centre of rotation was very close to the seat surface, and where a basiscentric co-ordinate system of the sort described in ISO (1997) was in use (or where it could be clearly determined what motion was being reported relative to such a set of axes). This restricted the number of papers which provided useful information, particularly in the field of thresholds of perception.

However, a number of papers which provide information about the effect of moving the position of the centre of rotation with respect to well defined anatomical landmarks produced the results which suggested that at low frequencies discomfort might be well predicted during rotation or translation in coplanar axes (e.g. pitch and fore-and-aft) by the acceleration in the plane of the seat. Some of these studies are discussed in Section 2.3.2.2 below.

2.3.2.2 The effect of varying the position of the centre of rotation on the discomfort arising from exposure to rotational oscillation

Simic (1970) exposed subjects to pitch oscillation on a seat with a medium height backrest mounted upon a beam such that it could be translated about the pivot both in the plane of the beam and normal to it producing a mixed pitch and vertical exposure. When this occurred subjects were exposed to additional accelerations, principally in the vertical axis. Simic found that as the horizontal separation from the centre of pitch increased the equivalent comfort contour produced by subjects became increasingly similar to that which they produced during vertical oscillation.

Parsons and Griffin (1978b) exposed subjects to oscillation with centres of rotation which varied by up to 240 mm, in and perpendicular to the plane of the seat, relative to the vibration input at the ischial tuberosities. The resulting vibration exposure was complex, with increasing additional exposure to horizontal and vertical acceleration as the distance from

the centre of rotation increased. During oscillation where the centre of rotation was displaced perpendicular to the seat the dominant additional acceleration was caused by an approximately sinusoidal lateral (in the case of roll), or fore-and-aft (in the case of pitch) oscillation. Where the displacement of the centre of rotation was in the plane of the seat the dominant additional acceleration was in the vertical axis. In both cases the dominant additional oscillations were at the same frequency as, and in phase with, the generating rotational oscillation. The authors noted the increasing similarity of the slope (Figure 2-17) of the rotational contours to that of the translational contours (which have been appropriately scaled to demonstrate the effect). It was concluded that this indicated that as subjects became separated from the centre of rotation it was the translational component of the oscillation which mediates discomfort not the rotational.

Shoenberger (1979) required subjects to match the intensity of roll oscillation with vertical excitation on a platform where the seat was approximately 0.8 m above the centre of rotation. Griffin *et al.* (1982) subsequently reanalysed these results and showed that the purported 'roll' response reported by Shoenberger could be effectively predicted from the lateral oscillation subjects would have experienced due to their displacement relative to the centre of rotation.

Shoenberger (1984b) exposed subjects to roll and lateral and also Shoenberger (1984a) to pitch and fore-and-aft oscillation. During rotational conditions the seat surface was displaced vertically from the centre of roll by between 508 and 1016 mm. This range of separations, combined with a fixed rotational acceleration (3.5 rad.s^{-2} in roll, and 2.5 rad.s^{-2} in pitch) resulted in an array of accelerations in the plane of the seat which increased with increasing separation from the centre of rotation. The magnitudes of the translational stimuli were matched with those arising in the plane of the seat. Subjects were required to adjust the level of a reference 5 Hz sinusoidal stimulus in the vertical axis until the test and reference produced approximately the same discomfort. During roll and lateral oscillation the matching accelerations were similar whether the stimulus was in the roll or lateral axes. However during pitch and fore-and-aft oscillation the matching acceleration during pitch was considerably greater than that for 'equivalent' fore-and-aft stimuli. This increase in sensitivity indicates that the acceleration in the plane of the seat is not a perfect predictor for discomfort during pitch oscillation on a seat with a backrest (Figure 2-16). Other acceleration terms, e.g. the tangential acceleration $r.\alpha$, or the frequency dependent earth referenced vertical and horizontal accelerations arising from the peak to peak displacement path of the seat (vertically: 0.647 – 1.1 m and horizontally 0.97-2.02 m) might have been responsible, in conjunction with the differing effects of the harness in pitch and fore-and-aft oscillation.

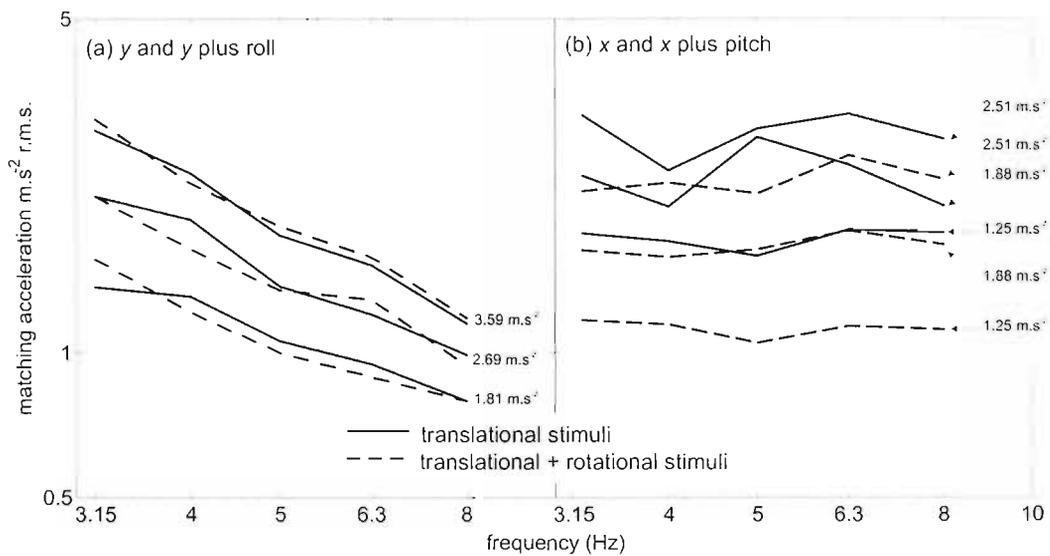


Figure 2-16 Matching accelerations comparing the discomfort arising from off axis roll and lateral oscillation (a) and fore-and-aft and off axis pitch oscillation (b). Adapted from Shoenberger (Shoenberger, 1984a; 1984b)

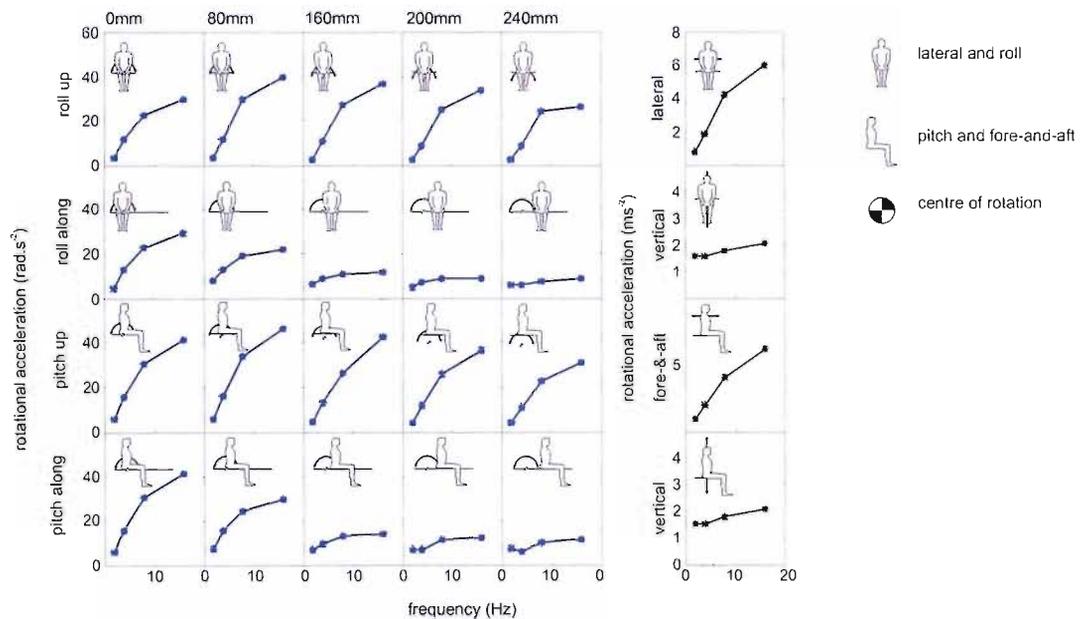


Figure 2-17 The discomfort arising from exposure to roll and pitch motions where the centre of rotation was displaced in the vertical and horizontal planes, together with comparative data in the lateral, fore-and-aft and vertical axes. Contour levels shown are the mean acceleration causing 'discomfort'. Adapted from Parsons and Griffin (1978b).

These papers conclusively show that, at all but the smallest displacements of the centre of rotation relative to the seated subject, the additional translational acceleration the subject is exposed to dominates their discomfort response. Since this is so, it raises the question about what acceleration components are principally responsible for discomfort during on axis rotation. As previous sections have shown, the rotational acceleration may be resolved into components perpendicular to and in the same plane as the seat surface. It might be that the

acceleration in the plane of the seat (an analogue for the translational oscillation which is dominant in off axis rotation) is an important determining factor during on axis rotation, although there is no evidence in the literature concerning this.

2.3.2.3 Effect of frequency on perception of oscillation in the roll and pitch axes

There is limited information on the perception of very low frequency rotational oscillation, and much of the work which has been reported concerns the detection of continuous roll or pitch motion, rather than the detection of oscillating stimuli. However some useful information can be inferred from such studies. A review by Clark (1967) reported the variations in pitch and yaw thresholds determined during 25 studies conducted between 1922 and 1965. Of these 25 studies 12 investigated pitch and yaw, or pitch alone. The pitch thresholds determined during the reported investigations varied widely between $\sim 2^\circ\text{s}^{-2}$ ($\sim 0.035 \text{ rad.s}^{-2}$) and 0.1°s^{-2} ($0.0017 \text{ rad.s}^{-2}$). Clarke comments on the difficulties of interpreting the results of these studies which used a wide variety of psychophysical techniques to determine the threshold. Unsurprisingly studies which used a more rigorous criterion (e.g. 75% correct responses) found lower thresholds than studies which used a 50% correct detection rate as their criterion. Clark suggested that the results of some studies which reported low threshold values might have been contaminated by transients in the stimuli.

Simic (1970) exposed five subjects to sinusoidal pitch oscillation at frequencies between 0.05 and 10 Hz using a pivoted beam driven by an hydraulic actuator in order to determine their threshold of perception. A car seat from that era with a medium height backrest was mounted on the beam and during the determination of the perception threshold subjects sat in an upright position with their eyes closed such that the axis of rotation passed through their body close to, but not at the seat surface. Each subject's perception threshold was determined by increasing the amplitude of motion at each frequency until the subject reported detecting it. The results showed that the perception threshold increased with increasing frequency from 0.002 rad.s^{-2} r.m.s. 0.05 Hz to 0.48 rad.s^{-2} r.m.s. at 10 Hz.

Perception of roll and pitch depends upon the relationship between the anatomical axis of the exposed person and the gravity vector. Since roll and pitch are defined with reference to the basi-centric coordinate system, it is possible for roll to occur both when the body oscillates about the gravity vector acting in the median saggital plane, or perpendicular to a coronal plane Gundry (1978a) conducted experiments on the detection of roll oscillation in both these conditions. He showed that the threshold was substantially lower when the body was oscillating about the earth vertical. This effect is probably attributable to the added signal from the component of the gravitational vector acting in the plane of the seat.

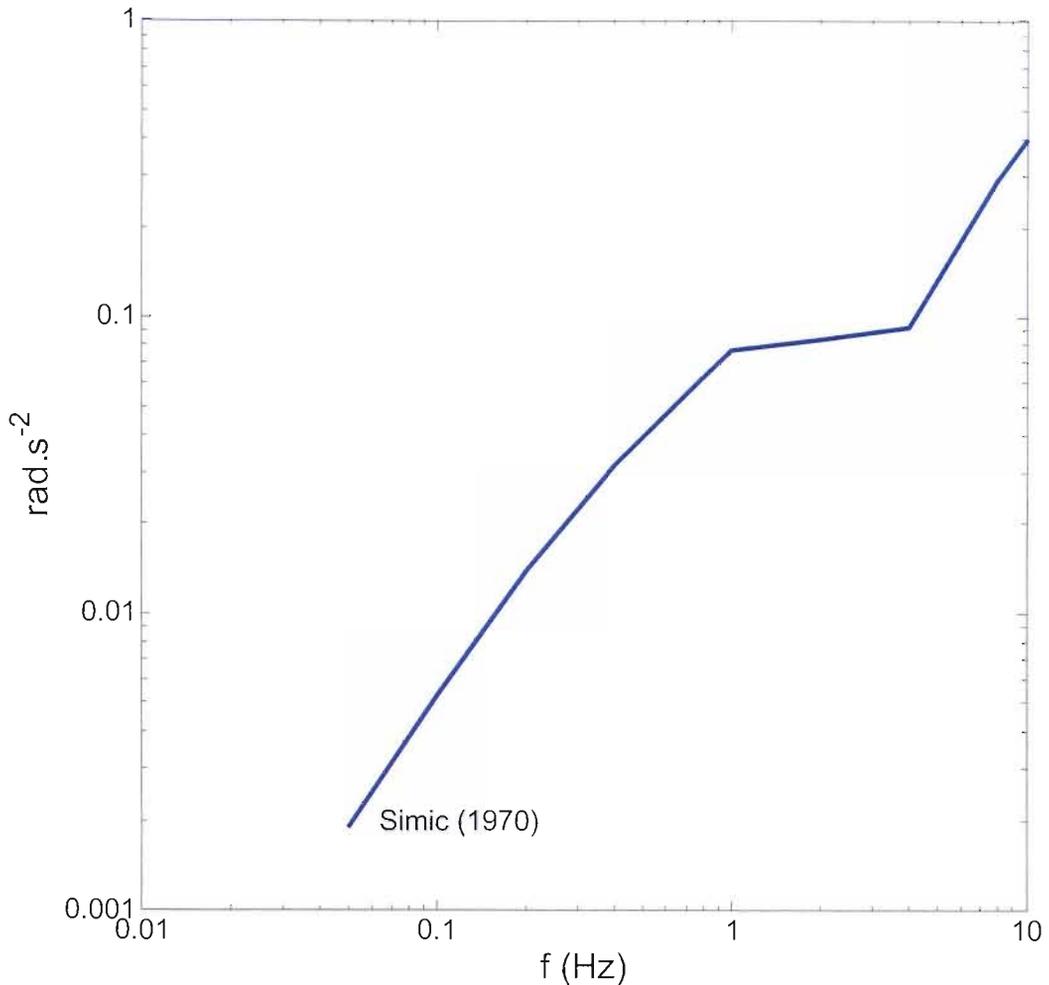


Figure 2-18 The frequency dependence of the perception threshold during pitch oscillation. Data from Simic (1970)

2.3.2.4 Effect of frequency on the discomfort arising during supra threshold oscillation in the roll and pitch axes

Pradko (1965) exposed subjects to rotational oscillation in the roll and pitch axes at frequencies between 1 and 30 Hz. His objective was to determine a 'vibration tolerance' limit for subjects seated on a seat with a backrest. Oscillation was generated using a 4 degree of freedom simulator generating motion in the z (vertical), r_x (roll), r_y (pitch), and r_z (yaw) axes. It is clear from the paper that it was possible to vary the position of the centre of rotation, but not where it was located during exposures intended to determine seated tolerance. Comparison of the shape of the contour during roll oscillation with that determined by other authors shows significant differences, with Pradko's contour appearing more like a discomfort contour associated with exposure to vertical oscillation. However, in the case of pitch oscillation Pradko's contour is in better agreement with other researchers. This might imply that the centre of pitch differed from the centre of roll in his study, or that as Shoenberger (1984a) showed, subjects' sensitivity to translational components of oscillation during pitch oscillation differed to that during roll oscillation.

Dempsey *et al.* (1979) conducted a study used a simulated passenger aeroplane fuselage to expose groups of six subjects to rotational motion at frequencies between 1 and 4 Hz. Neither the centre of rotation nor the seat heights were noted in this report and the roll accelerations were measured at the floor. However an examination of the data in a previous report by Leatherwood *et al.* (1976) which appeared to have used the same apparatus, and perhaps to be the source of the data reported in Dempsey *et al.* (1979) paper, showed that the centre of rotation was probably at the cabin floor, but it still proved impossible to infer the seat height, or horizontal separation from the centre of roll. This earlier report showed results by sitting position in the cabin as well as average trend. The results for seats horizontally separated from the centre seat were not significantly different to those from at the centre seat. This is curious in view of the differing accelerations arising from rotation through the gravity vector and translation through space which would have been experienced in these seats, and may be a source of some caution in interpreting the average data shown in Figure 2-19

Parsons and Griffin (1982) conducted an investigation into the discomfort arising from exposure to roll and pitch oscillation. The axis of rotation in these studies was at the seat surface, in the median sagittal plane for roll and passing through both ischial tuberosities for pitch. Oscillation was generated using an electrodynamic vibrator to excite the seat alone. Subject's feet were placed on a footrest (the height of which was varied to investigate the effect of variable thigh contact with the seat). The results showed that in both axes subject's sensitivity to oscillation decreased continuously from the lowest frequency (1.0 Hz) to the highest (31.5). At 31.5 Hz the median level of the contour in roll was 12 times higher in roll and 7.5 times higher in pitch than at 1.0 Hz. At 1.0 Hz exposure to pitch oscillation caused approximately half the discomfort of roll oscillation. (this implies that, in terms of the acceleration in the plane of the seat, subjects became increasingly sensitive with increasing frequency). The effect of varying the foot position was that increased thigh contact resulted in increased discomfort. The effect of the design of the apparatus was that, particularly at the lower frequencies there was significant relative motion between the seat and the feet. It would be unsurprising if whole-body vibration produced different effects, particularly at the lowest frequencies where the relative motion would be greatest.

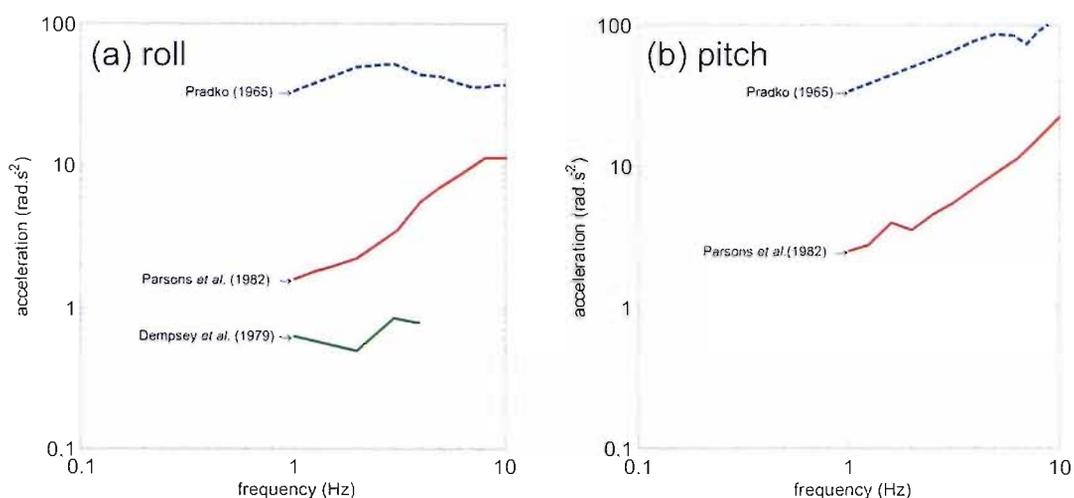


Figure 2-19 The discomfort arising from exposure to supra-threshold oscillation in the roll (a) and pitch (b) axes. Seating conditions, experimental methods, and the magnitude of the contours shown all vary, so direct comparison of the magnitude of contours may not be appropriate. For details of reference conditions see Table 3. The data of Pradko, should in particular be viewed with caution, as whether these investigations concerned vibration tolerance in fighting troops, or vibration discomfort in the general population is debatable.

2.3.2.5 The effect of magnitude on the discomfort arising during oscillation in the roll and pitch axes

Parsons and Griffin (1982) exposed subjects to roll and pitch vibration. Subjects used the method of constant stimuli to match the discomfort arising from rotational vibration with that caused by two reference stimulus separated by a factor of 2.5 (0.5 and 1.25 ms⁻² r.m.s.). The shapes of the two contours were then compared. The results showed that the differences in the shapes of the contours attributable to the effect of magnitude were small compared with the differences associated with inter-subject variability at one magnitude.

The Parsons and Griffin (1982) report is surprising in the context of other work e.g. that by Morioka and Griffin (2006), which showed that in the translational axes the effect of magnitude was important relative to inter-subject variability. Parson and Griffin's study in the rotational axes was inhibited by the difficulties of studying multiple magnitudes using the method of constant stimuli, although the difference in the investigated levels appeared a reasonable one to investigate their hypothesis. It is possible that subjects may have adopted subtly different postural strategies at different magnitudes of rotational acceleration, and that these postural changes may have masked an effect of magnitude.

2.4 The effect of backrest

2.4.1.1 Effect of backrest on the discomfort arising during oscillation in the lateral and fore-and-aft axes

Fore-and-aft oscillation

Donati *et al.* (1983) exposed subjects to sinusoidal fore-and-aft oscillation on a seat with and without a low backrest. The results, obtained via an intensity matching approach, showed that at frequencies below 2 Hz and between 3 and 6 Hz the presence of a backrest significantly increased sensitivity to fore-and-aft oscillation. Price *et al.* (2006) conducted an experiment somewhat similar to that described by Donati *et al.* (1983) with a full height backrest using the method of magnitude estimation. Comparison of the equivalent comfort contours showed that between 0.5 and 3 Hz subjects' sensitivity to oscillation was reduced when they were seated with backrest, as compared with exposure on a flat rigid seat. The differences in the results reported by Price *et al.* (2006) and Donati *et al.* (1983) indicate that the effect of backrest in the fore-and-aft direction may be complex, with changes in subjects' sensitivity depending on the height of the backrest as well as upon the frequency, and perhaps magnitude of the oscillation. Paddan and Griffin (1988b) studied seat to head transmissibility with and without backrest. During fore-and-aft oscillation there was uniformly greater head motion where subjects were seated with backrest than without. This increase in head motion was particularly evident (between 0.2 and 1.6 Hz) During these studies subjects were not secured to the backrest, so some of the general increase in head oscillation may have been due to intermittent back contact.

Lateral oscillation

This review has not found any literature reporting systematic experiments into the effect of backrest upon discomfort during lateral oscillation, however an investigation into the effect of backrest on seat to head transmissibility by Paddan and Griffin (1988b) showed that: seat oscillation in the lateral axis produced similar head oscillation with and without a backrest except in the lateral and yaw axes where it was significantly greater. If head motion were a good correlate for discomfort this would indicate that the presence of a backrest could reduce discomfort during oscillation with a backrest. Even if the correlation was perfect, Paddan and Griffin's (1988b) work would not provide comprehensive information since their investigation was conducted with a full height backrest without any sort of restraint system, a configuration not generally found in practical applications.

Pitch and roll oscillation

During pitch and roll oscillation at frequencies between 0.2 and 2 Hz, transmissibility data offers the only insight into the potential implications of exposure with and without a backrest upon discomfort.

Paddan and Griffin (1994a) showed that there was a marked reduction in head motion when subjects were seated with no backrest relative to an exposure with backrest. Such a reduction implies that the rotational oscillation at the seat surface was substantially attenuated by spinal bending. Such activity could conceivably reduce discomfort (if head motion was a good correlate for discomfort) or increase it if the spinal bending itself was an unpleasant experience for subjects.

2.4.2 Approaches

Historically production of the well controlled stimuli necessary for subjective research has only been possible (particularly at low frequencies where large displacements are required) in single axis facilities researchers have faced difficulties in comparing the discomfort arising from exposure to oscillation in different axes. Where direct comparison has not been available as an approach, authors have employed a variety of more or less sophisticated psychophysical approaches to produce these important inter axis equalities of sensation.

2.4.2.1 Direct comparison

Direct comparison, provides the most certain approach to the problem of ascertaining the relative discomfort in different axes (or different seating conditions). Experimenters have, and continue to, devise experimental apparatus which permits them to expose subjects to oscillations in different axes with minimum intra-trial disruption. However this approach is not always available, perhaps because transition from one part of the trial to the other requires to extensive re-configuration of the apparatus, or because it requires the participant to move in such a way, or experience a delay which might substantially impair their stimulus memory.

2.4.2.2 Category production

Category production discussed above in Section 2.2.3.2 could be used to approximate the sensation in one condition with another. Although such an approach is economical, and might be successful where the subject sets were matched, and the levels of discomfort were approximately equal (to account for the characteristic bias of categorical scales (see Figure 2-5 for example) its success is not guaranteed, and the fundamental problems with categorical scales remain.

Cross modality matching - discussed above in Section 2.2.4.2 is a potentially more viable approach. Its appropriateness varies depending on the manner in which it is conducted, with the most efficient approach being that conditions a, b, and c, (perhaps all vibration) are all related to some quantity d (perhaps an area, length or intensity of light). Thus a, b, and c have 'a common reference' and may be directly compared. However such an approach can fail to detect violations of transivity, and is in effect a magnitude estimation exercise where a quantity such as area acts as a proxy for a participant's direct report of the magnitude of the perceptual intensity using numbers.

2.4.2.3 Magnitude estimation

Magnitude estimation discussed above in Section 2.2.4.2 when conducted with a reference quantity can permit comparison between two identical (or more) 'test' conditions which share a different reference using as the basis for this the finding by Stevens (1975) that the n value was independent of the reference condition. Where the data in question support this finding (e.g. there is no significant difference between n values) any difference in the physical magnitudes associated with this rate of change of perceptual magnitude may be attributed to the effect of the reference condition. The size of this effect can be calculated, and a correction factor calculated.

2.4.3 Results of interest

Perhaps because of the difficulties of achieving meaningful comparisons reports in the literature of the relative discomfort between different axes are not widespread, particularly at, or close to the frequencies of interest in this work. The lack of low frequency information is probably partly a reflection of the general bias of discomfort studies towards greater frequencies, and partly because the large translational displacements involved at low frequency render practical comparison between different axes particularly difficult. There are however a number of studies which provide useful information in, or close to the upper boundary of the frequency range of interest.

Simic (1970) produced a single contour describing 'rotational' perception threshold (which was in fact obtained during pitch oscillation), and asserted that it was also valid for both roll and pitch, although it is not clear what the grounds for the assertion were. Parsons and Griffin (1978a) used the method of category production to assess the discomfort arising from roll and pitch oscillation at frequencies between 1.6 and 31.5 Hz showed that sensitivity to acceleration increased in a similar way whether the exposure was in the roll or pitch axis. A further study Parsons and Griffin (1982) which investigated frequencies between 1 and 31.5 Hz showed that the discomfort arising from exposure to rotational vibration was very similar whether the oscillation was in the roll or pitch axes, and subsequently Griffin *et al.* (1982) used these data to show that one frequency weighting sufficed to predict the discomfort arising from exposure to roll or pitch oscillation at these frequencies.

2.4.3.1 The relative discomfort between fore-and-aft and lateral oscillation

Yonekawa and Miwa (1972), Griefhan and Brode (1997), and Rao and Jones (1978) exposed subjects to fore-and-aft and lateral oscillation. Both authors reported that a single equivalent comfort contour sufficed to predict the discomfort arising from exposure to low frequency oscillation in either horizontal axis. Yonekawa and Miwa's study covered the frequency range from 0.05 Hz to 1 Hz, while the lowest frequency studied by Griefhan and Brode and Rao and Jones was 1.0 and 1.6 Hz respectively.

2.4.3.2 The relative discomfort between lateral and vertical oscillation

Although this review has avoided commenting on studies involving vertical oscillation, the relationship between discomfort arising from vertical oscillation and that arising from oscillation in other axes at low frequencies is of some interest. One study, Corbridge and Griffin (1986) describes the relationship between the discomfort arising from vertical and lateral oscillation at frequencies between 0.5 and 5 Hz.

2.5 The effect of duration on the discomfort arising from exposure to oscillation

A number of authors, including Osborne and Clarke (1974), Jones and Saunders (1974) and Simic (1970) used the technique of predictive rating, whereby subjects were asked to assess, based on a short duration exposure to a given stimulus, how long they believed they would be able to tolerate continued exposure.

Miwa (1973) employed semantic scales and the method of adjustment in a complex study which attempted to assess the effect of duration on discomfort in subjects exposed to single axis components of vibration recorded in real environments. The exposures were as follows: 'pile driving' for three hours, 'fork lift driving' for two hours with intermissions of 10 minutes every 30 minutes, and finally 'fork lift driving' for four hours without intermission. In each, a semantic scale was administered at intervals of 30 minutes. All exposures showed an increase in discomfort with time with, for example the acceleration judged to cause discomfort similar to a 10 Hz reference oscillation halving during three hours of 'pile driving'. There was no control condition, despite the author's own note that merely sitting in a static setting for these periods might increase discomfort, and this together with the differing exposure patterns makes interpretation of these results troublesome.

Seidel *et al.* (1980) conducted an investigation into the effects of duration using a battery of physical measures together with the 'subjectively assessed psychological state' of the subjects who were exposed to vertical vibration at 4 and 8 Hz for a total of 3 hours per day, for four consecutive days. The authors did not find significant changes in their subjects' psychological measures during these exposures which were assessed using a categorical system.

Griffin and Whitham (1976) conducted an experiment intended to isolate the effects of vibration duration on vibration discomfort using the method of intensity matching. Conscious of the systematic bias associated with this method, the authors exposed subjects to two sessions of vibration, one where the test oscillation preceded the reference, and a second where the opposite was true. The results of the study show that, when compensated for the reluctance of subjects to expose themselves to uncomfortable stimuli, there was no

systematic or continuous alteration in the level of the test stimulus with respect to the reference, which would have indicated that there was a significant alteration in the relative sensation with increasing exposure time. Two interpretations of these results are possible: first, that the duration of vibration does not affect the discomfort experienced, or second that some duration effect affected both frequencies in some uniform, but unknown way.

Griffin and Whitham, (1980b) with further discussion in their (1980a) publication conducted experiments into the effect of duration on the discomfort arising from exposure to whole-body vertical vibration. The method of constant stimuli provided dichotomous categorical data from 20 subjects for each of the four frequencies, and eight durations. The log normal fits to the cumulative distribution of the data at each duration showed that, for all subjects, greater acceleration was required to produce similar discomfort as stimulus duration increased. The slope of the regression line describing the rate of increase (in logarithmic coordinates) increased with increasing frequency, but did not indicate that a common r.m.s. magnitude was an effective method of predicting the discomfort of two signals of differing duration and amplitude profile at any frequency. This finding was replicated in a second study at one frequency which included reversal of test and reference vibration to examine response bias.

Kjellberg *et al.* (1985) conducted a study using the method of cross modality matching to examine the time dependency of vibration discomfort. The matching modality was sound, and in order to control for changes in sensitivity not caused by vibration exposure; subjects adjusted the sound level to a level equivalent to their memory of a TV emitting white noise, or a domestic vacuum cleaner. The results showed that, over the 64 minute exposure period, vibration discomfort increased in as a log linear function of acceleration and exposure time. The rate of growth of vibration discomfort with time was similar whether the exposure was at 3.1, or 6.3 Hz. The control condition indicated that these changes were unlikely to arise as a result of progressively reducing sensitivity to the matching stimulus.

More comprehensive reviews of the knowledge concerning the effects of duration on vibration discomfort prior to 1986 have been provided by Kjellberg and Wilkström (1985) and Howarth (1986).

Gallais *et al.* (2006) conducted an extensive study into whether duration affected vibration discomfort, and further whether any time dependency varied between the two investigated frequencies, 1 and 4 Hz. Within frequencies the method was similar to the cross modality matching method used by Kjellberg *et al.* (1985), save that the reference quantity was the discomfort produced by the first 10 seconds of the vibration, and that the random, sinusoidal and shock type vibration was systematically modulated in amplitude. To avoid bias introduced by the transient effects of this modulation, half the subjects were exposed to an

alternative signal which was symmetrically modulated – such that it was hoped that the transient effects would be cancelled out. In order that the results of these single frequency studies could be confidently compared, a cross referencing study was executed using the method of magnitude estimation. The results showed that the time dependence of discomfort depended principally on frequency, but also to a lesser extent on input direction, and spectrum. In general discomfort increased with increasing exposure time, this effect being greater at 4 Hz than 1 Hz, and in some cases random oscillation caused more rapid increments in discomfort than sinusoidal oscillation. The author related these findings to the biomechanical transmission of vibration through the body and its effect on various anatomical structures. A mechanical model for the discomfort arising at the head neck interface was proposed.

ISO 2631 (1978) on the basis of very limited positive evidence (e.g. Miwa (1973)) and in the face of other reports which showed that there was a poor correlation between predicted and actual exposure tolerance (Osborne, 1983). In many respects this compounded the difficulties which investigators faced in investigating the existence of a time dependency. The present evidence shows that the effects of duration are highly complex, varying with frequency, input axis, and spectrum, but predictable or at least, potentially predictable. It should, therefore, as the state of knowledge increases be possible to effectively predict how knowledge of the discomfort reported by subjects exposed to short durations of oscillation might be extended to longer exposures.

2.6 Predicting vibration discomfort

Predicting the discomfort arising from complex vibrations

Three main approaches have been proposed as effective for predicting the discomfort arising from multi-frequency and or multi-input vibration. Firstly the independent component model proposed in ISO 2631 (1978), secondly an extension of the inhibition model proposed by Stevens (1965) has been investigated, and thirdly the root sums of squares model reported by Fothergill and Griffin (1977) .

The inhibition model

Stevens (1965) investigating the assessment of the loudness of complex noise proposed a model which dealt with the phenomenon of inhibition, by which the loudness of two bands of noise is not given by the arithmetic sum of the loudness of each individual band. His model was that the addition of a band of noise to an already complex stimulus only increased the overall loudness (in Sones) by some proportion F of the loudness of the added band, had it been evaluated independently. It is possible to express F in terms of the loudness of the loudest band S_m , the arithmetic sum of the loudness of all bands ΣS and the perceptual loudness of all bands S_t

$$F = \frac{(S_t - S_m)}{((\sum S) - S_m)} \text{ Equation 2-9}$$

The results of extensive empirical investigations suggested that the value of F was about 0.3 when the composite stimulus was composed of n octave bands of noise. Subsequently Miwa (1968; Miwa, 1969) proposed that the magnitude of complex vibration VG_t , where that vibration was expressed in 'Vibration Greatness' units (defined in a similar way to Sones) could be predicted from the perceptual magnitude of the components as Stevens had done for noise. However there was some evidence in Miwa's work that the term equivalent to F might vary by a factor of 10, depending on both the separation of the vibration components and their magnitude. Although Miwa persisted with investigating the possibility of predicting discomfort in this way e.g. (Miwa, 1969) the technique has not been widely adopted because of its complexity.

The efficacy of the inhibition model compared with the weighted root sums of squares and worst component model

Griffin and Whitham (1977) conducted an investigation which was designed to provide information fundamental to the prediction of the discomfort arising from dual axis vibration. Eight male subjects adjusted the levels of a single axis 3.15 Hz test motion in both the lateral and vertical directions until they produced similar discomfort to ten dual axis (lateral and vertical motions) The relative magnitude of and phase between the lateral and vertical components varied. The results showed that the root sum of squares method was a better predictor of the discomfort arising from combined axes motion than the worst component method (ISO 2631 1974) and was as accurate as the results of a masking model but significantly less difficult to apply.

An extensive investigation of the efficacy of the inhibition and r.s.s. methods of predicting whole-body vibration discomfort during complex single axis vibration was conducted by Fothergill and Griffin (1977). The first part of the study was similar to the experiment reported by Griffin and Whitham (1977) but with a 10 Hz test stimulus and in a single axis. In subsequent parts subjects were required to match the discomfort arising from exposure to two similar frequencies which produced noticeable 'beating' due to mutual interference, and from vibration composed of up to four separate frequency components. The results showed effective prediction could be achieved at frequencies above 1 Hz using both the inhibition model and the weighted root sums of squares model (Figure 2-20).

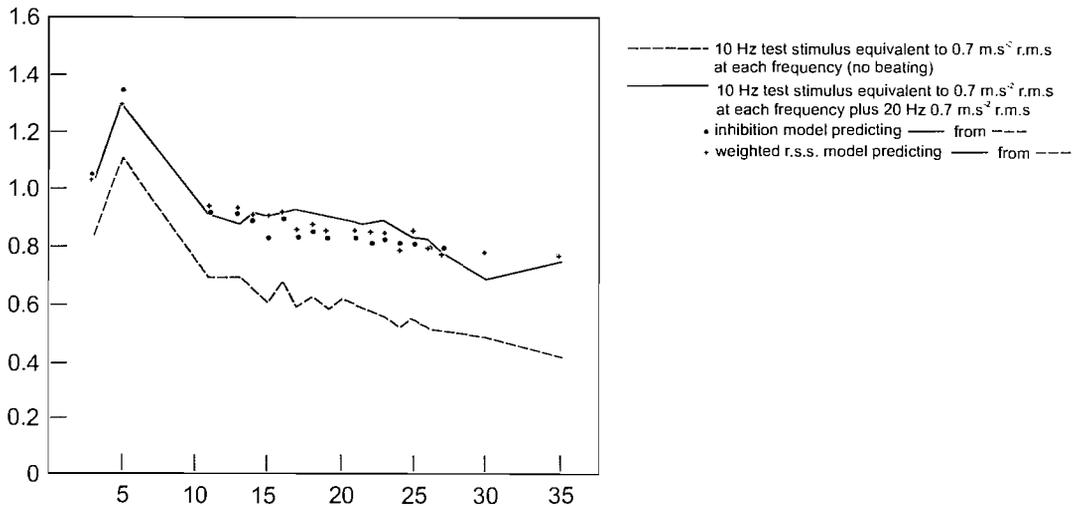


Figure 2-20 Efficacy of inhibition and weighted root sums of squares model for predicting the discomfort arising from dual frequency beating vibration at frequencies between 1 and 35 Hz. Adapted from Figure 2 in Fothergill and Griffin (1977).

Fairley (1995) reported on the efficacy of the 20 different models encoded in a range of standards designed to predict vibration discomfort. In a large scale evaluation eleven professional drivers drove production tractors across a variety of substrates. The subjective responses of drivers were obtained using a visual analogue scale with 'little discomfort' and 'much discomfort' as anchors, and they were also required to assess which axis caused most discomfort and which least. There was considerable variability in subject responses, but overall ISO 2631 [1985] was found to produce the best predictions. The authors interpreted this as evidence that the multi-input model of BS6841 (1987) was not suited to predicting discomfort where the oscillations involved were predominantly low frequency and "cannot be considered to be localised at any one particular point in the body"

2.6.1 The present standardised methods

BS 6841:1987

BS 6841 (1987) specifies that the discomfort caused by mechanical oscillation in the frequency range 0.5 to 80 Hz can be predicted using frequency weightings for translational and rotational vibration at the seat and from translational vibration at the feet and the backrest. This means that, in some combinations of oscillations a large number of acceleration components can theoretically contribute to discomfort. For example, during rotational and translational oscillation (i.e roll and lateral, or pitch and fore-and-aft oscillation) there are seven contributing accelerations

- (i) Earth-referenced translational acceleration in the plane of the seat
- (ii) translational acceleration in the plane of the seat due to rotation – i.e. $g \cdot \sin\theta$
- (iii) rotational acceleration in the plane of the seat in $\text{rad} \cdot \text{s}^{-2}$
- (iv) translational acceleration at the backrest
- (v) translational acceleration at the backrest in the plane of the seat - i.e, $g \cdot \sin\theta$
- (vi) translational acceleration at the feet

(vii) translational acceleration at the feet in the plane of the seat - i.e, $g \cdot \sin\theta$
The standard indicates that the r.m.s. magnitudes of acceleration obtained from each component are to be appropriately weighted, then the square root of the sum of squares of the weighted values determined, by measurement location. For seated persons, an overall exposure may be determined from the root sums of squares of the four vector sums (i.e. i & ii, iii, iv & v, and vi & vii)

The weightings in BS 6481 (1987) were evolved from studies with vibration in individual axes, so if one axis dominates they should provide a good prediction. However, this assumes that the weightings for different axes are given the appropriate relative weight and that relative motion between axes, and the phase of any relative motion, does not influence discomfort. In practice the relative motion between inputs (e.g. between the seat and the feet) can have a large influence on discomfort as previous sections [above] show.

ISO 2631-1:1997(E)

With respect to discomfort, ISO 2631 (1997) can be interpreted in such a way as to produce findings similar to those which would have arisen had the situation been assessed under the earlier standard BS 6481 (1987). There are however differences between the standards, some of which are potentially substantial e.g. the retention of a 1.4 multiplying factor for horizontal vibration in ISO 2631 (1997), and some which are probably not e.g. the substitution of W_k for W_b in ISO 2631 (1997). A comprehensive analysis of the differences, and their effects is beyond the scope of this work, but other authors have attempted such a task e.g. Griffin (1998)

ISO 6954:2000(E) (2001) Mechanical Vibration. Guidelines for the measurement, reporting and evaluation of vibration with regard to habitability on passenger and merchant ships.

ISO 6954:2000(E) (2001) suggests that the frequency range of interest with regard to habitability in the working and accommodation areas of passenger and merchant vessels may be assessed by triaxial (ship vertical, and fore-and-aft and lateral) measurement of vibration at frequencies between 1.0 and 80 Hz. During measurement the ship is to be conducting an approximately straight path ($\pm 2^\circ$ of rudder permitted) in a sea state of 3 or less, where the water depth is five times (or more) greater than the ship's draft with propulsors fully immersed. Measurement periods might be as short as 60 seconds, except where there is *significant* energy below 1 Hz in which case 120 seconds is stated as a sufficient measurement period. For the purposes of evaluation of these measurements they are to be weighted with the "band limited combined frequency weighting" specified in ISO 2631-2:2003(E) (2003) which concerns vibration in buildings. For the purposes of assessment the highest frequency weighted r.m.s. triaxial values is then selected and compared against a range of values which 'reflects the shipboard vibration environment commonly experienced and accepted' in each of three areas classified as A, B, and C. For

guidance the standard indicates that area A might be 'passenger cabins', area B 'crew accommodation areas' and area C 'working areas'.

It is not clear that ISO 6954:2000(E) (2001) will provide good prediction, since in other areas the worst component method of assessment has been shown to be less than optimal. The standard may be designed to provide ship manufacturers and owners commissioning vessels with an agreed framework upon which to base contractual terms for the acceptance of vessels into service. If that was the intention of the technical committee it may make a useful contribution. However the lack of consideration of oscillation in the rotational axes, the lower frequency limit of 1.0 Hz, the summative effect of vibration in different axes, and the potential orientations of persons receiving the vibration mean that its utility as a tool for improving passenger experience must be limited.

Environments designed to be stable: relevant standards

BS 6611:1985 (Evaluation of the response of occupants of fixed structures, especially buildings and offshore structures, to low-frequency horizontal motion (0.063 Hz to 1 Hz))

Introduction BS 6611:1985 (1985) adopts ISO 6897 *with necessary changes* as a UK standard. The document concerns the expectation of building occupants that structures will be 'virtually unresponsive even under storm conditions' and addresses the (then relatively new) phenomenon of off shore structures where 'trained personnel who are prepared to accept some degree of motion'. The standard requires measurement in both horizontal axes, and notes the capacity for earth referenced yaw oscillation to 'significantly exaggerate the actual magnitude of acceleration acting on the subject.' This might indicate that yaw measurement would also be recommended. Evaluation of the measurements is to be made with respect to suggested satisfactory magnitudes of motion which are generalisations of the perceptual thresholds. Environments required to be apparently stationary are related to the approximate mean threshold of the adult population, and environments where 'routine precision work' is to be executed by a curve with a magnitude four times the approximate mean threshold. In an offshore setting this higher magnitude of curve is thought to be suitable for work of a 'somewhat critical nature'. Assessment of the oscillations is, in the case of buildings, intended to be made with respect to the worst 10 minute period of a storm with an intensity expected to have a 5 year return interval. Although not explicitly stated this would require long term ongoing measurement. Depending on the nature of the spectra observed in selected 600 second sample, the treatment of the sample varies, since the threshold data upon which the evaluation is based pertain to single frequency components. Single frequency vibrations (e.g. the first natural frequency of a structure) are to be evaluated against the curves directly. When narrow band random vibration occurs the r.m.s. magnitude of the centre frequency is to be evaluated, and in the case of vibration in both horizontal axes, the vector sum of the components accounting for phase is to be evaluated. The standard predicts that for structures adhering to its guidance less than 2% of the

building occupants in the region of greatest oscillation will comment adversely about the storm peaks selected as the measurement criterion. No such prediction is offered in the case of workers on offshore platforms.

2.7 Conclusions of the literature review

This review has shown that despite considerable advances in knowledge concerning the discomfort arising from the exposure of persons to acceleration, deficiencies remain. In particular there has been a lack of systematic investigation into the effects of acceleration vectors in the plane of the seat. Such vectors arise both during translation of the seat in earth referenced co-ordinates and also when the seat rotates through the plane of action of the gravitational field (i.e. in roll or pitch oscillation). The literature reveals that there is a paucity of information about the frequency and magnitude of roll and pitch oscillation as single axis stimuli below approximately 1.6 Hz and decreasing confidence in the quality of information concerning lateral and fore-and-aft oscillation below the same frequency. The relative discomfort of exposure to oscillation in these four axes has also generally been inferred from studies at higher frequencies. Further there has been very little systematic investigation at these frequencies of the effects of the presence of a backrest, nor of the active control of posture during vibration on the consequent discomfort of those exposed.

The continuing development of civil and military transport means that populations of greater size are being exposed to environments where there is considerable energy at frequencies below 2 Hz, for example during travel on fast ferries in the civil sector, and in military forces the growing importance of highly mobile forces particularly those delivered by sea and air. As the frequency of vibration decreases the importance of considering roll and pitch oscillation as a source of discomfort increases, since typically it is at these frequencies where large angular displacements are observed. Reducing discomfort has become an important method by which commercial transport is differentiated. Military services too are increasingly interested in preventing the delivery of troops to combat theatres after excessively uncomfortable journeys because of the perceived diminution of their effectiveness. Modification of existing and development of new transport systems with reduced discomfort causing potential requires effective predictive methods. However this review has shown that existing standardised methods encode the uncertainties in knowledge outlined above.

2.7.1 Priorities for future research

This literature review has identified some areas where further research would enhance understanding of the discomfort arising from exposure to acceleration in the roll, pitch, lateral and fore-and-aft axes. The main objective of this thesis is to investigate the hypothesis that acceleration in the plane of the seat gives rise to similar discomfort whether the originating

oscillation is translation, or rotation through the plane of action of the gravitational field. The dependence of discomfort on the frequency and magnitude of oscillation, effects related to the presence of a backrest, and active control of posture during vibration will be investigated, principally using the method of magnitude estimation. The research findings will be used to evaluate the efficacy of existing predictive methods based on weightings and, if appropriate, to develop modifications intended to improve the accuracy of prediction.

Chapter 3 Apparatus, data acquisition & analysis

3.1 Introduction

This chapter of the thesis describes the equipment employed in the experimental work. The data acquisition and analysis methods are also described.

3.2 Experimental Apparatus

3.2.1 Seating

Three designs of seat were employed in the course of this work. The common feature of all seats was that the sitting position was 420 mm above the platform and that the sitting area depth was 450 mm. Where the seat rotated the centre of rotation was in the plane of the seat.

3.2.1.1 With and without backrest: direct comparison

The direct comparison between the discomfort arising from oscillation with and without a backrest was carried out using a seat as illustrated in Figure 3-1. The results of this comparison are reported as part of Chapter 5. The seat was constructed from timber, with a plywood seating surface which allowed subjects to slide laterally between a seat with a backrest and harness and a seat with no backrest. Foam blocks were stacked behind the subject when they were seated without a backrest to ensure their safety.

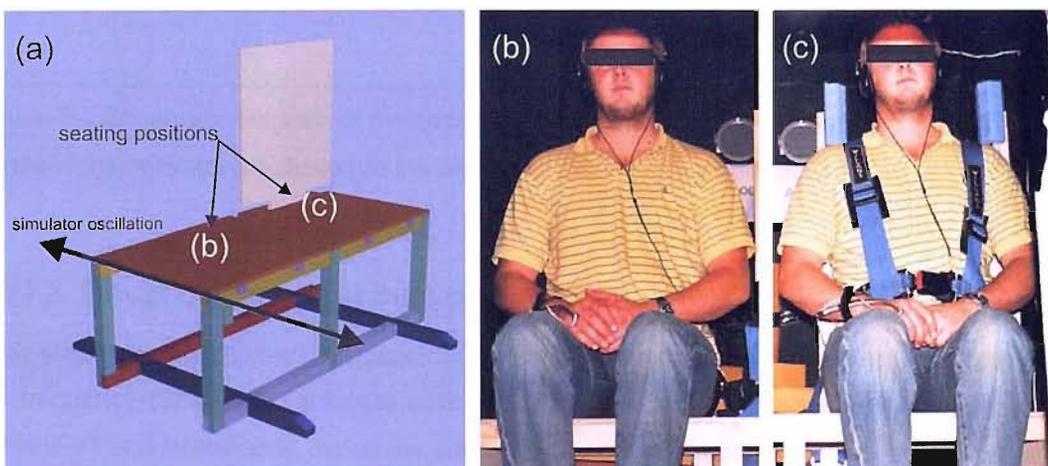


Figure 3-1 Schematic diagram of the seat used during the studies which investigated the relative discomfort arising from exposure to fore-and-aft oscillation with and without backrest at 0.2 Hz. (continued over) →

(a) schematic diagram of the seat which permitted subjects to move laterally between a seat with no backrest (b), and a seat with backrest (c), together with associated photographs of subjects.

3.2.1.2 Generic seating

The seats used in the majority of the experimental studies in this work (Chapter 4, Chapter 5 and Chapter 7) were of a metal frame construction. Three seats were available, one constructed of welded steel, and two of welded aluminium alloy. Their dimensions and rigidity (at the frequencies this work is concerned with) were functionally similar. The seats were fitted with a laminate timber seating block and a removable, height adjustable backrest as shown in Figure 3-2.

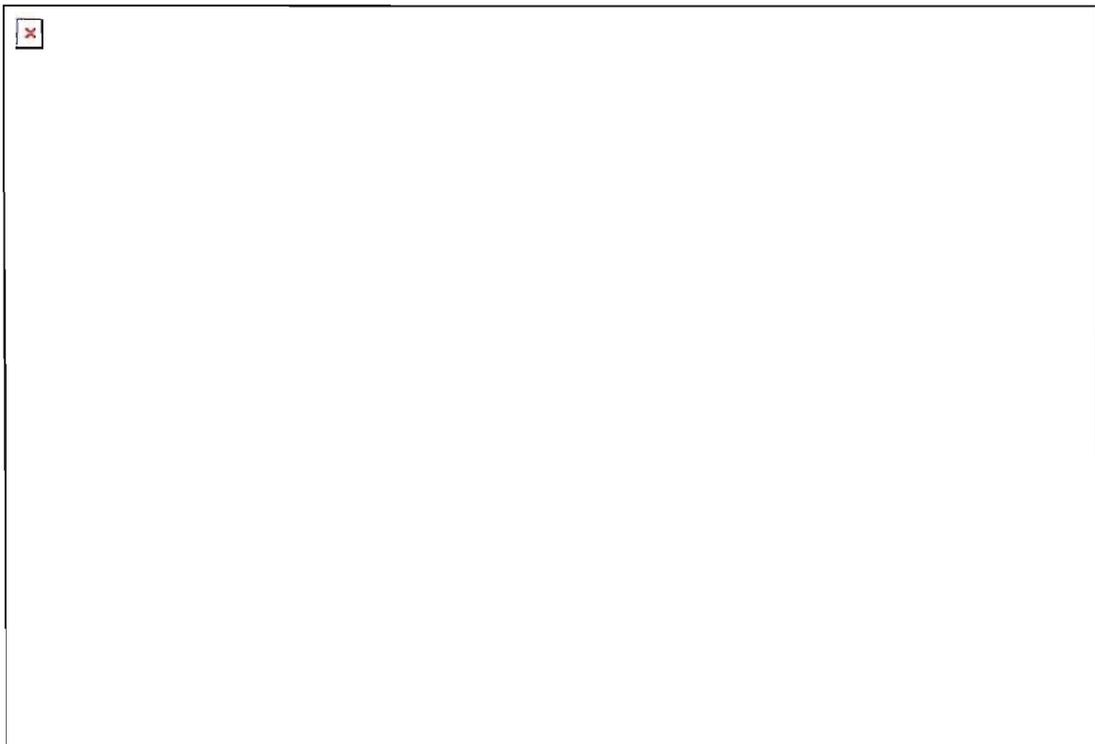


Figure 3-2 Schematic diagram of the seat used during the single axis studies, and for comparisons between the discomfort arising from roll and lateral oscillation.

3.2.1.3 Direct comparison between lateral and fore-and-aft oscillation

In the study which compared the discomfort arising from fore-and-aft and lateral oscillation at one frequency (Chapter 7) subjects were required to change their orientation between the fore-and-aft and lateral axes during the course of some magnitude estimation trials. The seat shown in Figure 3-3, which had an aluminium alloy subframe and a plywood surface facilitated this.

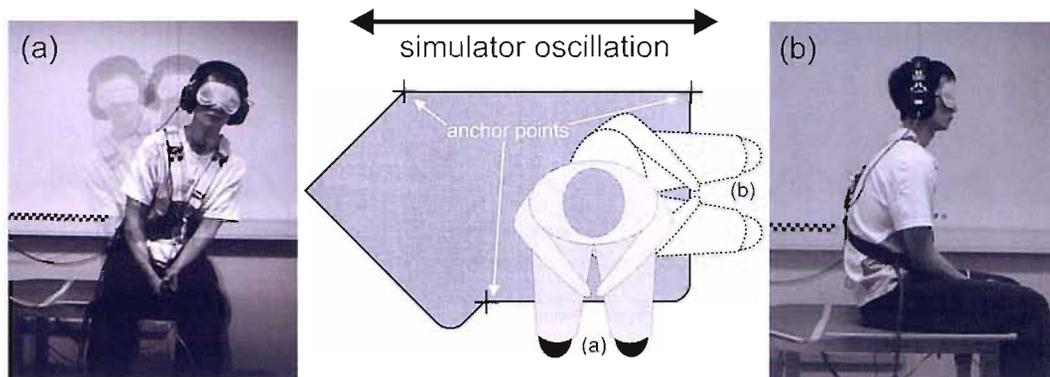


Figure 3-3 Schematic diagram (centre) of the seat, together with photographic illustrations of a subject (a) 0.5 Hz, 0.315 m.s^{-2} r.m.s. lateral oscillation, normalised for zero platform displacement (b) static image of fore-and-aft oscillation.

3.2.2 Vibration generating equipment

3.2.2.1 Twelve-metre long stroke simulator

The twelve-metre long stroke simulator is capable of up to $\pm 6 \text{ m}$ of horizontal oscillation, and or ± 10 degrees of rotation. The simulator is capable of achieving peak acceleration of 2.0 m.s^{-2} and $60 \text{ degrees.s}^{-2}$ in the translation and rotational axes respectively. The system consists of a carriage formed from welded aluminium alloy running on circular section stainless steel rails. The carriage is propelled backward and forward via the action of an asynchronous induction motor on a toothed belt. A superstructure, also constructed of aluminium alloy, is suspended from a pair of bearings permitting its rotation relative to the carriage by a belt drive. Simultaneous rotation of the superstructure and translation of the carriage is possible. A lightweight wooden cabin is fitted to the rotating superstructure, so that the visual environment can be controlled. The simulator safety features included electronic and mechanical systems designed to prevent the carriage overrunning the end of the track, as well as emergency stop switches for subject and experimenter. A schematic illustration of the twelve-metre long stroke simulator is shown at Figure 3-4

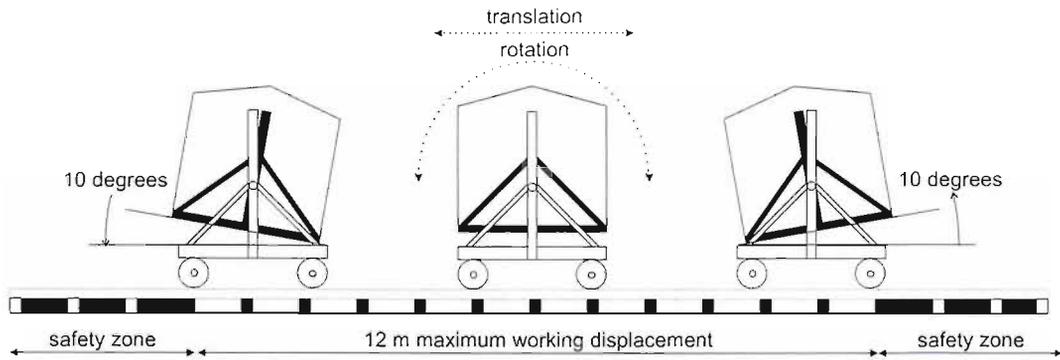


Figure 3-4 Schematic of the twelve-metre long stroke simulator. The carriage translates upon a track and the superstructure can rotate simultaneously. The phase relationship between the carriage and the superstructure is variable and is defined by the experimenter.

3.2.2.2 One-metre horizontal electro hydraulic vibrator

This vibrator was used to provide motion for the single axis studies conducted in the lateral and fore-and-aft directions. The vibrator is capable of producing 1-m peak to peak oscillation in the horizontal axes. The vibrator platform consists of a 1.5 by 1.0 by 0.02 m aluminium alloy plate, with a grid of threaded m12 holes allowing the attachment of equipment to the plate. A schematic illustration of the one-metre horizontal vibrator is shown at Figure 3-5

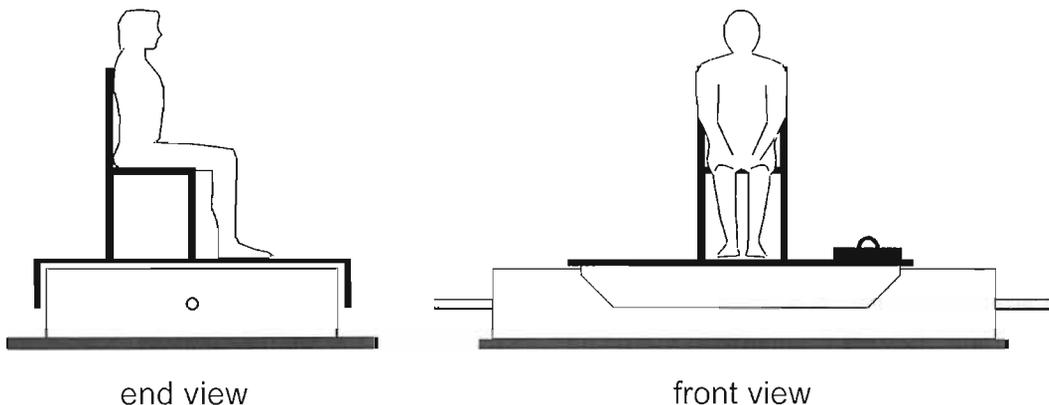


Figure 3-5 Schematic illustration of the one-metre horizontal electro hydraulic vibrator.

3.2.2.3 Rotation rig

The rotation rig was used to generate pitch and roll oscillation for the single axis studies. The rotation rig is capable of delivering a peak oscillation of ± 30 degrees with a variable centre of rotation. The simulator is driven by a crank connected to the one-metre horizontal electro hydraulic vibrator.

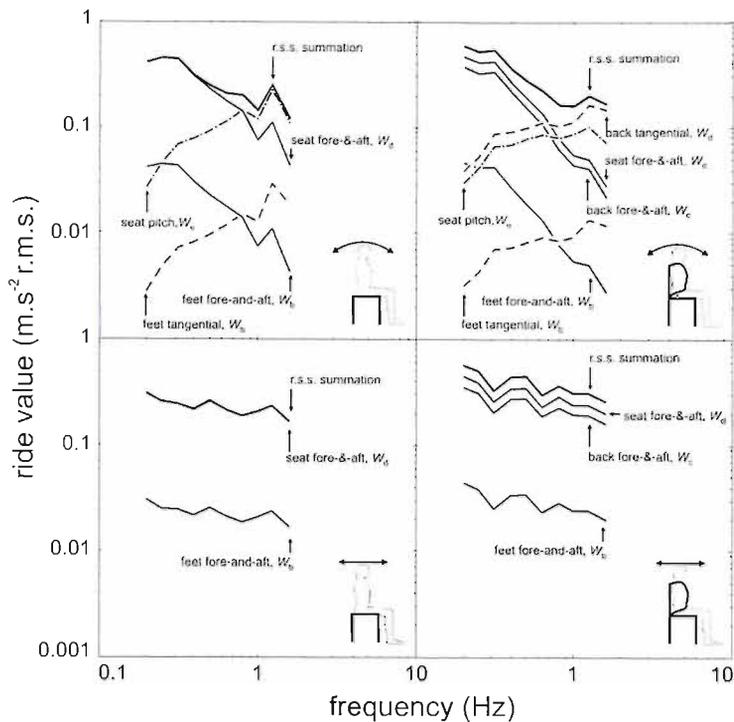


Figure 3-6 Schematic diagram of the 1 m horizontal electro hydraulic vibrator coupled to the roll rig. The crank converts the linear motion of the platform motion to a rotational oscillation.

3.2.3 Transducers

3.2.3.1 Smiths AVLS

An accelerometer manufactured by Smiths Industries (Experiment 1-1,1-2, and 2 details shown in Table 5) was mounted to the carriage of the twelve-metre long stroke in order to measure the earth horizontal acceleration of the carriage during its oscillation on the track. A similar accelerometer was fitted to the seat so that it was in line with the centre of rotation and suitably orientated to detect the $g \cdot \sin \theta$ component during pitch or roll. These accelerometers are of the capacitive design. The accelerometer was calibrated by placing it on an angled block which caused it to transduce the known component of the gravitational field acting in the plane of the block. An example of a calibration file resulting from this procedure is at Figure 3-7. Further details of the configuration of the accelerometers, and the associated signal conditioning are provided in the relevant experimental results Chapter 4 and Chapter 5). In studies investigating the effect of posture Chapter 6 an ultrasonic distance measuring system was employed to measure shoulder displacement. The system functioned by measuring the time delay between transmitted and received pulses. The sampling frequency was 50 samples per second, and the effective range of the device was 1.5 m. Calibration was effected by comparison of the output voltage with the receiver position at a series of known distances.

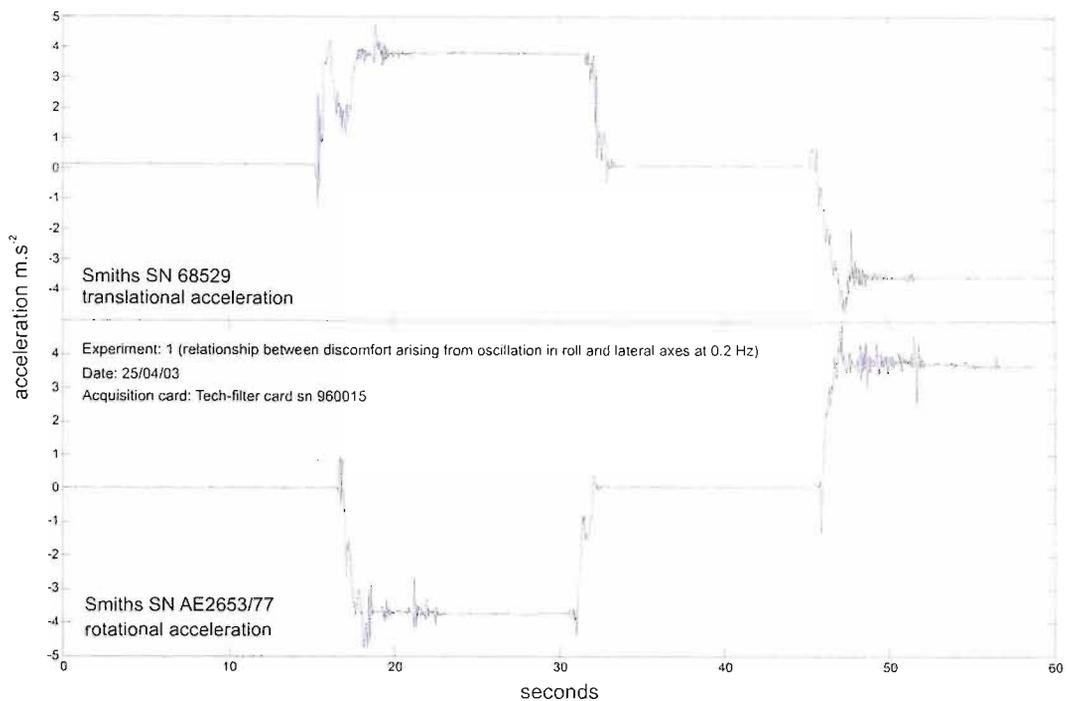


Figure 3-7 Example of calibration of a pair of Smiths Industries capacitive accelerometers using the 22 degree angled block method. The known translational acceleration in the plane of the block caused by the gravity field is transduced by the accelerometer, allowing a calibration to be effected.

3.2.3.2 Setra 141a

Accelerometers manufactured by Setra Systems (model 141a – miniature capacitive design) with varying sensitivity were employed during experiments using the rotation rig, or the 1m horizontal electro-hydraulic vibrator. These accelerometers were normally calibrated by the ‘turn-over’ method (BSI, 1994) . Details of the studies in which these accelerometers were employed are shown Table 5.

3.2.3.3 Ultrasonic position detector

In studies investigating the effect of posture Chapter 6 an ultrasonic distance measuring system was employed to measure shoulder displacement. The system functioned by measuring the time delay between transmitted and received pulses. The sampling frequency was 50 samples per second, and the effective range of the device was 1.5 m. Calibration was effected by comparison of the output voltage with the receiver position at a series of known distances.

Table 5 Transducers used in the course of this work

| Study | Orientation | Manufacturer | Range | Type | Serial Number |
|--------------------------------|--------------|-------------------|--------|--------------|-----------------|
| 0.2 Hz roll & lateral (part 2) | Lateral | Smiths Industries | ±12g | 503 AD/32 | SN 68529 |
| 0.2 Hz roll & lateral (part 1) | Roll | Smiths Industries | ±12g | | SN AE2653/77 |
| 0.2 Hz roll & lateral (part 2) | Lateral | Smiths Industries | ±6g | AV-L_692 | SN AH 738/80 |
| 0.2 Hz roll & lateral (part 2) | Roll | Smiths Industries | ±12g | | ASE 2653/77 |
| 0.2 Hz pitch & fore-and-aft | Fore-and-aft | Smiths Industries | ±6g | AV-L-692 | AH 738/80 |
| 0.2 Hz pitch & fore-and-aft | Pitch | Smiths Industries | ±12g | | AE 2653/77 |
| 0.2-1.6 Hz lateral | Lateral | Setra Systems | ±2g | 141a | 107311 |
| 0.2-1.6 Hz roll | Roll | Setra Systems | ±2g | 141a | 107310 |
| 0.2-1.6 Hz roll | Roll | Setra Systems | ±2g | 141a | 107308* |
| 0.2-1.6 Hz fore-and-aft | Fore-and-aft | Setra Systems | ±2g | 141a | 107311 |
| 0.2-1.6 Hz fore-and-aft | Pitch | Setra Systems | ±2g | 141a | 107308 |
| 0.5 Hz fore-and-aft & lateral | Horizontal** | Setra Systems | ±2g | 141a | 107311 |
| 0.2 – 1.6 Hz effect of posture | Roll | Setra Systems | ±2g | | 107309 |
| 0.2 – 1.6 Hz effect of posture | Pitch | Setra Systems | ±2g | 141a | 107910 |
| 0.2 – 1.6 Hz effect of posture | Roll | Setra Systems | ±2g | 141a | 107308* |
| 0.2 – 1.6 Hz effect of posture | Roll | HFRU | ±1.5 m | Ultrasonic | None*** |

* 107308 used as replacement for accelerometer 107310 which failed in service

** In this case the subject altered their orientation so that they moved between the fore-and-aft and lateral orientations

*** manufactured in the HFRU

3.3 Performance of the vibrators

3.3.1 Cross axis acceleration of the twelve-metre longstroke

The cross axis acceleration of the twelve-metre longstroke had not previously been assessed, it not having been previously used for experiments involving subjective discomfort. Table 6 shows the vertical oscillation associated with translational oscillation of the carriage. The vertical oscillation was the most suitable acceleration to measure, since it arose as a combination of track unevenness, and also the rocking motion of the carriage in the plane perpendicular to the intended direction of oscillation. Existing data at slightly higher frequencies indicated that this magnitude of vertical acceleration was likely to be perceptible. Experienced test subjects found that the vertical vibration was indeed just perceptible, especially at the lowest magnitudes of horizontal oscillation. It was assessed however that the difference between the just perceptible vertical vibration and the oscillation in the fore-and-aft and lateral axes which caused substantial discomfort was sufficient that the results of the study were unlikely to be unduly biased.

Table 6 Vertical acceleration associated with translational oscillation of the twelve-metre longstroke carriage.

| | Magnitude (m.s⁻² r.m.s) | | | | |
|----------------------------|---|--------|--------|--------|--------|
| Acceleration y | 0.2118 | 0.4048 | 0.6016 | 0.8005 | 0.9992 |
| Acceleration z | 0.0308 | 0.0329 | 0.0329 | 0.0343 | 0.0397 |
| Cross coupled y-z % | 6.88 | 8.13 | 5.47 | 4.28 | 3.97 |

3.3.2 Acceleration distortion

For the purpose of this work acceleration distortion is defined as the proportion of energy in the acquired signal outside some window about the fundamental frequency. Equation 3-1 which was used to calculate distortion yields as a percentage the square root of the power from the sampling frequency f_s down to $\sqrt{2}f_0$ where f_0 is the fundamental frequency, to the power between $\sqrt{2}f_0$ and $f_0 / \sqrt{2}$.

$$distortion = 100 \times \left[\frac{\int_{f_s/2}^{\sqrt{2}f_0} G(f)df}{\int_{f_0/\sqrt{2}}^{\sqrt{2}f_0} G(f)df} \right]^{1/2}$$

Equation 3-1: Calculation of distortion

3.3.2.1 Twelve-metre long stroke simulator

The acceleration distortion of the twelve-metre long stroke simulator was measured in both the translational and rotational axes at a range of acceleration magnitudes. The results are shown in Table 7

Table 7 Long Stroke performance at 0.2 Hz (percentage distortion)

| Magnitude (m.s⁻²) r.m.s. | 0.2 | 0.4 | 0.6 | 0.8 | 1.0 |
|--|------------|------------|------------|------------|------------|
| Translation | 7.93 | 4.74 | 4.17 | 4.21 | 4.75 |
| Rotation | 13.58 | 7.12 | 5.43 | 4.91 | 4.54 |

Low pass filter 5 Hz - Obtained: 13/03/03

3.3.2.2 Distortion performance of the one metre electrohydraulic vibrator.

The acceleration distortion of the one metre electrohydraulic vibrator was measured at each of the ten studied frequencies in this work. At each frequency there were two investigated magnitudes (0.2 and 0.63 m.s⁻² r.m.s).

Table 8 One-metre horizontal vibrator linear performance (percentage distortion)

| Frequency (Hz) | 0.2 | 0.25 | 0.315 | 0.4 | 0.5 | 0.63 | 0.8 | 1.0 | 1.25 | 1.6 |
|-------------------------|------|------|-------|------|------|------|------|------|------|------|
| 0.2 m.s-2 r.m.s | 15.5 | 15.4 | 17.1 | 16.2 | 19.4 | 24.8 | 20.5 | 28.2 | 19.8 | 11.8 |
| 0.63 m.s-2 r.m.s | 16.8 | 14.1 | 12.9 | 9.3 | 7.7 | 5.3 | 5.6 | 4.6 | 4.4 | 5.0 |

Low pass filter 5 Hz - Obtained: 05/05

3.3.2.3 Distortion performance of the Rotation simulator

The distortion performance of the rotation simulator was, since it is driven by a crank attached to the one-metre electrohydraulic vibrator, a function of that vibrator's performance. The measured platform accelerations on the rotation simulator were those caused by the acceleration in the plane of the platform as it rotated through the gravity vector. Effectively this resulted in the translational acceleration of the horizontal platform being double integrated before being detected as acceleration in the plane of the seat on the rotational simulator. Consequently these distortions were much lower than those observed during translation, and were in all cases less than 8%.

3.4 Data acquisition, analysis, and statistical testing

3.4.1 Data acquisition

Sinusoidal vibration signals generated using *HVLab* software (version 3.81) were used to drive the vibrators in all experiments. Parameters including signal acquisition duration, and sampling rate were set in the *HVLab* software. Signals were transmitted to the vibrators via a 16 channel *HVLab* data acquisition and analysis system based on an Advantech PCL-818 data acquisition card and Techfilter TF-16 anti aliasing card. Before being passed to the vibrator the input signals were low pass filtered and displayed on an oscilloscope. The output voltage of the accelerometers mounted on the platform was acquired using the *HVLab* acquisition system described above

3.4.2 Analysis tools

Motion data were analysed using *HVLab* software (v 3.81) and MATLAB software (versions, 6, 2007a, and 2007b (The Mathworks Inc., 2007). The subject data were stored as CSV files and manipulated as data structures in MATLAB or as spreadsheets in Microsoft Excel 2003, and in some cases exported for statistical analysis to SPSS (version 14) (SPSS Inc., 2005). The method of least squares used in Matlab to fit regression lines to the magnitude estimates was written in such a way that it produced identical results to that implemented in Microsoft Excel 2003.

3.4.3 Magnitude estimation practice instrument

Before each session of vibration exposure subjects were instructed to complete a magnitude estimation exercise. The purpose of this exercise was to ensure that subjects understood the process of magnitude estimation. In these exercises the physical quantity investigated was the length of a printed line. An example of the test instrument is included with an example experimental protocol [ANNEX]. Before use the instrument was tested with a cohort of six subjects. The results were in accordance with those reported by Stevens (Stevens, 1975b) who demonstrated that the rate of growth of perceptual line length with increasing physical line length was around 1.0.

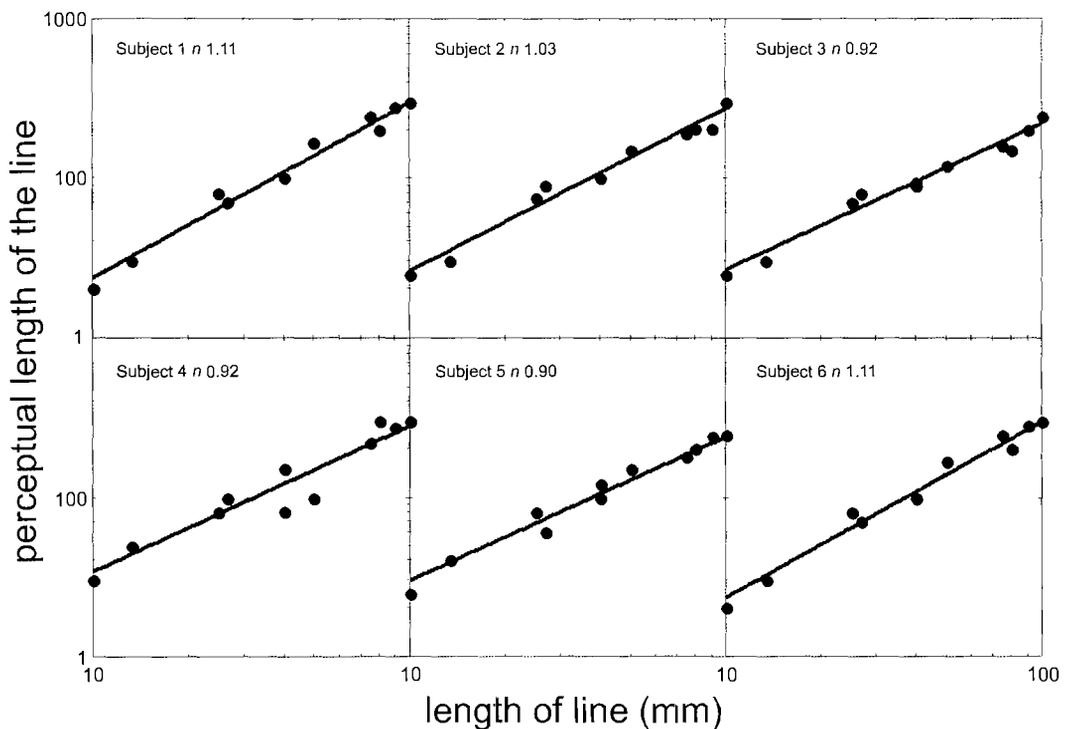


Figure 3-8 The relationship between the perceptual and physical length of a line as reported by six subjects who participated in a validation trial of a magnitude estimation instrument which was used to prepare subjects for vibration exposure throughout this work. n values in the plot describe the rate of perceptual growth of the line relative to its physical length.

3.4.4 Statistical methods employed

3.4.4.1 Kruskal-Wallis test for several independent samples

The Kruskal-Wallis test is a non parametric one way analysis of variance which, given m populations with equal, but not necessarily normal, distribution, allows for the testing of the hypothesis that the m population medians are equal. In this thesis the Kruskal-Wallis test was employed to compare the medians of three or more conditions where the set of subjects in those conditions was non union.

3.4.4.2 Wilcoxon matched pairs signed ranks test

The Wilcoxon matched pairs signed ranks test is a robust non parametric test which is functionally equivalent to the paired Student's t -test, but free from the assumptions regarding the distribution of the data associated with that test. Its application is limited to data of interval or greater quality, since both the sign and the magnitude of the observations contribute to the formation of the signed-ranks statistic (the sum of the positive signed ranks). The power efficiency of the Wilcoxon matched pairs signed ranks test relative to the parametric t -test varies according to the distribution of the data, performing less well with lighter tailed distributions e.g. (0.955 for a normal distribution) and better with heavier tailed distributions (e.g. 1.5 for an exponential distribution.) (Higgins, 2004)

In this thesis the Wilcoxon matched pairs test was employed to compare observations in the same and different conditions within matched sets of subjects.

3.4.4.3 Mann-Whitney test for two independent samples

The Mann-Whitney test can be shown to be equivalent to the Wilcoxon matched pairs signed ranks test, in that the value of the test statistics can be shown to be linearly related (Higgins, 2004).

In this thesis the test was employed to test pairs of conditions where the set of subjects was non union, i.e. the subject sets were not completely matched.

3.4.4.4 Friedman analysis of variance

The Friedman two way analysis of variance is a non parametric statistical tool used to test the hypothesis that k matched samples originate from the same population. In this thesis this test is employed selectively within matched subject groups since not every condition was tested using the same subjects.

3.4.4.5 Spearman rank correlation coefficient, ρ

The Spearman rank correlation coefficient ρ provides a measure of the strength of association between two variables, which is free from the assumptions concerning distribution which underlie the calculation of the Pearson correlation coefficient. In this thesis we applied the Spearman rank correlation coefficient as the sole method of testing for the significance of association between two variables.

3.4.4.6 Controlling the experiment-wise error rate

Where there are k treatments there are $k(k-1)/2$ possible pairwise comparisons, each with some probability p_i that a significant difference arises in error. Given sufficient comparisons the probability of such a report becomes large. In order to control for this phenomenon the alpha level may be adjusted according to one of a number of rank based procedures (Shaffer, 1995). In this thesis, where appropriate, we applied the Bonferonni criterion. Different authors present differing interpretations of the criterion:

- Set the alpha value for the entire set of n comparisons equal to α' by taking the alpha value for *each* comparison equal to α/n ... [noting that other authors specify] $1-(1-\alpha)^{1/n}$... [which] ... is not in general correct (Weisstein, 2006)
- Where the possible number of pairs $m = k(k-1)/2$ $\alpha' = \alpha/m$ (Higgins, 2004)

Here the method of (Weisstein, 2006) is adopted adjusting on the basis of the number comparisons we were obliged to make rather than on the total number of comparisons which might have been made. The necessity of employing multiple tests complicated the interpretation of effects close to our detection threshold. In some cases we have drawn inference from results significant at α but not at α' provided that: a) these differences occurred at more than one frequency b) the frequencies were coincident and c) the direction of the differences was the same.

Chapter 4 The effect of exposure to roll and lateral oscillation

Short summary

Discomfort caused by low frequency lateral and roll oscillations is often predicted from lateral acceleration in the plane of the seat, irrespective of whether it comes from horizontal motion or a component of gravity arising from roll. This study investigated discomfort arising from lateral and roll oscillation and whether acceleration in the plane of a seat was a sufficient predictor of discomfort. Twelve subjects, sitting with and without a backrest, used magnitude estimation to judge sinusoidal oscillations in the roll and lateral axes at 10 frequencies between 0.2 and 1.6 Hz at magnitudes between 0.063 and 0.63 ms⁻² r.m.s. The rate of growth of vibration discomfort with increasing magnitude reduced with increasing frequency, so the frequency-dependence of discomfort varied with magnitude. Acceleration in the plane of the seat predicted discomfort at frequencies less than 0.4 Hz. At higher frequencies, acceleration produced by roll oscillation resulted in greater discomfort than the same acceleration produced by lateral oscillation. At frequencies greater than 0.4 Hz, a full height backrest increased discomfort with both lateral and roll oscillation. The prediction of discomfort caused by low frequency lateral and roll oscillation requires that both components are measured and assessed according to their separate effects.

4.1 Introduction

The objective of the present study was to determine how discomfort depends on the frequency of oscillation (at frequencies between 0.2 and 1.6 Hz), the direction of oscillation (lateral and roll) and seating condition (with and without a backrest). It was hypothesised that discomfort would vary similarly with roll and lateral oscillation when these motions had the same acceleration in the plane of the seat.

Two experiments are reported. A 'between axes' experiment investigated the relative discomfort caused by roll and lateral oscillation at 0.2 Hz. A 'within axis' experiment investigated the rate of growth in discomfort with increasing vibration magnitude, the variation in discomfort with the frequency of oscillation between 0.2 and 1.6 Hz in the roll and lateral directions, and the effect of a backrest. The 'within axis' experiment also investigated the principal locations of discomfort in the body.

4.2 Method

Both experiments employed a 'within subjects' experimental design. Subjects were exposed to a reference stimulus followed by a test stimulus and asked to judge the discomfort of the test motion relative to the reference motion using the method of magnitude estimation (Stevens, 1975b). The reference motions and all test motions were sinusoidal with durations of 30 seconds.

In the 'between axes' experiment, the reference motion was lateral oscillation at a frequency of 0.2 Hz and a magnitude of 0.45 ms^{-2} r.m.s. with subjects seated on a flat rigid seat with a backrest and harness. The test motions were also at 0.2 Hz but with a magnitude chosen randomly from an array of magnitudes in either the lateral or the roll axis and with or without a backrest and harness. This experiment was completed in one session with the order of presentation of conditions balanced.

In the 'within axis' experiment, the reference motion was at a frequency of 0.5 Hz and a magnitude of 0.315 ms^{-2} r.m.s. The test motions had frequencies between 0.2 and 1.6 Hz and were chosen randomly from an array of frequencies and magnitudes. There were four separate sessions, corresponding to motion in both axes (lateral or roll) and both postures (with or without a backrest with harness). The order of sessions was balanced and subjects attended only one session per day. For one magnitude of oscillation at each frequency, subjects indicated verbally the location in their body at which they felt the greatest discomfort. With lateral oscillation, they judged the location of discomfort with 0.4 m.s^{-2} r.m.s. With roll oscillation, they judged the location of discomfort with 0.4 ms^{-2} r.m.s. at frequencies between 0.2 and 0.5 Hz, and at magnitudes that decreased in inverse proportion to frequency at higher frequencies.

4.2.1 Stimuli in the 'between axes' experiment

In the 'between axes' experiment there were five 0.2 Hz stimuli with magnitudes in logarithmic series between 0.2 and 1.0 ms^{-2} r.m.s. The simulator reproduced the test stimuli with unweighted acceleration distortions less than 8% in the lateral direction and less than 4% in roll. For the lateral motions, the cross-axis acceleration in the vertical direction (i.e. z-axis) was less than 8% of the lateral (y-axis) acceleration.

4.2.2 Stimuli in the 'within axis' experiment

In the 'within axis' experiment there were 10 frequencies, one at each preferred one-third octave centre frequency between 0.2 and 1.6 Hz. With lateral oscillation, there were 59 pairs of stimuli: six magnitudes in logarithmic series between 0.2 and 0.63 ms^{-2} r.m.s at each frequency, except 0.2 Hz where five magnitudes were used in the range 0.2 to 0.5 ms^{-2} r.m.s. due to simulator displacement limitations.

With roll oscillation, there were 60 pairs of stimuli: six magnitudes at each frequency between 0.2 and 1.6 Hz. At frequencies between 0.2 and 0.5 Hz, the magnitudes expressed

in terms of the equivalent lateral acceleration (i.e. the acceleration given by $g \cdot \sin \theta$, where θ is the angle of roll) were in a logarithmic series between 0.2 and 0.63 ms^{-2} r.m.s. At frequencies greater than 0.5 Hz, the acceleration magnitudes decreased in inverse proportion to frequency such that at 1.6 Hz the magnitude varied between 0.063 and 0.2 ms^{-2} r.m.s. in a logarithmic series.

Roll oscillation was reproduced with unweighted acceleration distortion less than 8%. Lateral oscillation was reproduced with unweighted acceleration distortion less than 28%, and much less than 20% for the majority of stimuli. The frequency-weighted distortion of the lateral acceleration (weighted using W_d BS6841 (BSI, 1987)) which should better reflect the perceptual impact of the distortion) was less than 20% at 0.63 and 1.0 Hz, and between 7 and 16% at the other eight frequencies.

Each of the four sessions lasted about 1 hour and included at least one rest period.

4.2.3 Subjects

In both experiments there were twelve male subjects. All subjects were staff or students of the University and aged between 18 and 30 years. In the 'between axes' experiment the mean subject mass was 74.5 kg (range 65 to 100 kg) and the mean stature 1.82 m (1.70 m to 1.89 m). In the 'within axis' experiment the mean mass was 75.6 kg (63.5 to 100 kg) and the mean stature 1.78 m (1.69 to 1.86 m).

4.2.4 Equipment

4.2.4.1 Seating

Rigid steel and aluminium alloy seats with flat horizontal wooden seat pans and removable vertical backrests were used in both experiments. The height of the seat pan was 420 mm above the simulator platform. When used, the height of the top of the backrest was adjusted to the sitting shoulder height of each subject – the backrest was adjustable in 30 mm increments within the 5th to 95th percentile of British male adult sitting shoulder heights (Pheasant, 1996).

For the 'harnessed' condition, subjects sat back in the seat in contact with the backrest and wore a four-point harness. The harness restrained subjects around the waist and at each shoulder. The harness was loosened before each test session and the subjects were instructed to tighten the harness to a 'comfortably tight' setting, adjusting first the waist and then the shoulder restraints. The experimenter assisted the subject where necessary and ensured that the harness was symmetrically adjusted.

4.2.4.2 Equipment used in the 'between axes' experiment

Oscillatory motion was produced by a simulator capable of 12 m of horizontal motion and $\pm 10^\circ$ of rotation located in the Human Factors Research Unit at the Institute of Sound and Vibration Research. Acceleration was measured using accelerometers operating on the

principle of variable reluctance (Smiths type AV-L-692). Lateral oscillation was measured with an accelerometer mounted on a non-rotating portion of the chassis immediately below the seat. Roll oscillation was measured with a similar accelerometer located at the centre of roll, which passed through the centre of the seat surface.

4.2.4.3 Equipment used in the ‘within axis’ experiment

Lateral oscillation was produced by a 1-metre stroke horizontal hydraulic vibrator in the Human Factors Research Unit at the Institute of Sound and Vibration Research. The acceleration was measured using a capacitive accelerometer (Setra type 141A) mounted on the platform of the vibrator immediately below the seat.

To produce rotational oscillation, the same 1-metre stroke horizontal vibrator was coupled via a crank to a rotational simulator. The axis of rotation passed through the centre of the seat surface and the acceleration arising from tilt through the gravitational vector (i.e. $g \cdot \sin\theta$) was measured using a capacitive accelerometer (Setra type 141A) orientated laterally and mounted at the centre of rotation.

4.2.4.4 Signal generation and acquisition

The motion stimuli were generated and monitored using an *HVLab* data acquisition system and *HVLab* software (version 3.81). The drive signals were converted from digital to analogue at 30 samples per second and low pass filtered at 10 Hz. Analogue to digital conversion of the measured acceleration also took place at 30 samples per second after low pass filtering at 10 Hz.

4.2.5 Procedure

Prior to participating in the study, which was approved by the Human Experimentation Safety and Ethics Committee of the Institute of Sound and Vibration Research, subjects were screened using a list of medical contraindications (British Standards Institution, 1973) and instructed in the method of magnitude estimation. Subjects then practised judging the lengths of lines using the method of magnitude estimation before an experiment commenced.

Subjects were asked to sit in a comfortable upright posture, with their feet shoulder-width apart, and to use the method of magnitude estimation to express the vibration discomfort caused by the test motions relative to the discomfort caused by the reference motion, ignoring any audible noise. The subjects assigned a number that represented the discomfort of the test motion relative to the discomfort of the reference motion, assuming the discomfort caused by the reference motion corresponded to ‘100’. Subjects were permitted to use any positive number for their estimate of discomfort.

During the ‘between axes’ experiment, subjects sat in a cabin that prevented them seeing their movement relative to the laboratory. The experimenter was able to observe subjects at all times via a closed circuit television system. During the ‘within axis’ experiment, subjects

wore a blindfold. In both experiments, subjects wore headphones through which white noise at 80 dB (A) was delivered to mask the operating noise of the simulator. The headphones also facilitated communication between the experimenter and the subject

4.3 Results

4.3.1 Rate of growth of discomfort

The magnitudes of the physical stimuli, φ (accelerations in the plane of the floor), were related to the magnitudes of the sensations, ψ (magnitude estimates of discomfort), using Stevens' power law (Stevens, 1975b):

$$\psi = k\varphi^n \quad \text{Equation 4-1}$$

The rates of growth in discomfort, n , were determined for each subject by regression between the logarithm of the vibration magnitude, φ , and the logarithm of the magnitude estimates, ψ :

$$\log_{10} \psi = \log_{10} k + n \log_{10} \varphi \quad \text{Equation 4-2}$$

Median rates of growth at each frequency were calculated from the individual slopes, n , and individual intercepts, k (Figure 4-1). The data from one subject in the 'within axis' experiment whose judgements indicated lack of comprehension of the method of magnitude estimation were discarded.

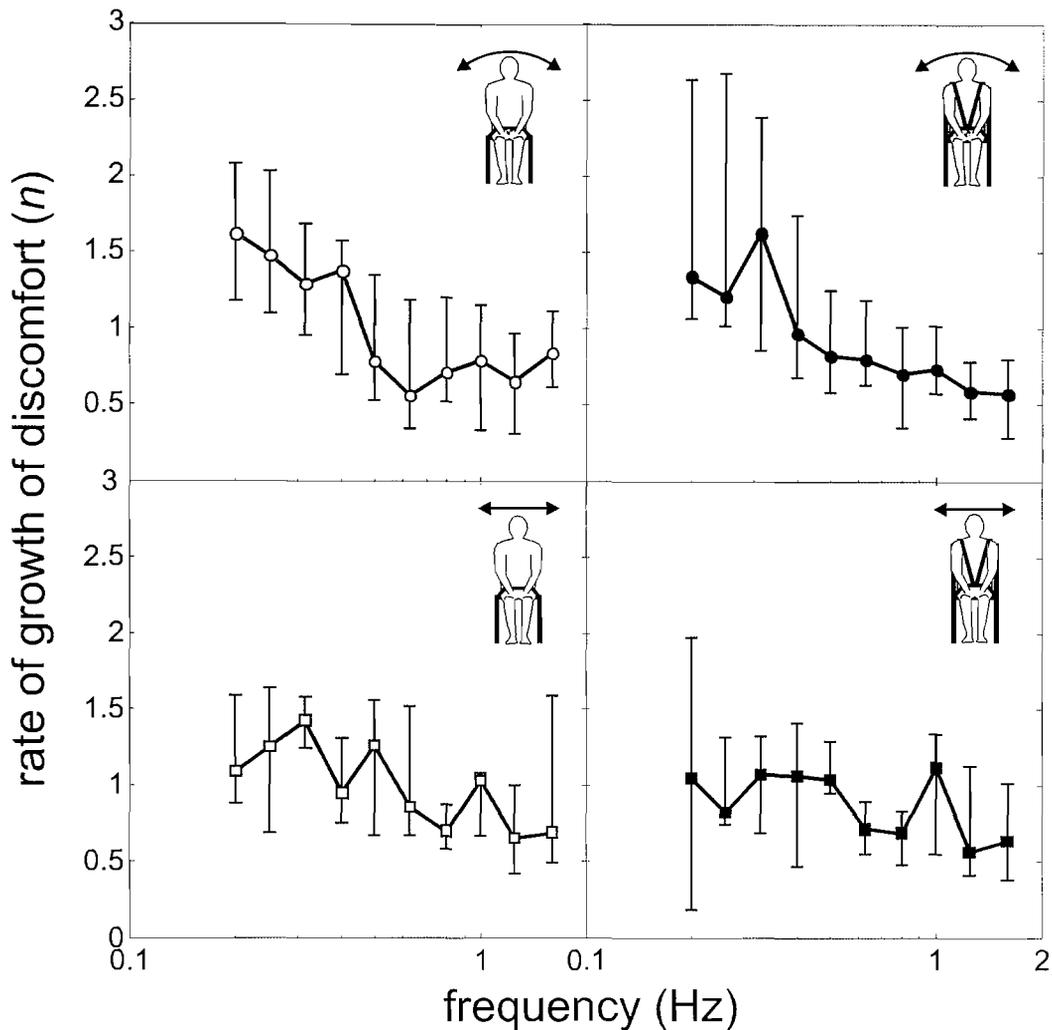


Figure 4-1 Median rates of growth of discomfort, n , for roll and lateral oscillation with and without a backrest. Upper and lower error bars show the 75th and 25th percentile rates of growth of discomfort respectively.

With roll oscillation, the rate of growth of vibration discomfort with increasing vibration magnitude varied significantly with frequency, both when subjects were seated on a flat rigid seat ($p < 0.01$; Friedman) and when they were seated on a rigid seat with a backrest ($p < 0.05$; Friedman). Analysis of the trend showed that the median rate of growth of discomfort was negatively correlated with increasing frequency ($p < 0.05$; Spearman).

With lateral oscillation and no backrest, the rate of growth of discomfort varied significantly with frequency ($p < 0.01$; Friedman) and analysis of the trend showed that the median rate of growth of discomfort was negatively correlated with increasing frequency ($p < 0.01$; Spearman). With the backrest, the rate of growth of discomfort did not vary significantly with frequency ($p > 0.05$; Friedman).

The presence of a backrest had no statistically significant effect on the rate of growth of discomfort with either roll or lateral oscillation at any frequency ($p > 0.05$ Wilcoxon).

With no backrest, the median rate of growth of discomfort was lower for roll than for lateral oscillation at 0.315, 0.5, 0.63, 1.0, and 1.2 Hz, but the difference was only significant at 0.63

Hz ($p < 0.05$ Wilcoxon). With the backrest, the median rate of growth of discomfort was greater for roll than for lateral oscillation at 0.2, 0.25, 0.315, 0.63, 0.8, and 1.25 Hz but the difference was only significant at 0.25 and 0.315 Hz ($p < 0.05$, Wilcoxon). Adjustment according to the Bonferroni criterion suggests that these differences with and without a backrest might have arisen by chance.

The rates of growth in discomfort determined at 0.2 Hz during the 'between axes' experiment and the 'within axes' experiment were not significantly different for either roll or lateral oscillation ($p > 0.05$, Mann-Whitney U), except for roll oscillation without backrest where the rate of growth of vibration discomfort was greater in the single frequency 'between axes' experiment ($n = 1.09$) than during the multiple frequency 'within axes' experiment ($n = 1.54$) ($p = 0.012$ Mann-Whitney U).

4.3.2 Relative discomfort between lateral and roll oscillation

4.3.2.1 The relationship at 0.2 Hz

The magnitudes of 0.2 Hz oscillation required in both axes and with both seating conditions to elicit a discomfort judgment of 100 (i.e. discomfort equivalent to the 0.2 Hz sinusoidal reference motion at 0.45 ms^{-2} r.m.s in the lateral axis on the rigid seat with backrest) differed significantly ($p < 0.05$ Friedman). In order of increasing sensitivity, the equivalent magnitudes were: lateral on a flat rigid seat (0.37 ms^{-2} r.m.s.), lateral on a rigid seat with backrest (0.45 ms^{-2} r.m.s.), roll on a rigid seat with backrest (0.47 ms^{-2} r.m.s.), and roll on a flat rigid seat (0.54 ms^{-2} r.m.s.).

4.3.2.2 Comparing results of the 'within axis' experiment across axes.

In the 'between axis' experiment it was found that the reference motion exerted an effect on discomfort that varied between axes and between seating conditions. To adjust the level of the contours obtained in the 'within axis' experiment to allow for the differing sensitivity found at 0.2 Hz in the 'between axis' experiment, a correction factor, C_{Si} , was calculated for each of the four conditions:

$$C_{Si} = \varphi_{Si} / \varphi_{SR} \quad \text{Equation 4-3}$$

where φ_{Si} is the magnitude of a 0.2 Hz motion in the 'between axis' experiment that gave discomfort equivalent to 0.2 Hz lateral oscillation at 0.45 ms^{-2} r.m.s. on a rigid seat with backrest, and φ_{SR} is the magnitude of a 0.2 Hz test motion in the 'within axis' experiment that corresponded to a magnitude estimate of 100 when using a 0.5 Hz 0.315 m.s^{-2} r.m.s. sinusoidal reference motion in the same axis and seating condition as the test stimulus.

The correction factors were calculated from the medians of the individual slopes and intercepts. Stevens (1975b) found that the n value was independent of the reference

condition, so it was assumed that the reference motion had a constant effect at all frequencies and the same 0.2 Hz correction factor was applied at all frequencies.

Five subjects participated in both the 'within axis' and the 'between axis' experiments. Their k and n values were used to calculate individual correction factors. For each of the four conditions, the median correction factor from the 12 subjects lay within the range of the five individual subject correction factors.

To allow statistical comparisons across axes (see below), the individual contours obtained in the 'within axis' experiment were adjusted by the median correction factors obtained in the 'between axis' experiment.

4.3.3 Effect of frequency on discomfort caused by lateral and roll oscillation

Equivalent comfort contours were determined within each axis for each subject by calculating the vibration acceleration, φ , corresponding to each of five subjective magnitudes, ψ , (i.e. 63, 80, 100, 125, and 160) where 100 corresponds to the discomfort produced by 0.315 ms^{-2} r.m.s. at 0.5 Hz in that axis, for each frequency (from 0.2 to 1.6 Hz) using

Equation 4-4

$$\log_{10} \psi = \log_{10} k + n \log_{10} \varphi \quad \text{Equation 4-2}$$

Five median equivalent comfort contours were then generated from the medians of the contours of individual subjects. The contour equivalent to a perceptual magnitude of 100 was then adjusted according to differences between axes as stated above (Equation 3). The adjusted contours for a subjective magnitude of 100 were highly dependent on vibration frequency ($p < 0.01$, Friedman; Figure 4-2).

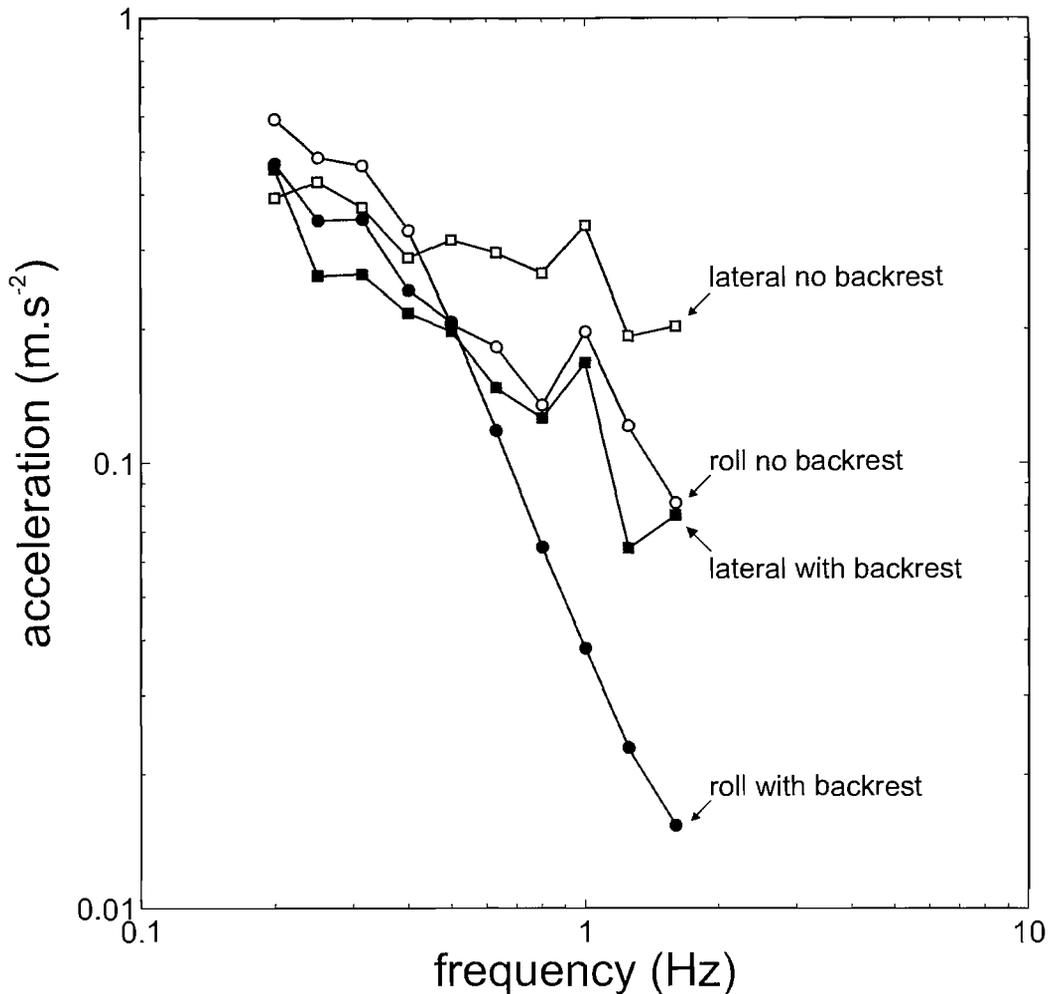


Figure 4-2 Adjusted roll and lateral contours, each producing discomfort equivalent to that arising from exposure to sinusoidal lateral oscillation on a rigid seat with a backrest at 0.2 Hz, 0.45 m.s⁻² r.m.s.

With roll oscillation, the level of the 100 comfort contour declines at almost 12 dB per octave between 0.2 and 1.6 Hz when using a backrest and at less than 6 dB per octave when not using a backrest.

With lateral oscillation, the level of the 100 comfort contour declines at very approximately 3 dB per octave between 0.2 and 1.6 Hz when not using a backrest, and at almost 12 dB per octave when using a backrest.

Without a backrest at frequencies greater than 0.5 Hz, and with backrest at frequencies greater than 0.8 Hz, the comfort contours corresponding to a subjective magnitude of 100 were significantly lower for roll oscillation than for lateral oscillation – indicating greater sensitivity to roll oscillation than to lateral oscillation ($p < 0.05$ Wilcoxon).

4.3.4 Effect of backrest

With roll oscillation, at frequencies less than about 0.5 Hz, the backrest had little effect on the level of the 100 comfort contour, although the median contour suggests slightly less

discomfort without the backrest. At frequencies greater than 0.63 Hz, subjects were significantly more sensitive to the motion when the backrest was present ($p < 0.05$ Wilcoxon).

With lateral oscillation at 0.315 Hz, and at all frequencies greater than 0.4 Hz, subjects experienced greater discomfort when the backrest was present ($p < 0.05$, Wilcoxon).

4.3.5 Effect of magnitude on the frequency-dependence of equivalent comfort contours

The effect of motion magnitude on the level of the comfort contours equivalent to subjective judgements between 63 and 160 arising from exposure to motion in the roll and lateral axes is shown in Figure 4-3. These median contours were calculated from individual subject contours produced using Equation 4-2. The reference condition for these contours is 0.5 Hz, 0.315 m.s^{-2} r.m.s. sinusoidal motion in the same axis as the test motion, so the levels of these contours in one axis should not be compared with those in another axis.

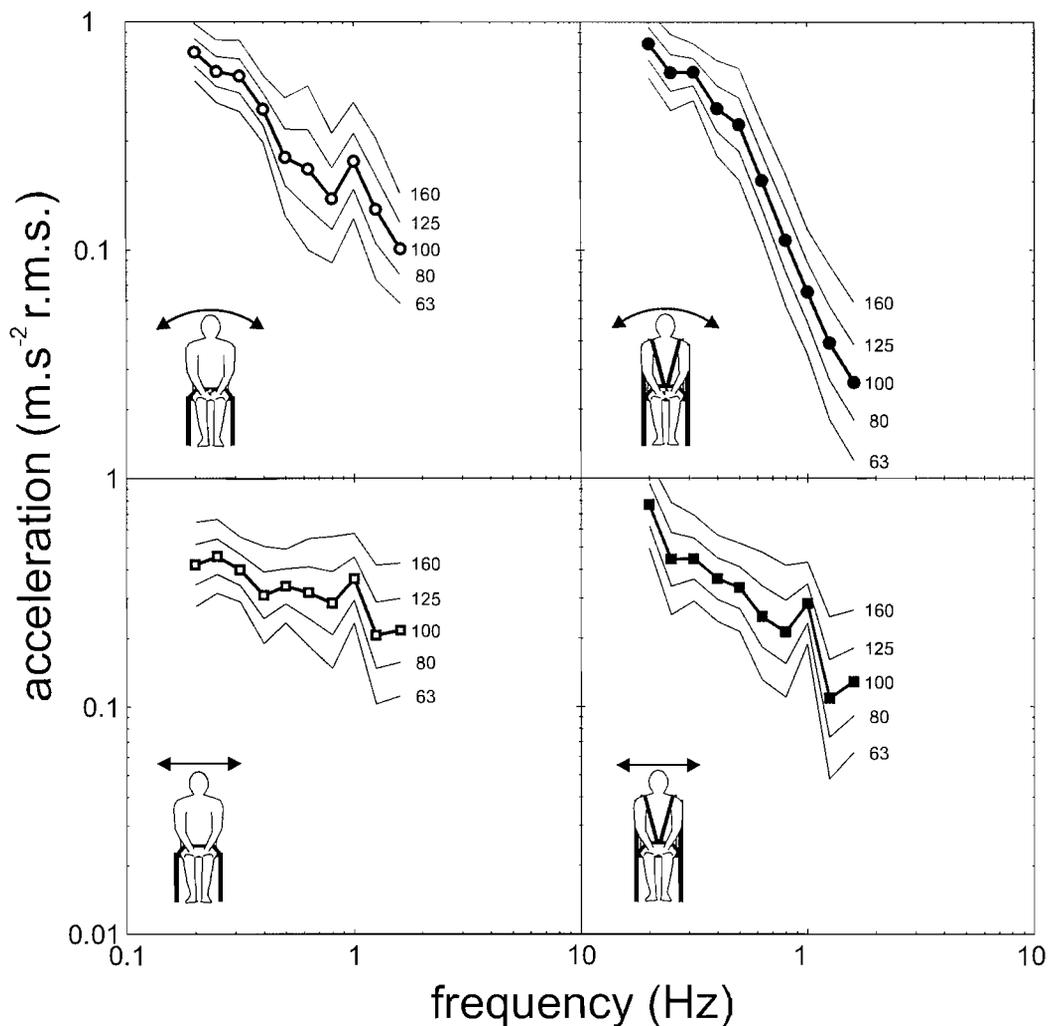


Figure 4-3 The effect of frequency and magnitude on the level of the equivalent comfort contours arising from exposure to oscillation in the roll and lateral axes on both a flat rigid

seat and a rigid seat with a backrest. The 100 contour (bold) represents discomfort equivalent to that caused by 0.5 Hz 0.315 m.s⁻² r.m.s. oscillation in the same axis.

Within the range of stimuli employed in this study, the shapes of the equivalent comfort contours are not greatly affected by the magnitude of the stimuli, although it can be seen that the spread between contours is less where the *n* value is greatest at low frequencies.

4.3.6 Location of discomfort

There were no clear variations in the locations of discomfort with frequency. However there was a higher incidence of subjects reporting discomfort at the head, neck, or shoulders while seated with a backrest than without a backrest (Figure 4-4). This trend reached significance at 1.0 Hz during exposure to roll oscillation ($p < 0.01$, McNemar) and at 0.315 Hz during exposure to lateral oscillation ($p < 0.05$, McNemar).

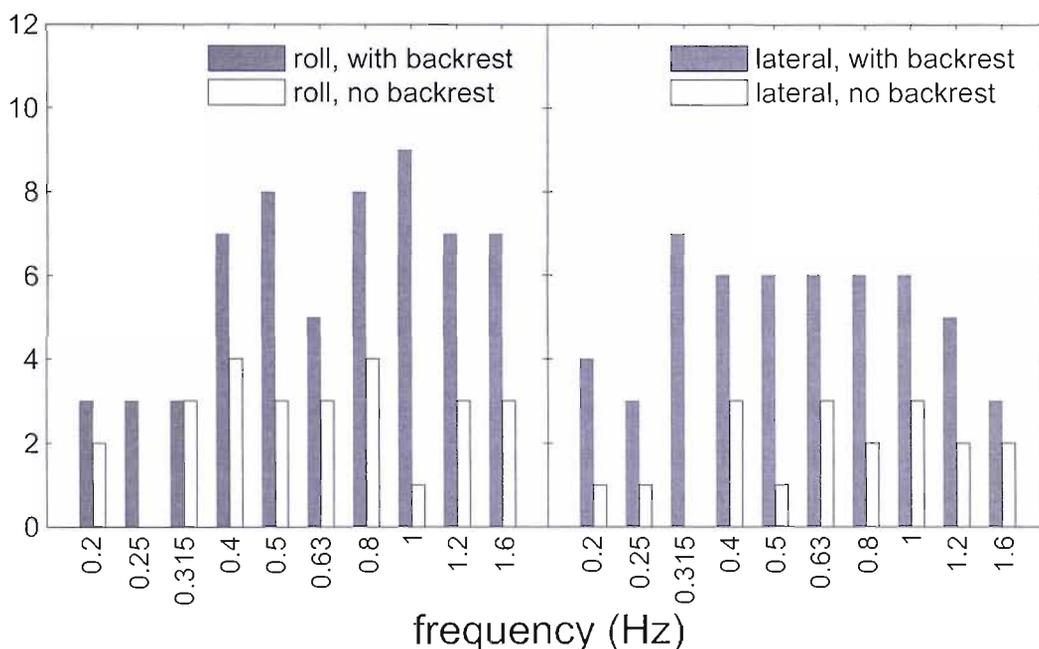


Figure 4-4 Effect of backrest and frequency of oscillation on the incidence of the dominant location of discomfort being at the head, neck or shoulders.

4.4 Discussion

4.4.1 Rate of growth of discomfort caused by lateral and roll oscillation

From a study of low frequency vertical oscillation at frequencies between 0.2 and 1.6 Hz, Shoenberger (1975) reported rates of growth of vibration discomfort between 1.34 and 1.47. In the present study with lateral oscillation, the rates of growth of discomfort are similar, despite the differing axis and seating condition.

A high n value is associated with a greater increment in the subjective magnitude, ψ , for a unit increase in the physical magnitude of the stimulus, ϕ . The results show that a unit increment in the magnitude of oscillation was associated with a greater increment in discomfort at low frequencies than at high frequencies. This means that contours of equivalent discomfort change shape with the magnitude of oscillation, as seen in Figure 4-3. Over a wider range of magnitudes, the change of shape would be greater and it would be seen that a frequency weighting appropriate for low magnitudes would be inappropriate for high magnitudes.

During exposure to vibration at frequencies similar to, and greater than, those studied here, the presence of a backrest changes biodynamic responses of the body, including the lateral apparent mass (Fairley and Griffin, 1990), roll apparent mass (Gunston, 2004), the transmission of lateral vibration from the seat to the head (Paddan and Griffin, 1988a) and the transmission of roll vibration from the seat to the head (Paddan and Griffin, 1994b). Notwithstanding these biodynamic changes, the rate of growth of discomfort was not found to be affected by the backrest in either axis.

The rates of growth in discomfort with vibration magnitude (i.e. the value of n in Stevens' power law) showed a high level of inter-subject variability. At the lowest frequencies, subjects were able to exercise voluntary control of the movement of their upper bodies in response to motion, whereas at the higher frequencies the response may have been more dictated by involuntary muscular activity. The experimental design presented stimuli in a random order of frequency and magnitude, so subjects experienced motions of the same frequency at widely separated points in time. They may have chosen to respond differently to stimuli of the same frequency at different times, although no evidence of a systematic effect could be found in the data. Such variability in their chosen response would reduce correlations between the magnitudes of the motions and the magnitude estimates of discomfort made by subjects.

4.4.2 Relative discomfort between lateral and roll oscillation at 0.2 Hz

The rate of growth of discomfort at 0.2 Hz during exposure in the 'between axes' and the 'within axis' experiments showed little difference other than a marginally significant difference with roll oscillation. The difference might have arisen from the different visual conditions – subjects were exposed to motion in an enclosed cabin in the 'between axes' experiment but blindfolded in the 'within axis' experiment. Allowing subjects to see their motions may have altered their voluntary postural responses to the motions.

The inter-quartile range of n values in the 'within axis' experiments tended to be greater than in the 'between axis' experiments. The stimuli were randomised by frequency and magnitude in the 'within axis' experiment and so this increased variability is consistent with subjects choosing to respond differently on the different occasions they were exposed to the same frequency.

The adjustments required for the four sets of comfort contours so that they represent the same degree of discomfort with both axes and both postures were not large. There is limited knowledge of what constitutes a just noticeable difference at the frequencies of this study. With 5 Hz vertical vibration of seated subjects, Morioka and Griffin (2000) and Forta (2005) have reported difference thresholds of 12.3% and 13.4% respectively. If such changes are required to detect differences in discomfort at 0.2 Hz, it can be argued that the contours obtained in the 'within axis' experiment can be used without the adjustment calculated using the 'between axis' experiment – although this would not have been known without the 'between axis' experiment. The differing frequency-dependence between axes and postures (as evident in Figure 4-2) means that the adjustment would have been large if a reference frequency much greater than 0.2 Hz had been employed in the between axes experiment.

4.4.3 Effect of frequency on discomfort caused by lateral and roll oscillation

At frequencies less than 0.4 Hz, the levels of the 100 comfort contours for lateral and roll oscillation are not the same, but they are very roughly similar (Figure 4-2), indicating that a broadly similar degree of discomfort was caused by acceleration in the plane of the seat irrespective of whether the acceleration arose from lateral oscillation or roll through the gravitational vector. At frequencies greater than about 0.4 Hz, the differences increase and roll oscillation causes greater discomfort than lateral oscillation, with the difference increasing with increasing frequency of oscillation.

Caution over the similarity in response at frequencies less than about 0.4 Hz may be appropriate. In this frequency range, subjects can adopt different strategies and could choose to allow their bodies to move differently with lateral and roll oscillation. It is not yet clear which strategy gives least comfort and persons exposed to these motions may not always find the most comfortable strategy. Furthermore, although similar discomfort was found with the 30-second stimuli used here, differences in muscular activity in response to the two motions may result in other differences in discomfort with longer durations of exposure.

The finding that lateral acceleration in the plane of the seat does not predict discomfort at frequencies greater than 0.4 Hz means that the prediction of discomfort in vehicles where there is significant oscillation at frequencies greater than 0.4 Hz requires knowledge of whether the measured acceleration is caused by translation or caused by rotation through the gravitational vector. Many vehicles have suspensions causing roll oscillation at frequencies in the range 0.4 to 1.6 Hz when excited by undulations of the terrain or track or by changes of direction. The motions are often evaluated considering only the acceleration indicated by accelerometers orientated in the lateral axis of the vehicle, disregarding whether the measured acceleration arises from lateral acceleration or the component of gravity (i.e. $g \cdot \sin\theta$) caused by roll. The results of this study show that, in the frequency range

0.4 to 1.6 Hz, such acceleration is less uncomfortable when it is caused by lateral acceleration than when it is caused by roll.

4.4.4 Effect of backrest

With roll oscillation, the backrest increased discomfort at frequencies greater than about 0.5 Hz (Figure 4-2). With constant acceleration in the plane of the seat (i.e. constant $g \cdot \sin\theta$, due to a constant angle of oscillation), the lateral acceleration at the top of the backrest increases in proportion to the square of the frequency of oscillation, so causing increased discomfort with increasing frequency. Without a backrest, there appeared to be less motion of the upper bodies and heads of subjects.

With low frequency lateral oscillation and no backrest, the motion of the upper body could be seen to lag behind the motion of the platform, suggesting there was a resonance with amplification of body motion and greater discomfort, or voluntary and involuntary back muscle activity producing sensations described as 'discomfort'. However, this varied between subjects. With a backrest and harness, the upper body was held and moved with the backrest, reducing any amplification due to resonance and reducing the opportunity of useful back muscle activity. Although the contours in Figure 4-2 tend to suggest slightly greater discomfort at low frequencies when the backrest was present, this may depend on how a person chooses to 'ride the motion' when there is no backrest.

The present study used two apparently extreme backrest conditions: no backrest and a full height backrest with harness. These two extremes may not represent extremes of the effects of backrests on the discomfort caused by low frequency oscillation. For example, the detrimental effects of a backrest with roll oscillation were partially caused by the lateral acceleration at the top of the backrest, so discomfort will be reduced with a lower backrest. Any beneficial effects of a backrest at low frequencies may therefore be extended towards higher frequencies as the height of a backrest is reduced.

4.4.5 Location of discomfort

At higher frequencies than studied here, the location of discomfort is strongly associated with the frequency of vibration (e.g. (Whitham and Griffin, 1978)). Jang and Griffin (2000) found that variations in the relative motion between the seat and the feet altered the location of discomfort at frequencies close to those used in the present study. It seems probable that at frequencies less than 1.6 Hz, oscillation produces discomfort which is not well localised, and that measures of static comfort may become increasingly important in predicting responses to the environment.

With both lateral and roll oscillation, the presence of a backrest increased the incidence of the dominant location of discomfort being identified at the head-neck interface. It seems that this was because the backrest prevented the torso moving so as to reduce the acceleration reaching the head and neck. Any increased muscular activity in the neck when using a backrest, and any increased muscular activity in the back when not using a backrest, may

have different time-dependent characteristics. These time-dependencies may mean that comfort contours obtained during short exposures may not give a good indication of discomfort experienced during long exposures.

4.4.6 Comparison with previous research

Miwa (1967) reported the frequency-dependence of discomfort caused by lateral vibration on a rigid seat with backrest at frequencies between 0.5 and 300 Hz. At supra threshold levels, sensitivity was independent of frequency at frequencies less than 2 Hz. The results of the present study show discomfort decreasing with decreasing frequency below 1.6 Hz. The difference between these results and those of Miwa (1967) might be due to the short exposures used by Miwa – at 0.5 Hz his subjects were exposed to only 3 cycles of oscillation.

With a minimum frequency of 1.0 Hz and similar magnitudes to those studied here, Rao and Jones (1978) described decreasing sensitivity as the frequency decreased from 2 Hz to 1 Hz when subjects were exposed to oscillation on a seat with no backrest, consistent with the present findings.

Corbridge and Griffin (1986) investigated the discomfort caused by lateral oscillation at frequencies greater than 0.5 Hz using a rigid seat with a backrest. Although the magnitudes of the stimuli were greater than those used in the present study, the overall trends appear similar. When the results of this work are normalised with respect to those of Corbridge and Griffin at 0.8 Hz (the lowest frequency for which they had a complete dataset), the frequency-dependence for discomfort is similar to the present study (Figure 4-5).

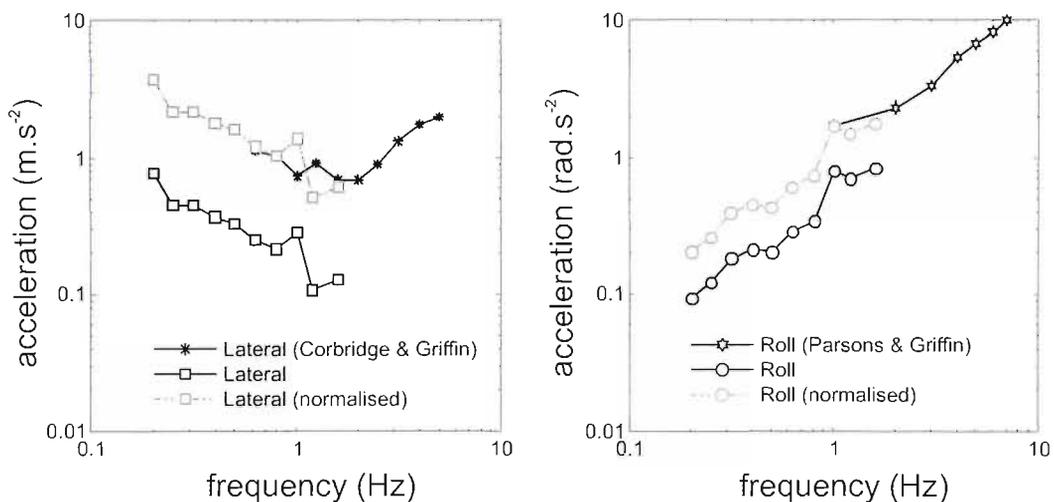


Figure 4-5 Comparison of equivalent comfort contours without backrest with previous studies of lateral oscillation (Corbridge and Griffin, 1986) and roll oscillation (Parsons and Griffin, 1982).

Parsons and Griffin (1982) investigated the discomfort caused by roll vibration at frequencies between 1 and 30 Hz with subjects seated on a flat rigid seat with no backrest. They found that sensitivity to roll acceleration (in $rad.s^{-2}$) increased with decreasing frequency. When the

results of the present study are expressed in terms of angular acceleration, an overall trend for increased sensitivity to roll acceleration at lower frequencies continues to 0.2 Hz, although with some increase in sensitivity between 0.5 and 1.0 Hz (Figure 4-5).

4.4.7 Prediction of discomfort caused by roll oscillation

According to current standards, the discomfort caused by mechanical oscillation in the frequency range 0.5 to 80 Hz can be predicted using frequency weightings for translational and rotational vibration at the seat and from translational vibration at the feet and the backrest (BSI, 1987; Griffin, 1990). The method means that with combined roll and lateral oscillation, seven components can theoretically contribute to discomfort:

- (i) horizontal acceleration in the plane of the seat (weighted by frequency weighting W_d);
- (ii) translational acceleration in the plane of the seat due to roll – i.e. $g.\sin\theta$ (weighted by frequency weighting W_d);
- (iii) roll acceleration in the plane of the seat in rad.s^{-2} (weighted by frequency weighting W_e , with a multiplying factor of 0.63);
- (iv) lateral acceleration at the backrest (weighted by frequency weighting W_d , with a multiplying factor of 0.5);
- (v) translational acceleration at the backrest in the plane of the seat due to roll – i.e. $g.\sin\theta$ (weighted by frequency weighting W_d , with a multiplying factor of 0.5);
- (vi) lateral acceleration at the feet (weighted by frequency weighting W_b , with a multiplying factor of 0.25);
- (vii) translational acceleration at the feet in the plane of the seat due to roll – i.e. $g.\sin\theta$ (weighted by frequency weighting W_b , with a multiplying factor of 0.25);

In practice, many of these components are sufficiently small to be neglected. For example, with high frequencies of vibration the angle of roll is small, so $g.\sin\theta$ is small and the contributions of components (ii), (v) and (vii) are insignificant.

Hitherto, it has been assumed that either the components due to $g.\sin\theta$ are small (as with high frequency vibration) or that the effects are adequately reflected in the combination of this component with the lateral acceleration measured by nominally horizontal accelerometers. The results of the present study allow this assumption to be tested, but only provide definitive information about the relative discomfort of roll and lateral motion when the centre of roll is in the plane of the seat surface. This is not the case in some practical situations.

The four equivalent comfort contours shown in Figure 4-2, correspond to conditions in which there was the same discomfort at all frequencies – hence the root-sums-of-squares (i.e. r.s.s.) summation of weighted components for each of these four conditions should be the same at all frequencies if the standardised weighting method in BS 6841 (1987) is appropriate – at least at frequencies greater than 0.5 Hz where the method is intended to be used. The contours in Figure 4-6 were constructed from the four equivalent comfort contours

in Figure 4-2 (i.e. the motions that produced discomfort equivalent to 0.2 Hz 0.45 ms⁻² r.m.s. lateral oscillation with a rigid seat and backrest) after applying the standardised frequency weightings without the high-pass filter at 0.4 Hz (equivalent to the simple asymptotic weightings shown in Figure 4-7) with the multiplying factors as specified in BS 6841 (1987). The seat lateral acceleration contour in each figure was obtained by weighting the measured contour by W_d . The foot lateral acceleration contours were calculated from the foot lateral acceleration weighted by W_b with a multiplying factor of 0.25. Any roll acceleration at the seat was weighted by W_e with a multiplying factor of 0.63. Where the back was in contact with the backrest, the back lateral acceleration contour was weighted by W_d with a multiplying factor of 0.5, and the tangential acceleration at the top of the backrest due to roll was weighted by W_d with a multiplying factor of 0.5. The tangential acceleration at the feet due to roll was weighted by W_b with a multiplying factor of 0.25. The root-sums-of-squares of the components present (two components with lateral oscillation without a backrest, three with lateral oscillation with backrest, four with roll oscillation without a backrest, and six with roll oscillation with a backrest) were then calculated.

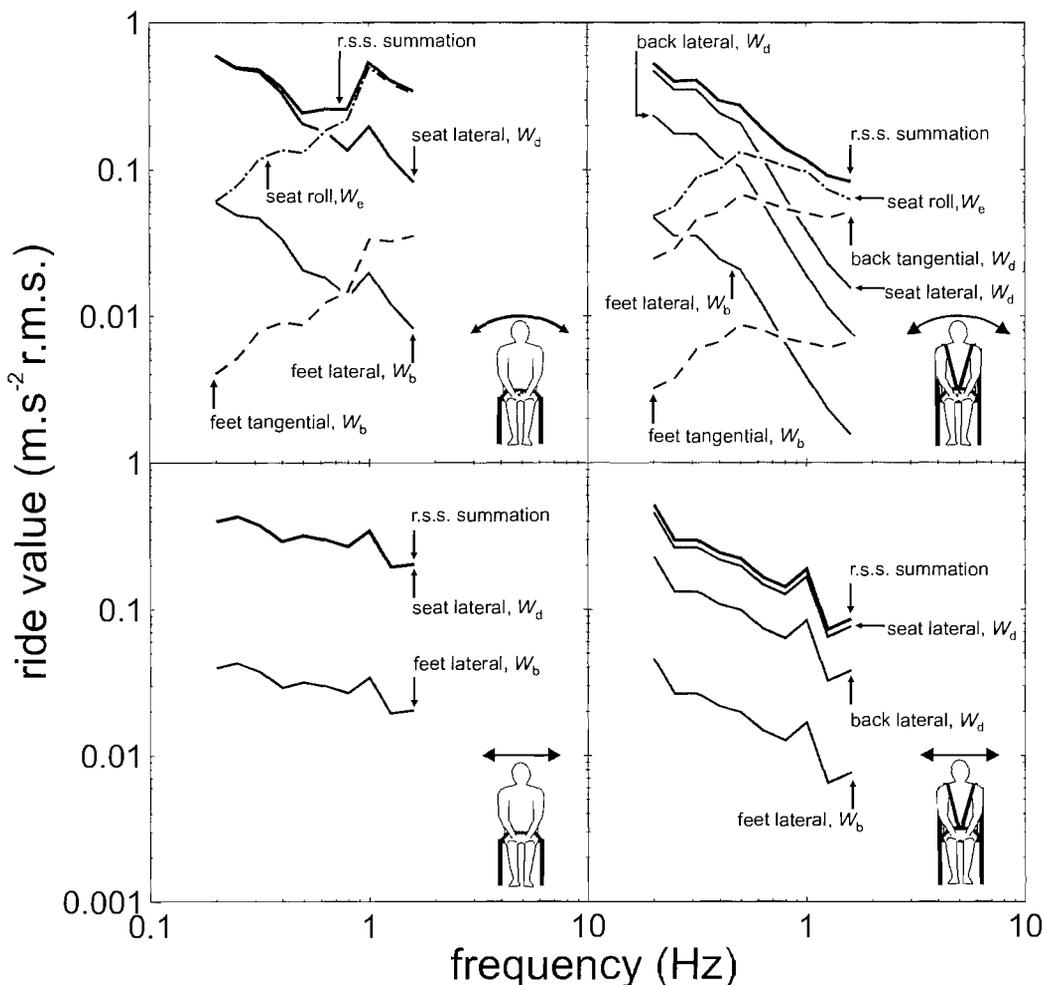


Figure 4-6 Frequency-weighted accelerations corresponding to the adjusted contours generated from the median individual k and n values. (Values calculated using BS 6841 (1987) asymptotic frequency weightings extrapolated below 0.5 Hz without band-pass

filtering. Components of motion shown together with root-sums-of-squares of weighted values in each axis and seating condition.

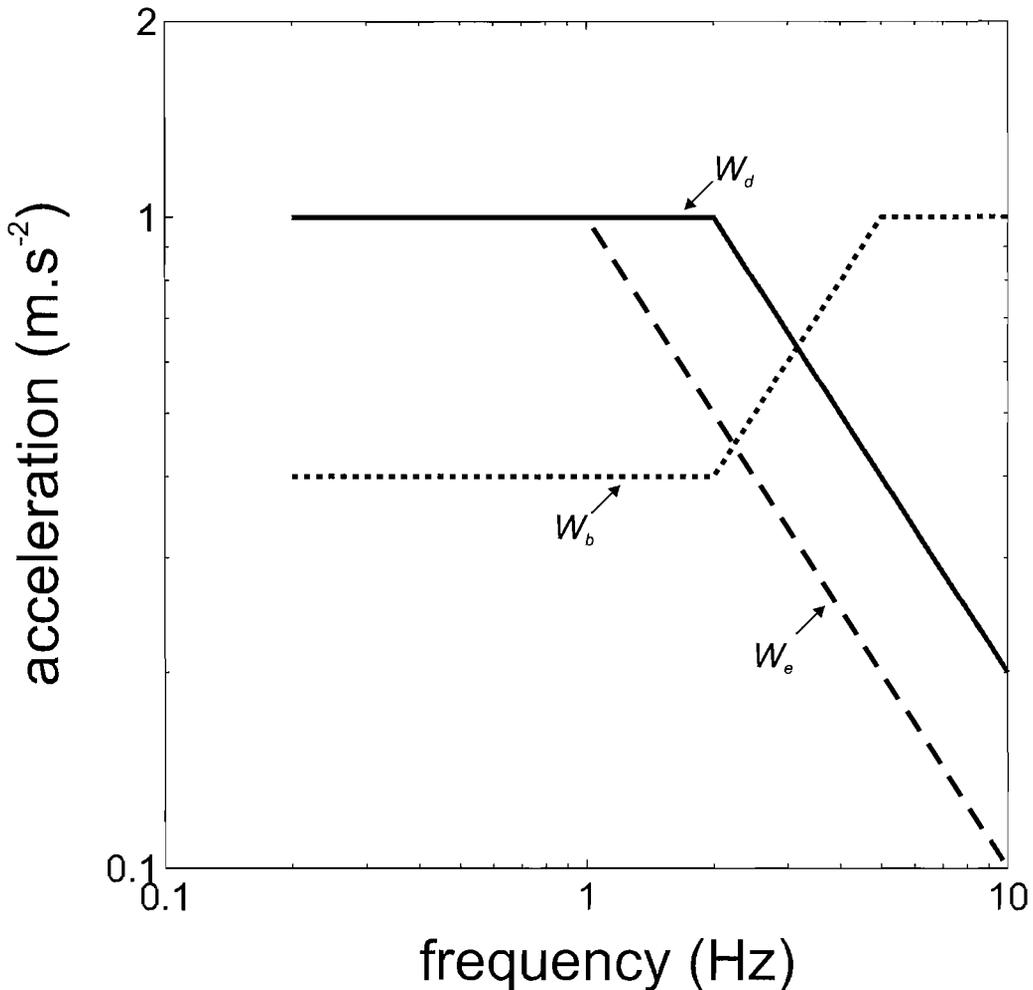


Figure 4-7 Asymptotic frequency weightings according to BS 6841 (1987) extrapolated below 0.5 Hz without band-pass filtering.

The prediction method in BS 6841 (1987) allows for the assessment of discomfort caused by complex motions containing both rotational and translational components using weightings that assume the rotational components are measured in rad.s^{-2} and the translational components are measured in ms^{-2} . After frequency weighting according to the weightings and multiplying factors in the standard, components in any axis (translational or rotational) can be compared and combined such that the overall ride value is appropriately influenced by each component according to its importance.

For lateral oscillation without a backrest, the equivalent comfort contour (i.e. the r.s.s. of the weighted lateral seat and lateral floor accelerations) corresponds to a similar overall ride value at all frequencies from 0.5 to 1.6 Hz, as expected. The slight decrease with increasing frequency suggests that sensitivity to lateral acceleration is slightly less than predicted at the lower frequencies. The main contributor to the overall ride value is the lateral oscillation at the seat, with the motion at the feet contributing little to the discomfort, according to the

standardised method. As predicted, the contour is at about the same level as the reference motion (i.e. 0.2 Hz 0.45 ms⁻² r.m.s. lateral oscillation with a rigid seat and backrest). At frequencies less than about 0.5 Hz, the contour remains at a similar level (whereas when the band-limiting filters at 0.4 Hz are used the contour drops sharply) – suggesting that constant sensitivity to lateral acceleration at frequencies less than 0.5 Hz is a reasonable approximation when there is no backrest.

For lateral oscillation with a backrest, the equivalent comfort contour produced overall ride values that declined from the expected level of 0.45 ms⁻² r.m.s. as frequency increased from 0.2 to 1.6 Hz. So the discomfort caused by the higher frequencies was underestimated. When the 0.4 Hz high-pass filter was used, as advocated in BS 6841 (1987), the contour was at a more similar level from 0.2 to 1 Hz. The main contributor to the overall ride value was the lateral oscillation at the seat, with a small contribution from the backrest and little contribution from motion of the feet.

For roll oscillation without a backrest, the equivalent comfort contour produced an overall ride value that was influenced by different components at different frequencies. From 0.2 Hz to 0.5 Hz the seat lateral acceleration was dominant, whereas at frequencies greater than 0.8 Hz the roll acceleration was dominant. The root-sums-of-squares of all components is roughly constant, at about the level of the reference (i.e. 0.2 Hz 0.45 ms⁻² r.m.s. lateral oscillation with a rigid seat and backrest), but with a slight trough between 0.63 and 0.8 Hz at the transition between dominance by the seat lateral acceleration and dominance by the seat roll acceleration. The two components at the feet contributed little to the root-sums of squares of components.

For roll oscillation with a backrest, the seat lateral acceleration again dominates at low frequencies (less than 0.63 Hz) and the seat roll acceleration dominates at high frequencies (greater than 0.63 Hz). The lateral acceleration at the seat back makes a small contribution at low frequencies whereas the tangential acceleration at the seat back makes a small contribution at high frequencies. There is an overall decline in the root-sums of squares of all the components, indicating that the standardised method underestimated the discomfort caused by the higher frequencies relative to the discomfort caused by the 0.2 Hz reference condition.

Within the range of conditions studied here, with and without a backrest, the standardised methods judge the lateral oscillation at all frequencies based on the lateral acceleration on the seat. Ignoring the high-pass filter at 0.4 Hz, at frequencies less than 0.5 Hz, the standardised methods also judge the roll oscillation based on the lateral acceleration (i.e. the acceleration arising from the angle of roll of the seat – $g \cdot \sin\theta$). At frequencies greater than 0.5 Hz, the roll acceleration is the dominant component, both with and without a backrest.

The standards were evolved from studies with vibration in individual axes, so if one axis dominates they should provide a good prediction. However, this assumes that the weightings for different axes are given the appropriate relative weight and that relative motion between axes, and the phase of any relative motion, does not influence discomfort.

In practice, the relative motion between inputs (e.g. between the seat and the feet) can have a large influence on discomfort (Jang and Griffin, 1999; 2000),.

The overall ride values obtained with roll oscillation are influenced by the W_e frequency weighting, but the W_e weighting has not been well developed at low frequencies. The rotational acceleration weighting, W_e , is independent of frequency at frequencies less than 1.0 Hz. To maintain a constant weighted value of roll acceleration, the angle of roll must increase in inverse proportion to the square of the frequency, requiring angles of roll that increase by 12 dB per octave with decreasing frequency. These increasing angles of roll correspond to similarly increasing magnitudes of lateral acceleration in the plane of the seat (i.e. $g \cdot \sin\theta$) as the frequency decreases. Figure 4-2 shows that lateral acceleration corresponding to conditions giving equivalent comfort produced by roll declined at almost 12 dB per octave between 0.2 and 1.6 Hz when using a backrest but at less than 6 dB per octave when not using a backrest. This indicates that the frequency weighting W_e , if used as the sole indicator of discomfort caused by roll, gives insufficient weight to the low frequencies studied here, especially when there is no backrest, as may be seen in Figure 4-6. However, the contribution of the low frequencies to discomfort may be predicted from the translational acceleration in the plane of the seat caused by the gravity vector.

4.5 Conclusions

At frequencies less than 0.4 Hz, acceleration in the plane of the seat is a useful predictor of discomfort, irrespective of whether the acceleration is caused by lateral oscillation or roll through the gravitational vector. At frequencies greater than 0.5 Hz it is necessary to know whether the acceleration is due to rotation or translation: acceleration in the plane of the seat caused by roll produces greater discomfort than the same acceleration caused by lateral acceleration.

A backrest can increase the discomfort associated with lateral acceleration measured in the plane of the seat. At frequencies greater than about 0.4 Hz, with both lateral oscillation and roll oscillation, a full height backrest with harness increased discomfort, with the discomfort increasing rapidly with increasing frequency of acceleration.

Chapter 5 Pitch and Fore-and-aft oscillation

Short Summary

The objectives of this study were to test whether fore-and-aft acceleration in the plane of the seat was an adequate predictor of vibration discomfort arising from low frequency pitch and fore-and-aft oscillation and to determine the effect of a backrest on discomfort. Twelve male subjects used the method of magnitude estimation to judge the discomfort produced by sinusoidal oscillations in the pitch and fore-and-aft axes at 10 frequencies between 0.2 and 1.6 Hz, while seated with and without a backrest. Results: The rate of growth of discomfort with increasing vibration magnitude decreased with increasing frequency, indicating the frequency-dependence of discomfort is magnitude-dependent. At frequencies greater than 0.63 Hz, fore-and-aft acceleration in the plane of the seat arising from pitch oscillation caused greater discomfort than the same acceleration produced by fore-and-aft oscillation. A backrest increased discomfort with both pitch and fore-and-aft oscillation at most frequencies greater than 0.4 Hz, but decreased discomfort at lower frequencies during fore-and-aft oscillation. The prediction of discomfort caused by low frequency pitch and fore-and-aft oscillation requires that both components are measured and assessed according to their separate effects.

5.1 Introduction

The present investigation was designed to determine how discomfort depends on the frequency of oscillation (at frequencies between 0.2 and 1.6 Hz), the direction of oscillation (pitch and fore-and-aft), and the seating condition (with or without a backrest). It was hypothesised that discomfort would be dependent on the frequency of oscillation and the presence of the backrest, and that the discomfort caused by acceleration in the plane of the seat would depend on whether it was caused by fore-and-aft or pitch oscillation.

Two experiments are reported. A 'between axes' experiment investigated the relative discomfort caused by pitch and fore-and-aft oscillation at 0.2 Hz. A 'within axis' experiment investigated the rate of growth in discomfort with increasing vibration magnitude, the variation in discomfort with the frequency of oscillation (between 0.2 and 1.6 Hz) in both the pitch and the fore-and-aft directions, and the effect of a backrest. In the 'within axis' experiment the principal locations of discomfort in the body were also investigated.

5.2 Method

Both experiments employed a 'within subjects' experimental design and are similar to experiments with lateral and roll oscillation reported separately (Wyllie and Griffin, 2007). Subjects were exposed to a reference motion followed by a test stimulus and asked to judge the discomfort of the test motion relative to the reference motion using the method of magnitude estimation (Stevens, 1975b). The reference motions and all test stimuli were sinusoidal with durations of 30 seconds.

In the 'between axes' experiment, the reference motion was fore-and-aft oscillation at a frequency of 0.2 Hz and a magnitude of 0.45 ms^{-2} r.m.s. with subjects seated on a flat rigid seat with a backrest and harness. The test motions were also at 0.2 Hz but with a magnitude chosen randomly from an array of magnitudes and in either the lateral or the roll axis and both with and without a backrest with harness. This experiment was completed in one session with the order of presentation of conditions balanced.

In the 'within axis' experiment, the reference motion was at a frequency of 0.5 Hz and a magnitude of 0.315 ms^{-2} r.m.s. The test motions had frequencies between 0.2 and 1.6 Hz and were chosen randomly from an array of frequencies and magnitudes. There were four separate sessions, corresponding to motion in both axes (lateral or roll) and both postures (with or without a backrest with harness). The order of sessions was balanced and subjects attended only one session per day. For one magnitude of oscillation at each frequency, subjects indicated verbally the location in their body at which they felt the greatest discomfort. With fore-and-aft oscillation, they judged the location of discomfort with 0.4 m.s^{-2} r.m.s., whereas with pitch oscillation, they judged the location of discomfort with 0.4 ms^{-2} r.m.s. at frequencies between 0.2 and 0.4 Hz, and at magnitudes that decreased in inverse proportion to frequency at greater frequencies.

5.2.1 Stimuli in the 'between axes' experiment

In the 'between axes' experiment there were five 0.2 Hz stimuli with magnitudes in logarithmic series between 0.2 and 1.0 ms^{-2} r.m.s. The simulator reproduced the test stimuli with acceleration distortions less than 8% in the lateral direction and less than 4% in roll. For the lateral motions, the cross-axis acceleration in the vertical direction (i.e. z-axis) was less than 8% of the lateral (y-axis) acceleration.

5.2.2 Stimuli in the 'within axis' experiment

In the 'within axis' experiment there were 10 frequencies, one at each preferred one-third octave centre frequency between 0.2 and 1.6 Hz. With fore-and-aft oscillation, there were 59 pairs of stimuli: six magnitudes in logarithmic series between 0.2 and 0.63 ms^{-2} r.m.s at each frequency, except 0.2 Hz where five magnitudes were used in the range 0.2 to 0.5 ms^{-2} r.m.s. due to simulator displacement limitations.

With pitch oscillation, there were 60 pairs of stimuli: six magnitudes at each frequency between 0.2 and 1.6 Hz. At frequencies between 0.2 and 0.5 Hz, the magnitudes expressed in terms of the equivalent lateral acceleration (i.e. the acceleration given by $g \cdot \sin \theta$, where θ is the angle of pitch) were in a logarithmic series between 0.2 and 0.63 ms^{-2} r.m.s. At frequencies greater than 0.4 Hz, the acceleration magnitudes decreased in inverse proportion to frequency such that at 1.6 Hz the magnitude varied between 0.05 and 0.16 ms^{-2} r.m.s. in a logarithmic series.

Pitch oscillation was reproduced with acceleration distortions of less than 8%. Lateral oscillation was reproduced with unweighted acceleration distortions less 28% and much less than 20% for the majority of stimuli.

Each of the four sessions lasted about 1 hour and included at least one rest period.

5.2.3 Subjects

Twelve male subjects, staff or students of the University aged between 18 and 30 years, participated in both experiments. In the 'between axes' experiment the mean subject mass was 75.6 kg (range 54.5 to 100 kg) and the mean stature was 1782 mm (1690 mm to 1865 mm). In the 'within axis' experiment the mean mass was 71.5 kg (range 54 to 90 kg) and the mean stature 1778 mm (1700 mm to 1860 mm).

5.3 Equipment

5.3.1 Seating

Rigid steel and aluminium alloy seats with flat wooden seat pans and removable backrests were used in the experiments. The height of the seat pan was 420 mm above the simulator platform. When used with a backrest, the height of the top of the backrest was adjusted to the sitting shoulder height of each subject – the backrest was adjustable in 30 mm increments within the 5th to 95th percentile of British male adult sitting shoulder heights (Pheasant, 1996).

For the 'harnessed' condition, subjects sat back in the seat in contact with the backrest and wore a four-point harness. The harness restrained subjects around the waist and above each shoulder. The harness was loosened before each test session and the subjects were instructed to tighten the harness to a 'comfortably tight' setting, adjusting first the waist and then the shoulder restraints. The experimenter assisted the subject where necessary and ensured that the harness was symmetrically adjusted.

5.3.2 Equipment used in the 'between axes' experiment

Oscillatory motion was produced by a simulator capable of 12 m of horizontal motion and $\pm 10^\circ$ of rotation located in the Human Factors Research Unit at the Institute of Sound and Vibration Research. Acceleration was measured using accelerometers operating on the

principle of variable reluctance (Smiths type AV-L-692). Fore-and-aft oscillation was measured with an accelerometer mounted on a non-rotating portion of the chassis immediately below the seat. Pitch oscillation was measured with a similar accelerometer located at the centre of pitch, which passed through the seat reference point in the plane of the seat surface.

5.3.3 Equipment used in the ‘within axis’ experiment

Fore-and-aft oscillation was produced by a 1-metre stroke horizontal hydraulic vibrator in the Human Factors Research Unit at the Institute of Sound and Vibration Research. The acceleration was measured using a capacitive accelerometer (Setra type 141A) mounted on the platform of the vibrator immediately below the seat.

To produce pitch oscillation, the same 1-metre stroke horizontal vibrator was coupled via a crank to a rotational simulator. The axis of rotation was in the plane of the seat surface at the seat reference point and the acceleration arising from tilt through the gravitational vector (i.e. $g \sin \theta$) was measured using a capacitive accelerometer (Setra type 141A) orientated in the fore-and-aft direction and mounted at the centre of rotation.

5.3.4 Signal generation and acquisition

The motion stimuli were generated and monitored using an *HVLab* data acquisition system and software (version 3.81). The drive signals were converted from digital to analogue at 30 samples per second and low pass filtered at 10 Hz. Analogue to digital conversion of the measured acceleration also took place at 30 samples per second after low pass filtering at 10 Hz.

5.3.5 Procedure

Prior to participating in the study, which was approved by the Human Experimentation Safety and Ethics Committee of the Institute of Sound and Vibration Research, subjects were screened using a list of medical contraindications (British Standards Institution, 1973) and instructed in the method of magnitude estimation. Subjects then practiced judging the lengths of lines using the method of magnitude estimation before an experiment commenced.

Subjects were asked to sit in a comfortable upright posture, with their feet shoulder-width apart, and to use the method of magnitude estimation to express the vibration discomfort caused by the test motions relative to the discomfort caused by the reference motion, ignoring any audible noise. The subjects assigned a number that represented the discomfort of the test motion relative to the discomfort of the reference motion, assuming the discomfort caused by the reference motion corresponded to ‘100’.

During both the ‘within axis’ and the ‘between axes’ experiments, subjects wore a blindfold and headphones through which noise at 80 dB(A) was delivered to mask the operating noise of the simulator. The headphones also facilitated communication between the experimenter

and the subject. The experimenter was able to observe subjects at all times, either directly or via a closed circuit television system.

5.4 Results

5.4.1 Rate of growth of discomfort

The magnitudes of the physical stimuli, ϕ (accelerations in the plane of the floor), were related to the magnitudes of the sensations, ψ (magnitude estimates of discomfort), using Stevens' power law (Stevens, 1975b):

$$\psi = k\phi^n \quad \text{Equation 5-1}$$

The rates of growth in discomfort, n , were determined for each subject by regression between the logarithm of the vibration magnitude, ϕ , and the logarithm of the magnitude estimates, ψ :

$$\log_{10} \psi = \log_{10} k + n \log_{10} \phi \quad \text{Equation 5-2}$$

Median rates of growth at each frequency were calculated from the individual slopes, n , and individual intercepts, k (Figure 5-1).

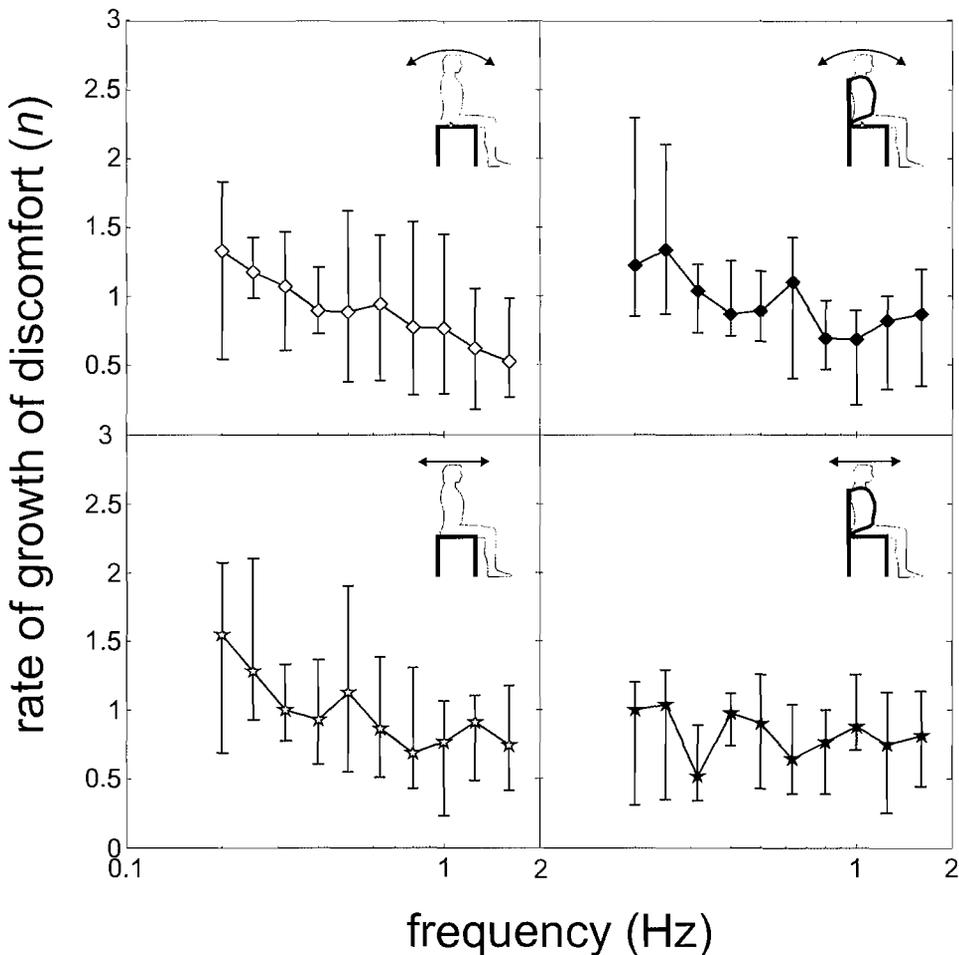


Figure 5-1 Median rates of growth of discomfort, n , for pitch and fore-and-aft oscillation with and without a backrest. Upper and lower error bars show the 75th and 25th percentile rates of growth of discomfort respectively.

With pitch oscillation, the rate of growth of vibration discomfort with increasing vibration magnitude varied significantly with frequency, both with and without the backrest ($p < 0.01$; Friedman). In both cases, analysis of the trend showed that the median rate of growth of discomfort was negatively correlated with increasing frequency ($p < 0.01$; Spearman).

With fore-and-aft oscillation and no backrest, the rate of growth of discomfort varied significantly with frequency ($p = 0.001$; Friedman) and analysis of the trend showed that the median rate of growth of discomfort was negatively correlated with increasing frequency ($p = 0.002$; Spearman). With the backrest, the rate of growth of discomfort did not vary significantly with frequency ($p = 0.295$; Friedman).

The presence of a backrest had no significant effect on the rate of growth of discomfort with pitch oscillation at any frequency ($p > 0.05$ Wilcoxon). With fore-and-aft oscillation the rate of growth of discomfort was significantly lower when subjects were seated with a backrest than when seated without a backrest at 0.25 Hz ($p = 0.034$) and at 0.315 Hz ($p = 0.002$).

The direction of oscillation appeared to affect the rate of growth of discomfort differently according to whether the backrest was present or not. With no backrest, the median rate of growth of discomfort was lower with pitch than with fore-and-aft oscillation at 0.2, 0.25, 0.4, 0.5, 1.0, 1.2, and 1.6 Hz, although the differences did not approach significance at any frequency ($p > 0.05$, Wilcoxon). With the backrest, the median rate of growth of discomfort was greater with pitch than with fore-and-aft oscillation at 0.2, 0.25, 0.315, 0.63, and 0.8 Hz, with the difference significant at only 0.315 Hz ($p = 0.019$) and 0.10 Hz ($p = 0.004$).

The rates of growth in discomfort determined at 0.2 Hz during the 'between axes' experiment and the 'within axes' experiment were not significantly different for either pitch or fore-and-aft oscillation ($p > 0.10$, Mann-Whitney U).

5.4.2 Relative discomfort between pitch and fore-and-aft oscillation

5.4.2.1 The relationship at 0.2 Hz

The magnitudes of 0.2 Hz oscillation required in both axes and with both seating conditions to elicit a discomfort judgment of 100 (i.e. discomfort equivalent to the 0.2 Hz sinusoidal reference motion at 0.45 ms^{-2} r.m.s in the fore-and-aft axis on the rigid seat with backrest) differed significantly ($p = 0.016$; Friedman). In order of increasing sensitivity, the equivalent magnitudes were: fore-and-aft oscillation without backrest (0.31 ms^{-2} r.m.s.), pitch without backrest (0.41 ms^{-2} r.m.s.), fore-and-aft with backrest (0.44 ms^{-2} r.m.s.), and pitch with backrest (0.47 ms^{-2} r.m.s.).

5.4.2.2 Comparing results of the 'within axis' experiment across axes

In the 'within axis' experiment it was necessary to use a different reference motion for each of the four conditions (i.e. both postures with both directions of motion). In the 'between axis' experiment it was found that the reference motion exerted an effect on discomfort that varied between axes and between seating conditions. To adjust the level of the contours obtained in the 'within axis' experiment to allow for the differing sensitivity found at 0.2 Hz in the 'between axis' experiment, a correction factor was calculated for each of the four conditions:

$$C_{Si} = \varphi_{Si} / \varphi_{SR} \quad \text{Equation 5-3}$$

where φ_{is} is the magnitude of a 0.2 Hz oscillation in the 'between axis' experiment that gave discomfort equivalent to fore-and-aft oscillation at 0.2 Hz, with a magnitude of 0.45 ms^{-2} r.m.s. on a rigid seat with backrest, and φ_{SR} is the magnitude of a 0.2 Hz test motion in the 'within axis' experiment that corresponded to a magnitude estimate of 100 when using a 0.5 Hz 0.315 m.s^{-2} r.m.s. sinusoidal reference motion in the same axis and seating condition as the test stimulus.

The correction factors were calculated from the medians of the individual slopes and intercepts. Stevens (1975b) concluded that the n value was independent of the reference condition, so it was assumed that the reference motion had a constant effect at all frequencies and the same 0.2 Hz correction factor was applied at all frequencies.

Five subjects participated in both the 'within axis' and the 'between axis' experiments. Their k and n values were used to calculate individual correction factors. For each of the four conditions, the median correction factor from the 12 subjects lay within the range of the five individual subject correction factors.

To allow statistical comparisons across axes (see below), the individual contours obtained in the 'within axis' experiment were adjusted by the median correction factors obtained in the 'between axis' experiment.

5.4.3 Effect of frequency on discomfort caused by lateral and roll oscillation

Equivalent comfort contours were determined within each axis for each subject by calculating the vibration acceleration, φ , corresponding to each of five subjective magnitudes, ψ , (i.e. 63, 80, 100, 125 and 160) where 100 corresponds to the discomfort produced by 0.315 ms^{-2} r.m.s. at 0.5 Hz in that axis, for each frequency (from 0.2 to 1.6 Hz) using Equation 5-2. Five median equivalent comfort contours were then generated from the medians of the contours of individual subjects and adjusted according to differences between axes as stated above (Equation 5-3). Apart from fore-and-aft oscillation with a backrest, the adjusted contours for a subjective magnitude of 100 were highly dependent on vibration frequency ($p \leq 0.002$, Friedman; Figure 5-2).

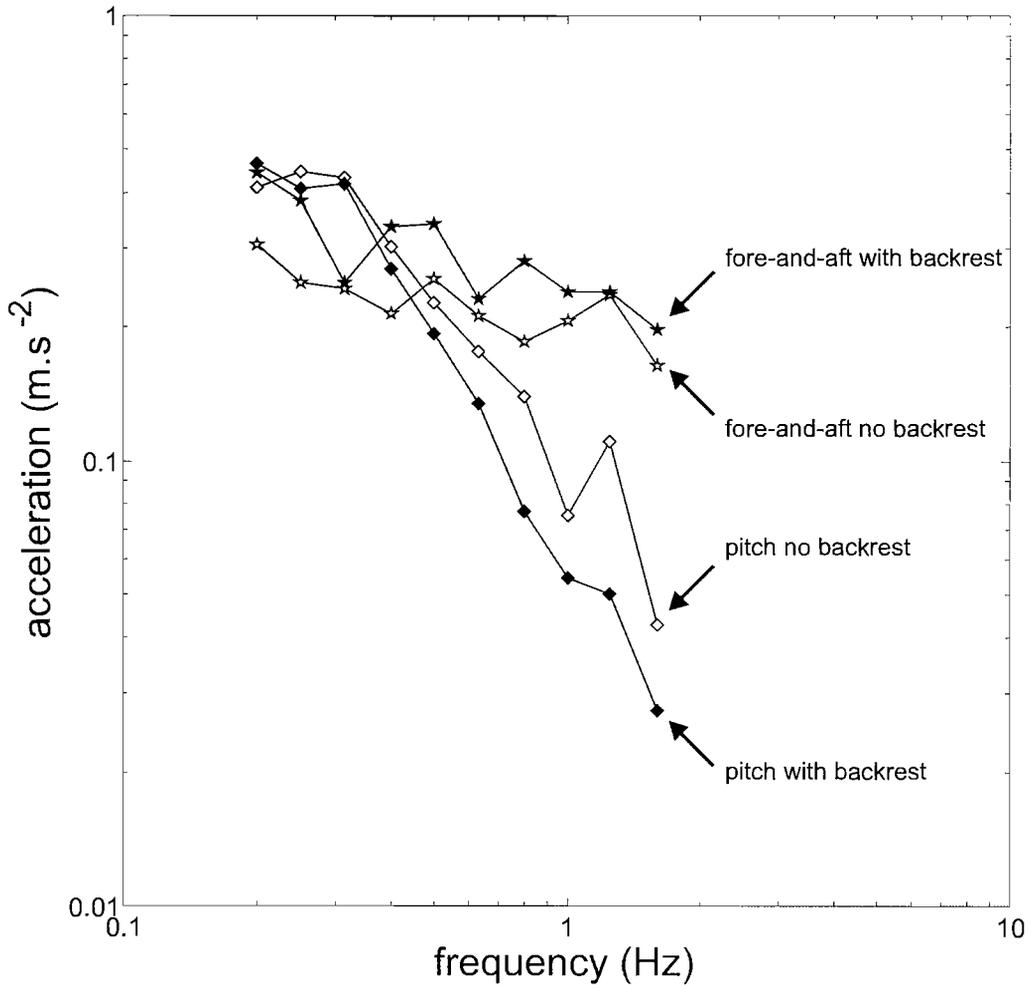


Figure 5-2 Comparison of the level of the adjusted pitch and fore-and-aft contours, each producing discomfort approximately equivalent to that arising from exposure to sinusoidal lateral oscillation on a rigid seat with a backrest at 0.2 Hz, 0.45 m.s⁻² r.m.s.

For pitch oscillation, the level of the 100 comfort contour declines at more than 6 dB per octave between 0.2 and 1.6 Hz, both with and without the backrest.

For fore-and-aft oscillation without the backrest, the level of the 100 comfort contour declines at less 3 dB per octave between 0.2 and 1.6 Hz.

Without the backrest, at frequencies less than 0.4 Hz, the contour corresponding to a subjective judgment of 100 was significantly lower for fore-and-aft oscillation than for pitch oscillation ($p < 0.05$), indicating greater sensitivity to fore-and-aft oscillation than to pitch oscillation.

Without the backrest at 0.8, 1.2, and 1.6 Hz, and with the backrest at frequencies greater than 0.4 Hz, the comfort contours corresponding to a subjective judgment of 100 were significantly lower for pitch oscillation than for fore-and-aft oscillation ($p < 0.05$), indicating greater sensitivity to pitch oscillation.

5.4.4 Effect of backrest

With pitch oscillation, the presence of the backrest reduced discomfort at the lowest frequency (0.2 Hz) ($p < 0.01$ Wilcoxon), while at 0.315 Hz and frequencies greater than 0.63 Hz subjects reported less discomfort when there was no backrest ($p < 0.05$ Wilcoxon). With fore-and-aft oscillation, at frequencies between 0.25 and 1.2 Hz, subjects were significantly less uncomfortable when the backrest was present ($p < 0.05$ Wilcoxon).

5.4.5 Effect of magnitude on the frequency-dependence of equivalent comfort contours

The magnitudes of pitch and fore-and-aft oscillation equivalent to subjective magnitudes between 63 and 160 are shown in Figure 5-3. These median contours were produced using equation 2 from individual subject k and n values. The reference condition for these contours is a 0.315 m.s^{-2} r.m.s. sinusoidal oscillation at 0.5 Hz in the same axis as the test motion, so the levels of these contours in one axis should not be compared with those in another axis. Hz, 0.45 m.s^{-2} r.m.s.

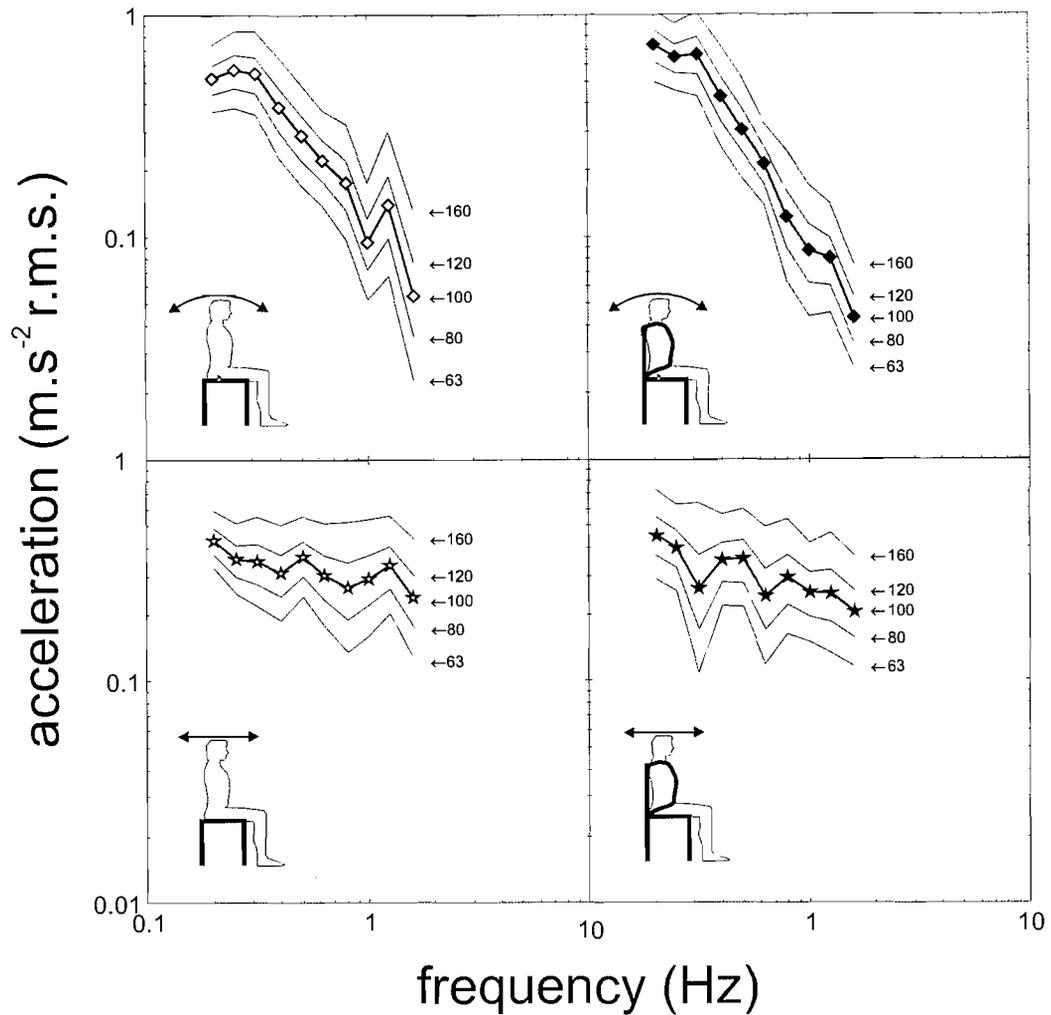


Figure 5-3 The effect of frequency and magnitude on the level of the equivalent comfort contours arising from exposure to oscillation in the roll and lateral axes on both a flat rigid seat and a rigid seat with a backrest. The 100 contour (bold) represents discomfort approximately equal to that caused by exposure to a 0.5 Hz, 0.315 m.s⁻² r.m.s. sinusoid in the same axis. Within the range of stimuli employed in this study, the shapes of the equivalent comfort contours are not greatly affected by the magnitude of the stimuli.

5.4.6 Location of discomfort

There were no clear variations in the locations of discomfort with frequency. However there was a higher incidence of subjects reporting discomfort at the head, neck, or shoulders when seated with the backrest than when seated without the backrest (Figure 5-4). This trend reached significance with pitch oscillation at most frequencies between 0.5 and 1.2 Hz ($p < 0.05$ McNemar) and at 0.25, 0.315, and 1.0 Hz with fore-and-aft oscillation ($p < 0.05$ McNemar).

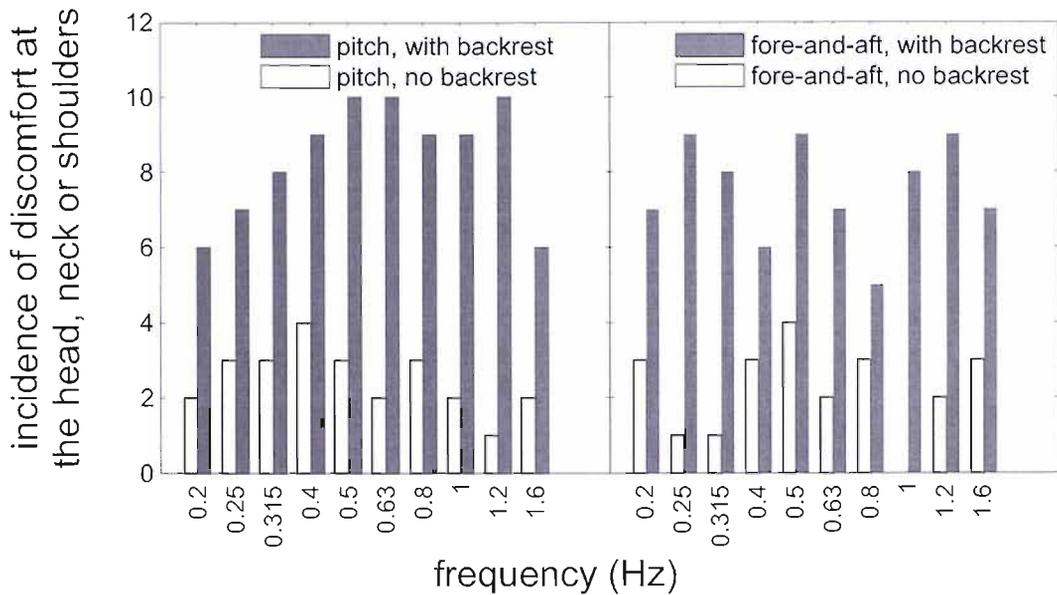


Figure 5-4 The effect of backrest on the incidence of the dominant location of discomfort being at the head neck or shoulders during pitch oscillation (a) and fore-and-aft oscillation (b) [y-axis], with increasing frequency [x-axis]

5.5 Discussion

5.5.1 Rate of growth of discomfort caused by fore-and-aft and pitch oscillation

In a study of low frequency fore-and-aft oscillation at frequencies between 0.5 and 16 Hz, Price (2002) reported rates of growth of discomfort that varied between 1.4 at 0.5 Hz and 1.0 at 1.6 Hz. In the present study the rates of growth of discomfort in the fore-and-aft axis are show a similar trend but at slightly lower levels. The higher rates of growth of discomfort reported by Price (2002) might be a consequence of the much wider range of magnitudes employed in her study.

A high n value is associated with a greater increment in the subjective magnitude, ψ , for a unit increase in the physical magnitude of the stimulus, ϕ . The results show that a unit increment in the magnitude of oscillation was associated with a greater increment in discomfort at low frequencies than at high frequencies. This means that contours of equivalent discomfort change shape with the magnitude of oscillation, as seen in Figure 5-3. Over a wider range of magnitudes, the change of shape would be greater and it would be seen that a frequency weighting appropriate for low magnitudes would be inappropriate for high magnitudes.

The rates of growth in discomfort with increasing vibration magnitude (i.e. the value of n in Stevens' power law) showed a high level of inter-subject variability. At the lowest frequencies, some subjects were able to exercise voluntary control of the movement of their upper bodies in response to the motion, whereas at the higher frequencies the response

may have been influenced by involuntary muscular activity. The experimental design presented stimuli in a random order of frequency and magnitude, so subjects experienced motions of the same frequency at widely separated points in time. They may have chosen to respond differently to stimuli of the same frequency at different times, although no evidence of a systematic effect could be found in the data. Such variability in their chosen response would reduce correlations between the magnitudes of the motions and the magnitude estimates of discomfort made by subjects.

5.5.2 Relative discomfort between fore-and-aft and pitch oscillation at 0.2 Hz

There were no significant differences between the rates of growth of discomfort at 0.2 Hz in the 'between axes' and the 'within axes' experiments.

The inter-quartile range of n values in the 'within axis' experiments was greater than in the 'between axis' experiments. The stimuli were randomised by frequency and magnitude in the 'within axis' experiment, so the increased variability is consistent with subjects choosing to respond differently on the different occasions they were exposed to the same frequency. This indicates that the differences in acceleration equivalent to a subjective judgement of 100 at 0.2 Hz may be considered to be a consequence of the differing reference conditions in the 'between axes' and the 'within axes' experiments.

The adjustments required to the four sets of 'within axes' contours to allow for the differences in sensitivity found in the 'between axes' experiment were in some cases considerable: (pitch without backrest: 0.7912; pitch with backrest: 0.6339; fore-and-aft without backrest: 0.7067; fore-and-aft with backrest 0.9665). There is limited knowledge of what comprises a just noticeable difference at the frequencies in this study. Morioka and Griffin (1999) and Forta (2005) have reported difference thresholds of 12.3% and 13.4% for seated subjects exposed to 5 Hz vertical vibration. If such changes are required to detect differences in discomfort at 0.2 Hz, the contours from the 'within axes' experiment could not be used without the adjustment calculated from the results of the 'between axes' experiment. The differing frequency-dependence between axes and postures (as evident in Figure 5-2) means that the adjustment would have been greater if a reference frequency much greater than 0.2 Hz had been employed in the 'between axes' experiment

Effect of frequency on discomfort caused by fore-and-aft and pitch oscillation

At frequencies less than 0.4 Hz, the levels of the comfort contours for pitch and fore-and-aft oscillation on a seat with a backrest are not the same, but they indicate that, very approximately, a similar level of discomfort arose irrespective of whether the acceleration in the plane of the seat arose from pitch or fore-and-aft oscillation. However, with no backrest, acceleration in the plane of the seat caused by pitch oscillation caused greater discomfort than acceleration caused by fore-and-aft oscillation. This may reflect difficulty maintaining stability during excursions of the centre of mass of the upper body with respect to the ischial tuberosities, particularly as the body was rotated backwards. The difference between the

findings of this study and those of Wyllie and Griffin (2007) where low frequency roll and lateral oscillation caused similar discomfort on a flat rigid seat with and without a backrest, might be explained by the geometrical differences between the base of support during roll (or lateral) oscillation and pitch (or fore-and-aft) oscillation. During roll (or lateral) oscillation the centre of pressure can move between the ischial tuberosities without instability requiring muscular effort resulting. During pitch (or fore-and-aft) oscillation, in order to maintain stability muscular effort or a reaction force at the feet is required, even with small accelerations. The presence of a backrest may be helpful. In the absence of a backrest, the difference between fore-and-aft and pitch oscillation may have arisen because stability can be provided by exerting pressure at the feet, but this is more difficult when the footrest moves vertically due during pitch oscillation. It was observed that when subjects were seated without the backrest their posture was under some degree of voluntary control, especially at frequencies less than about 0.4 Hz. Different response strategies (e.g. riding in-phase or out-of-phase with the seat) may cause different discomfort and all subjects may not have found the most comfortable strategy. Furthermore, the different postures may be differently affected by fatigue, and the discomfort experienced during a short period of oscillation may not be a good predictor of discomfort arising from longer exposures.

5.5.3 Effect of backrest

With pitch oscillation, the backrest increased discomfort at frequencies greater than about 0.5 Hz (Figure 5-2). With constant acceleration in the plane of the seat (i.e. constant $g \cdot \sin\theta$, due to a constant angle of oscillation), the fore-and-aft acceleration at the top of the backrest increases in proportion to the square of the frequency of oscillation, so causing increased discomfort with increasing frequency. Without a backrest, there appeared to be less motion of the upper bodies and heads of subjects.

With fore-and-aft oscillation and no backrest, the motion of the head and upper body appeared to lag behind the oscillation of the seat. If subjects had sat perfectly upright this lag would have increased the probability that their centre of pressure moved behind the ischial tuberosities with potentially undesirable implications for their stability. Observation showed that subjects' posture tended to be slightly kyphotic during fore-and-aft oscillation presumably to mitigate this risk. The presence of a backrest reduced discomfort at frequencies above 0.25 Hz. This was probably because the backrest reduced the instability due to the displacement of the centre of mass of the upper body, and thus the discomfort caused by its motion relative to the seat. This study employed seating conditions which are apparent extremes, but it is conceivable that in these axes they do not represent the extremes of discomfort, since the presence of a harness removes the possibility of loss of contact with the backrest and subsequent high acceleration impacts.

5.5.4 The rate of growth of discomfort

There was high inter-subject variability in the rates of growth of discomfort (i.e. the n value in Stevens' power law). At the lowest frequencies it appears that subjects were able to exercise a considerable degree of voluntary control over their posture, whereas at the highest frequencies their responses were more dictated by involuntary muscular activity. The randomisation of stimuli by frequency and magnitude meant that subjects were exposed to stimuli of the same frequency at widely separated points in time and it is possible that they may have chosen to respond differently at different times. However, no evidence of a systematic effect could be found in the data. Such variability would reduce correlations between the magnitude of the motions and the magnitude estimates of discomfort made by subjects.

5.5.5 Location of discomfort

At higher frequencies than studied here, the location of discomfort during exposure to whole-body vibration is highly frequency-dependent – varying between the ischial tuberosities and the head according to the direction and frequency of the vibration (Whitham and Griffin, 1978). During vertical oscillation, movement between the seat and the feet contributes to a frequency-dependent discomfort which is evident in the localisation of discomfort (Jang and Griffin, 2000). A similar effect has been found with fore-and-aft oscillation when there is differential vibration at the seat, feet and back at frequencies between 0.5 and 16 Hz (Price, Morioka *et al.*, 2006). The present study found that discomfort caused by frequencies less than 1.6 Hz did not show a clear frequency-dependence, although the presence of a backrest strongly influenced the location of discomfort (Figure 5-4). This presumably arose because the backrest reduced the opportunity for subjects to minimise the acceleration at the head.

5.5.6 Comparison with previous research

Parsons and Griffin (1982) investigated the discomfort caused by roll vibration at frequencies between 1 and 30 Hz with subjects seated on a flat rigid seat with no backrest. They found that as the frequency decreased the sensitivity to pitch acceleration (in rad.s^{-2}) increased. When the results of the present study are expressed in terms of angular acceleration, an overall trend for increased sensitivity to roll acceleration at lower frequencies continues at a similar rate down to 0.2 Hz (Figure 5-5).

Price (2002) reported that the rate of growth of vibration discomfort (the n value in Stevens' power law) declined from around 1.4 at 0.5 Hz to about 0.7 at 1.0 Hz when subjects were seated on a flat rigid seat with a footrest that moved in phase with the seat. The trends in the n values were compatible with those determined in the present study. Price (2002) reported higher median n values than this study, possibly because of the difference in the range of

magnitudes studied. The shapes of the equivalent comfort contours reported by Price (2002) are similar to those from the present study (Figure 5-5).

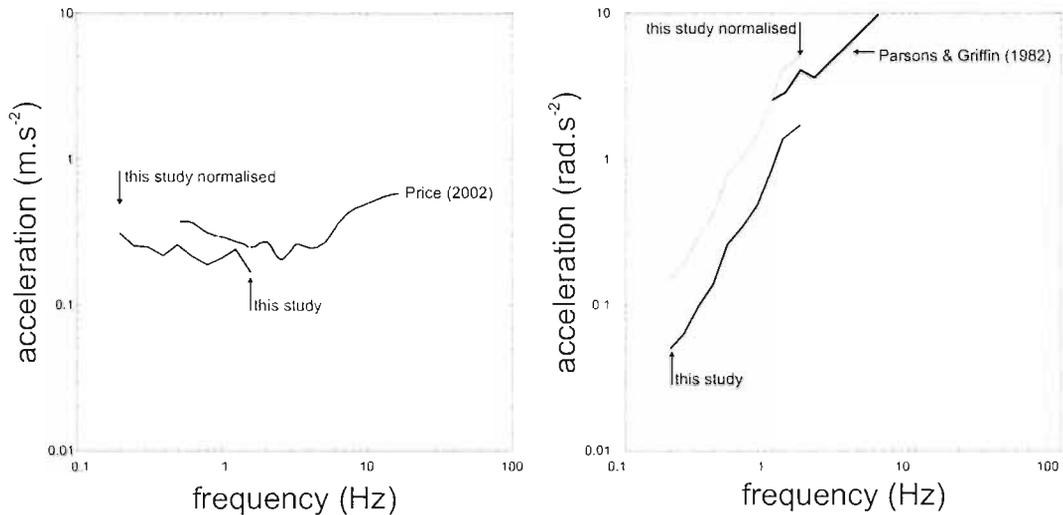


Figure 5-5 Comparison of fore-and-aft data from Price (2002) and pitch data from Parsons and Griffin (1982) with the contours determined in this study.

5.5.7 Prediction of discomfort caused by pitch oscillation

According to current standards, the discomfort caused by mechanical oscillation in the frequency range 0.5 to 80 Hz can be predicted using frequency weightings for translational and rotational vibration at the seat and from translational vibration at the feet and the backrest (BSI, 1987; Griffin, 1990). The method means that with combined pitch and fore-aft oscillation, seven components can theoretically contribute to discomfort:

- (i) horizontal acceleration in the plane of the seat (weighted by frequency weighting W_d);
- (ii) translational acceleration in the plane of the seat due to pitch – i.e. $g \sin\theta$ (weighted by frequency weighting W_d);
- (iii) pitch acceleration in the plane of the seat in rad.s^{-2} (weighted by frequency weighting W_e , with a multiplying factor of 0.4);
- (iv) fore-and-aft acceleration at the backrest (weighted by frequency weighting W_c , with a multiplying factor of 0.8);
- (v) translational acceleration at the backrest in the plane of the seat - i.e., $g \sin\theta$ (weighted by frequency weighting W_c , with a multiplying factor of 0.8);
- (vi) fore-and-aft acceleration at the feet (weighted by frequency weighting W_b , with a multiplying factor of 0.25);
- (vii) translational acceleration at the feet in the plane of the seat - i.e., $g \sin\theta$ (weighted by frequency weighting W_b , with a multiplying factor of 0.25);

In practice, many of these components are sufficiently small to be neglected. For example, with high frequencies of vibration the angle of pitch is small so $g \sin\theta$ is small and the contribution of components (ii), (v) and (vii) is insignificant.

Hitherto, it has been assumed that either the components due to $g \sin\theta$ are small (as with high frequency vibration) or that the effects are adequately reflected in the combination of this component with the lateral acceleration measured by nominally horizontal accelerometers. The results of the present study allow the assumption to be tested.

The four equivalent comfort contours shown in Figure 5-2, correspond to conditions in which there was the same discomfort at all frequencies – hence the root-sums-of-squares (i.e. r.s.s.) summation of weighted components for each of these four conditions should be the same if the standardised weighting method is appropriate – at least at frequencies greater than 0.5 Hz where it is intended to be used. Figure 5-6 shows the various components to which subjects were exposed in the four conditions, weighted as suggested in BS6841 (1987), together with the root-sums-of-squares of these weighted components so as to produce an 'overall ride value'.

The prediction method in BS 6841 (1987) allows for the assessment of discomfort caused by complex motions containing both rotational and translational components using weightings that assume the rotational components are measured in rad.s^{-2} and the translational components are measured in ms^{-2} . In principle, after frequency weighting according to the weightings and multiplying factors in the standard, components in any axis (translational or rotational) can be compared and combined (using root-sums-of-squares summation) such that the 'overall ride value' is appropriately influenced by each component according to its importance.

It may be seen in Figure 5-6 that for fore-and-aft oscillation without a backrest, the equivalent comfort contour (i.e. the r.s.s. of the weighted fore-and-aft seat and lateral floor accelerations) corresponds to a similar overall ride value at all frequencies from 0.5 Hz to 1.6 Hz, as expected. The main contributor to the overall ride value is the fore-and-aft acceleration at the seat, with acceleration at the feet making a negligible contribution using the standardised method. However, the r.s.s. of the weighted contours appears to have underestimated the subject's sensitivity as the contour level is somewhat below the level of the reference motion (0.2 Hz, 0.45 ms^{-2} r.m.s. in the fore-and-aft axis).

For fore-and-aft oscillation on a seat with a backrest, the r.s.s. summation of the weighted components produced values which declined from close to the predicted value (0.45 ms^{-2} r.m.s.) as the frequency increased from 0.2 to 1.6 Hz. This implies that the discomfort caused by the higher frequencies was underestimated by the weightings. The principal contribution to the r.s.s was the fore-and-aft oscillation at the seat, with a high contribution from the backrest and a negligible contribution from the oscillation of the feet.

For pitch oscillation with no backrest, the seat fore-and-aft acceleration is the dominant term in the r.s.s summation at frequencies less than 0.5 Hz. At greater frequencies, the summation is dominated by the seat pitch component. The root-sum-of-squares of all

components is variable but, overall, decreases with increasing frequency. The level at 0.2 to 0.315 Hz is only slightly below the reference condition (0.45 ms^{-2} r.m.s.) but at greater frequencies the reduction indicates that discomfort was underestimated by the standard method.

For pitch oscillation on a seat with a backrest the seat fore-and-aft acceleration remains the dominant term between 0.2 and 0.315 Hz. According to the standard method, the response at frequencies greater than 1.0 Hz is dominated by the backrest tangential term. The r.s.s. of the weighted components is at approximately the correct level (0.45 ms^{-2} r.m.s.) at the three lowest frequencies, but declines indicating underestimation of discomfort by the standard method.

The standards were evolved from studies with vibration in individual axes, so if one axis dominates they should provide a good prediction. However, this assumes that the weightings for different axes are given the appropriate relative weight and that relative motion between axes, and the phase of any relative motion, does not influence discomfort. In practice the relative motion between inputs (e.g. between the seat and the feet) can have a large influence on discomfort (Jang and Griffin, 1999; 2000). In this case, even though seat and feet moved in phase with one another relative motion may still be an important variable since, particularly at the lowest frequencies, there was opportunity for voluntary control over the movement of the upper body, and the relative motion between the seat and upper torso may have been important factors in producing discomfort.

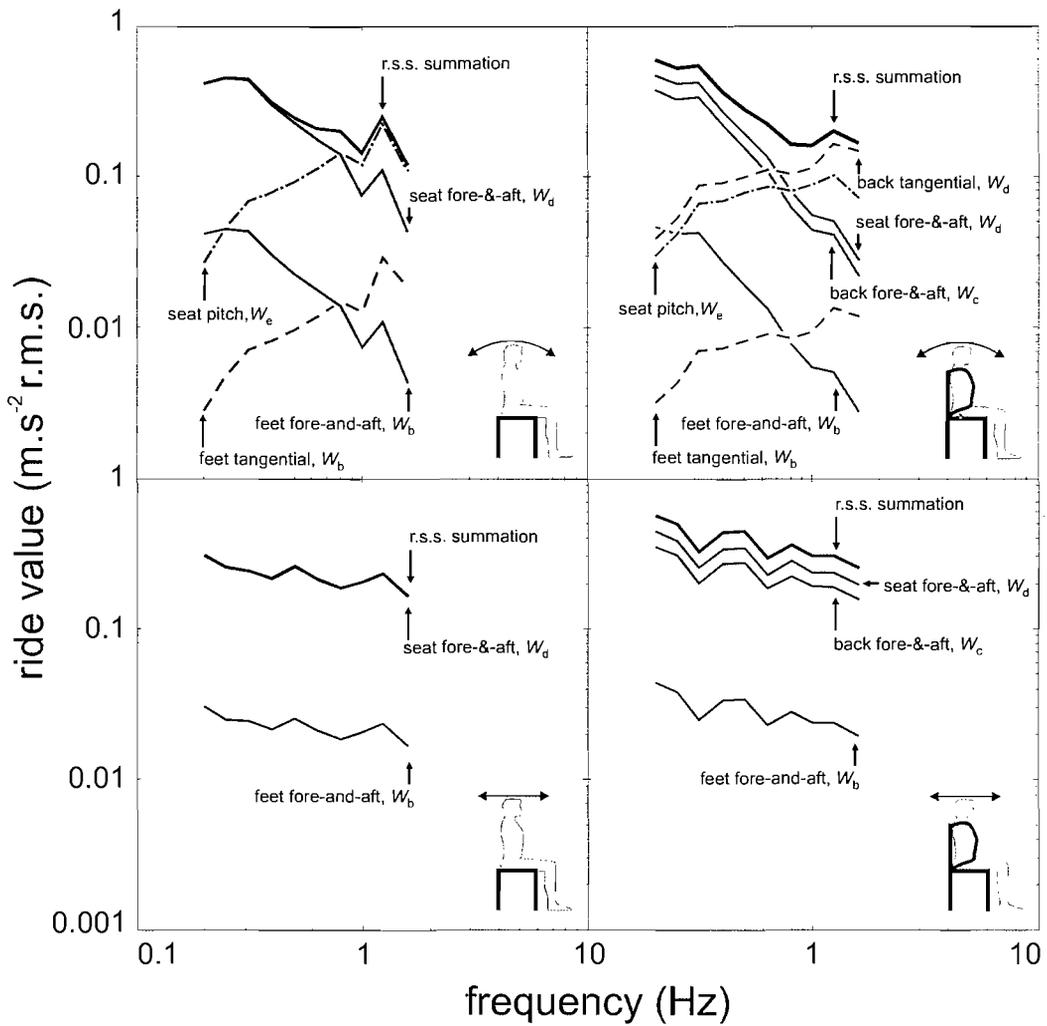


Figure 5-6 Weightings of the adjusted contours generated from the median of individual k and n values. BS641 realisable weightings with bandpass filters of components of motion shown together with r.s.s. summation of weighted values in each axis and seating condition.

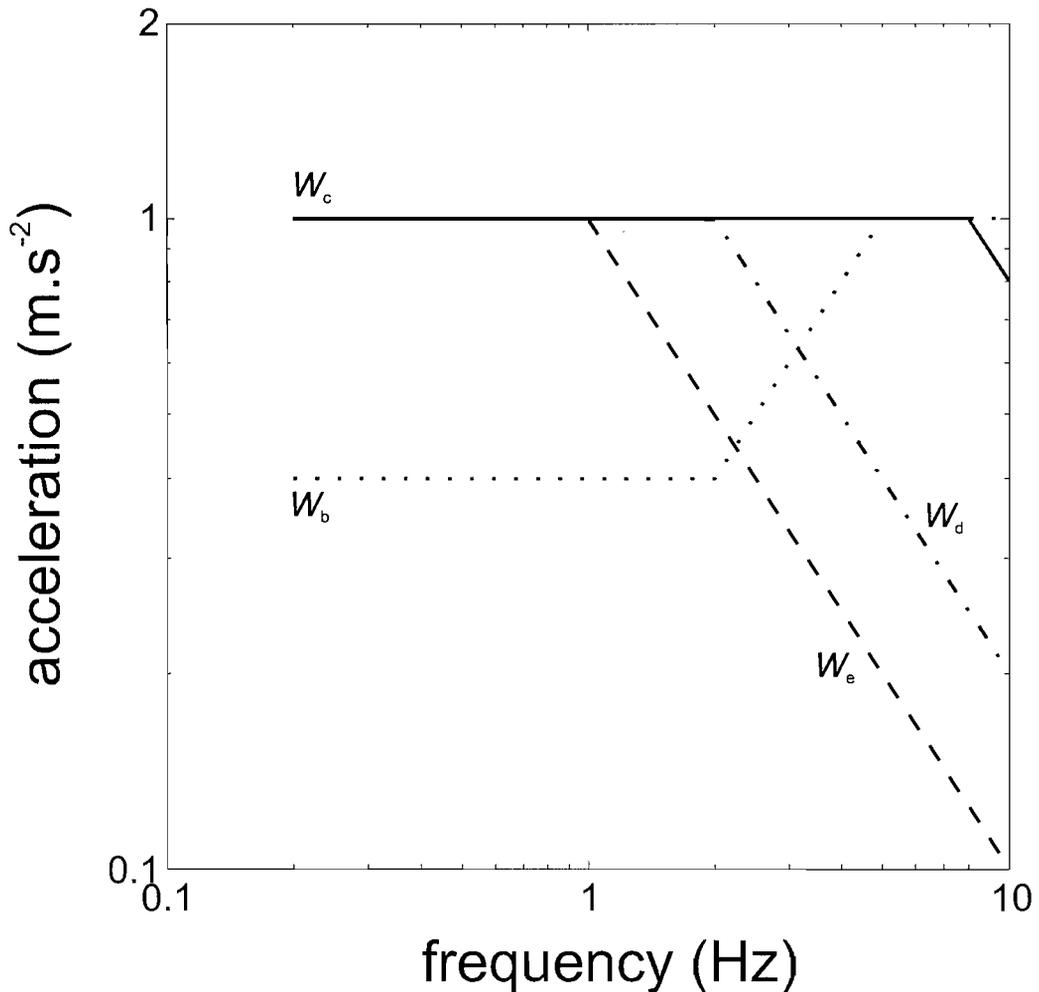


Figure 5-7 Weightings of the adjusted contours generated from the median of individual k and n values. BS641 weightings (flat below 0.5 Hz as recommended by ISVR TM808 of components of motion shown together with r.s.s. summation of weighted values in each axis and seating condition.

The finding that fore-and-aft acceleration in the plane of the seat is not a reliable predictor of discomfort has implications for the prediction of discomfort in vehicles and vessels. Where there is significant oscillation at frequencies similar to those in this study it will be necessary to determine what proportion of the fore-and-aft acceleration in the plane of the seat is due to pitch oscillation and what is due to fore-and-aft oscillation.

5.6 Conclusions

At frequencies less than 0.4 Hz acceleration in the plane of the seat may be used to predict the discomfort arising from pitch and fore-and-aft oscillation on a flat rigid seat with no backrest, irrespective of whether the source of the oscillation is rotation or translation. At frequencies greater than 0.5 Hz prediction of discomfort requires knowledge of the

underlying cause of the oscillation: acceleration in the plane of the seat arising from pitch motion produced greater discomfort than the same acceleration arising from fore-and-aft oscillation.

Chapter 6 Effect of posture on discomfort caused by low frequency roll and oscillation

Short summary

The effect of posture on the discomfort arising from exposure to whole-body vibration is seldom reported. Much current knowledge is based on studies during which subjects sat 'comfortably upright' on a flat rigid seat. During low frequency rotational oscillation, two interpretations of these instructions are possible: either subjects minimise their head motion in earth-referenced co-ordinates or they try to move with the seat in seat-referenced co-ordinates. It was hypothesised that minimising head motion in earth-referenced co-ordinates would minimise the discomfort reported by subjects. Twelve subjects seated without backrest were exposed to sinusoidal roll and pitch oscillation at frequencies between 0.2 and 1.6 Hz at magnitudes determined in previous work to produce approximately equal discomfort. The subjects exhibited only limited ability to move in phase with the seat, but during pitch oscillation, and to a lesser extent roll oscillation, they were able to maintain their upper-bodies in an earth-vertical posture. There was some evidence that posture affected the frequency-dependence of discomfort, particularly during pitch oscillation.

6.1 Introduction

The prediction of vibration discomfort in moving environments has traditionally been based on experimentally determined relationships between physical variables (e.g. magnitude, frequency, and direction of vibration) and the associated perceptual response. In current standards these relationships are represented by 'weightings' for each factor. The relative importance of each factor is conventionally determined in systematic laboratory investigations. The accuracy of the procedures for predicting discomfort depends on the appropriateness of the weightings determined in such experiments.

The approach to predicting whole-body vibration discomfort was largely developed from information relating the physical and perceptual magnitudes of vibration at frequencies greater than 1 Hz, where response to the typical instructions 'sit comfortably upright' was relatively homogenous. However, during exposure to low frequency roll or pitch oscillation the interpretation of the instructions 'sit comfortably upright' depends upon the referenced co-ordinates assumed by a subject. There are broadly two methods of interpreting the instruction. Sitting in seat-referenced co-ordinates should result in subjects trying to move with the seat so that their bodies remain approximately perpendicular to the supporting seat surface, whereas keeping the head still should result in subjects remaining vertical in earth-

referenced co-ordinates. It is not clear how much control seated subjects have on their posture during low frequency oscillation and whether variations in the interpretation of their instructions in previous studies (e.g. Parsons and Griffin (1982)) could have affected estimates of their discomfort.

The main objective of this study was to investigate the effect of posture on the frequency-dependence of discomfort during roll and pitch oscillation at frequencies between 0.2 and 1.6 Hz. To establish whether any frequency-dependent effect of posture could be attributed to variations in body movement, the shoulder position of subjects was monitored continuously during oscillation (an objective measure of performance). As a secondary objective, the effect of posture on the rate of growth of discomfort with increasing magnitude of oscillation was investigated at two frequencies, 0.2 and 0.5 Hz. Together, these objectives permitted an assessment of the degree to which the posture of subjects may have influenced previous investigations of the effects of the frequency and magnitude of roll and pitch oscillation on discomfort (Chapter 4 and Chapter 5).

6.2 Method

The experiment employed a 'within subjects' experimental design. They attended two sessions on different days during which they were exposed to either roll or pitch oscillation, with the order of sessions balanced over subjects.

Subjects were exposed to a reference stimulus followed by a test stimulus and asked to judge the discomfort of the test motion relative to the reference motion using the method of magnitude estimation (Stevens, 1975b). The reference motion was at a frequency of 0.5 Hz and a magnitude of 0.315 ms^{-2} r.m.s. and in the same axis as the test motion (either roll or pitch). The test motions had frequencies between 0.2 and 1.6 Hz and were presented in a random order from an array of frequencies and magnitudes. The reference motions and all test motions were sinusoidal with durations of 30 seconds.

During exposure to the reference motion the subjects were asked to sit with their 'head still' – minimising their head motion in earth-reference co-ordinates.

6.2.1 Stimuli

There were ten frequencies of sinusoidal oscillation, one at each preferred one-third octave centre frequency between 0.2 and 1.6 Hz. The magnitudes of oscillation are expressed in terms of the 'equivalent lateral acceleration' (i.e. the acceleration given by $g \cdot \sin \theta$, where θ is the angle of roll). At 0.25 and 0.5 Hz there were six vibration magnitudes in logarithmic series between 0.16 and 0.5 ms^{-2} r.m.s. At all other frequencies there was one magnitude of oscillation. The equivalent lateral acceleration was 0.5 ms^{-2} r.m.s. at frequencies between 0.2 and 0.315 Hz, 0.4 ms^{-2} r.m.s. at 0.4 Hz, and then decreased in inverse proportion to frequency at frequencies greater than 0.5 Hz such that at 0.63 Hz the acceleration was 0.25

ms^{-2} r.m.s. and at 1.6 Hz the acceleration was 0.1 ms^{-2} r.m.s. The rotational oscillation was reproduced with unweighted distortions of the equivalent lateral acceleration less than 8%.

6.2.2 Postures

The experiment investigated two postures in which subjects attempted to minimise their head and upper-body motion in either earth-referenced or seat-referenced co-ordinates. For clarity during the experiment these were called 'head still' and 'move with' postures, respectively. Perfectly executed, the 'head still' posture resulted in the subject allowing the seat to roll or pitch under their pelvis, while the 'move with' posture resulted in their upper-body remaining perpendicular to the seat surface at all times.

6.2.3 Subjects

There were twelve male subjects. All subjects were staff or students of the University and aged between 18 and 30 years. Their median stature was 1.78 m (range 1.72 to 1.88 m) and median mass 68 kg (range 55 to 126 kg)

6.3 Equipment

6.3.1 Seating and the generation of oscillation

A rigid aluminium alloy seat with a flat wooden seat pan and no backrest was used. The height of the seat pan was 420 mm above the simulator platform. The oscillation of the rotation simulator was produced by a 1-metre stroke horizontal vibrator coupled via a crank to the rotation simulator, and the axis of rotation passed through the centre of the seat surface. The acceleration arising from tilt through the gravitational vector (i.e. $g \sin \theta$) was measured using a capacitive accelerometer (Setra type 141A) orientated laterally and mounted at the centre of rotation in the plane of the seat surface.

6.3.2 Signal generation and acquisition

The motion stimuli were generated and monitored using an *HVLab* data acquisition system and *HVLab* software (version 3.81). The drive signals were converted from digital to analogue at 30 samples per second and low pass filtered at 10 Hz. Analogue to digital conversion of the measured acceleration also took place at 30 samples per second after low pass filtering at 10 Hz.

Measurement of body movement

The motion of the shoulder of each subject was monitored using an ultrasonic distance measuring system that measured the time delay between transmitted and received pulses. The sampling frequency was 50 samples per second, and the effective range of the device was 1.5 m. The transmitter was orientated to broadcast in the subject's median coronal plane and was attached to a bracket rigidly fixed to the seat. The bracket was adjustable in

height so that the transmitter could be placed in the same horizontal plane as the receiver which was attached to subjects' inner clothing in the hollow of the acromioclavicular joint. For every subject, the system was adjusted so that 'zero' displacement corresponded with the subject sitting comfortably upright when the surface of the seat was horizontal. Displacement time histories were filtered with a zero-phase digital band-pass filter having roll-off frequencies of 0.05 and 5 Hz. These filtered time histories were used to calculate the r.m.s. displacement of the shoulder relative to the seat.

6.4 Procedure

Prior to participating in the study, which was approved by the Human Experimentation Safety and Ethics Committee of the Institute of Sound and Vibration Research, subjects were screened using a list of medical contraindications (BSI, 1989) and instructed in the method of magnitude estimation. Subjects were then familiarised with the method of magnitude estimation and had opportunity to practise judging the lengths of lines using the method. Subjects were also instructed in the two postures that they would be required to adopt during the experiment and exposed to stimuli on the vibrator during which they could practice maintaining these postures. The experiment did not commence until subjects were satisfied that they were able to maintain the specified postures.

Subjects were instructed to use the method of magnitude estimation to express the vibration discomfort caused by the test motions relative to the discomfort caused by the reference motion, ignoring any audible noise. During the reference motion subjects attempted to minimise head motion relative to the laboratory (the 'head still' posture). During the five-second pause between the reference and test motion subjects were instructed by the experimenter as to the posture they should adopt during the test motion using the instruction 'head still' or 'move with'. The subjects assigned a number that represented the discomfort of the test motion relative to the discomfort of the reference motion, assuming the discomfort caused by the reference motion corresponded to '100'. Subjects were permitted to use any positive number as their estimate of discomfort and wore a blindfold during vibration. Throughout the experiment, subjects wore headphones through which noise at 80 dB(A) was delivered to mask the operating noise of the simulator. The headphones also facilitated communication between the experimenter and the subject.

6.5 Results

6.5.1 The effect of posture on the rate of growth of discomfort

The magnitudes of the physical stimuli, φ (accelerations in the plane of the seat), were related to the magnitudes of the sensations, ψ (magnitude estimates of discomfort), using Stevens' power law (Stevens, 1975b):

$$\psi = k\phi^n \quad \text{Equation 6-1}$$

The rates of growth in discomfort, n , were determined for each subject by regression between the logarithm of the vibration magnitude, ϕ , and the logarithm of the magnitude estimates, ψ :

$$E\log_{10} \psi = \log_{10} k + n \log_{10} \phi \quad \text{Equation 6-2}$$

Median rates of growth at each frequency were calculated from the individual slopes, n , and individual intercepts, k . There were no significant differences in the rate of growth of discomfort with increasing vibration magnitude between the 'head still' and the 'move with' postures at either 0.2 or 0.5 Hz whether subjects were exposed to roll or pitch oscillation. There were also no clear non-significant trends.

6.5.2 Effect of frequency and posture on magnitude estimates of discomfort

The magnitude estimates made by subjects of the discomfort experienced during oscillation in each posture were compared (Figure 6-1). When subjects were exposed to pitch oscillation there were no significant differences between the magnitude estimates of discomfort made in the 'head still' and 'move with' postures ($p > 0.05$ Wilcoxon). During roll oscillation there was one frequency (1.25 Hz) where the magnitude estimates of discomfort in the 'head still' posture were significantly lower than those in the 'move with' posture. ($p = 0.011$ Wilcoxon). This difference might have arisen as an artefact of conducting multiple tests. The adjusted criterion for significance would have been $p < 0.005$. There was considerable inter-subject variability in subjects' responses (Figure 6-2).

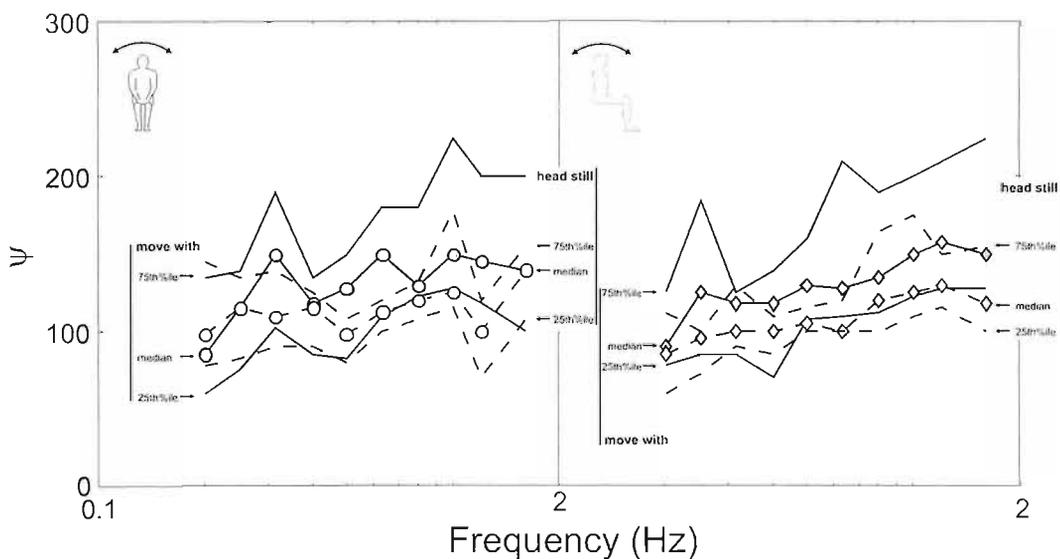


Figure 6-1 Magnitude estimates as a function of frequency: magnitude estimates of discomfort for two postures ('head still', and 'move with') arising from exposure to roll and pitch oscillation relative to the discomfort arising from exposure to 0.5 Hz sinusoidal oscillation at 0.315 m.s⁻² r.m.s in the same axis as the test motion.

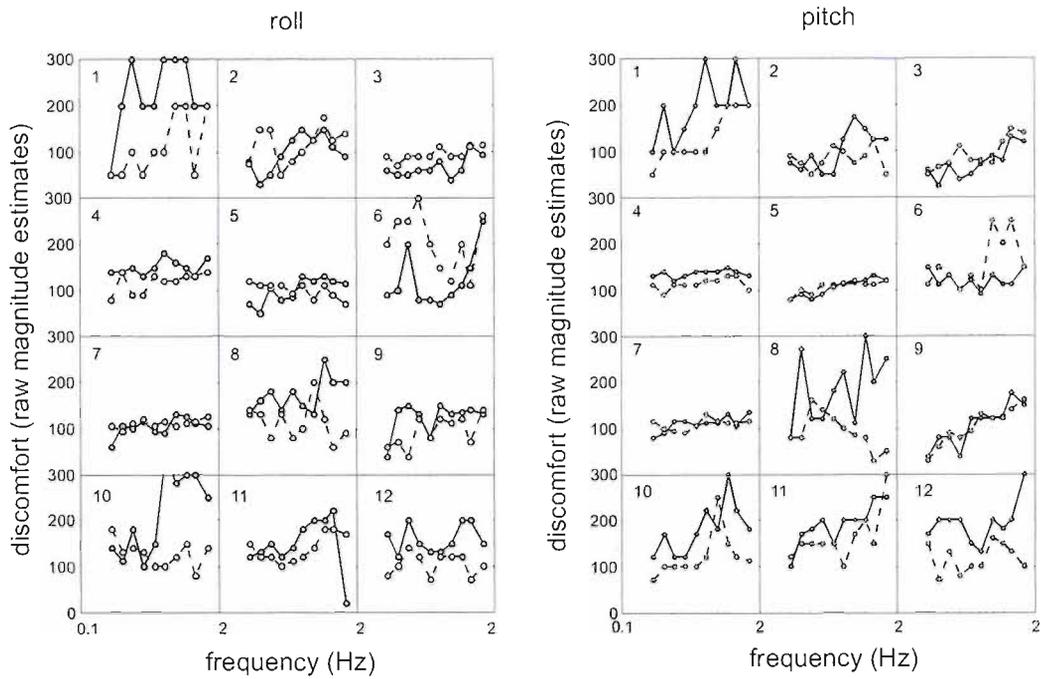


Figure 6-2 Individual subject magnitude estimates of discomfort for two postures ('head still', and 'move with') arising from exposure to roll and pitch oscillation relative to the discomfort arising from exposure to 0.5 Hz sinusoidal oscillation at 0.315 m.s^{-2} r.m.s in the same axis as the test motion.

6.5.3 Effect of posture on subject movement

To assess the accuracy with which the specified posture was maintained, the movement of the subjects was compared with the movement that would have occurred if they had moved according to the instructions. In the 'move with' posture, there should have been zero relative displacement between the shoulder transducer and the seat-mounted transmitter. In the 'head still' posture, because the magnitude of the stimuli varied with frequency, the relative motion should also have varied with frequency. If the subjects sat upright with the sensor a height R m, and the subject shoulder remained earth stationary during oscillation, the distance between the sensor and transmitter would be given by the chord of a circular arc described by the transmitter during oscillation. The chord length is $2 R \sin (\frac{1}{2}\theta)$, where θ is the total angle through which the seat rotated per half cycle. The relative displacement predicted for $R = 0.7\text{m}$ (the mean transmitter height) is shown in Figure 6-3.

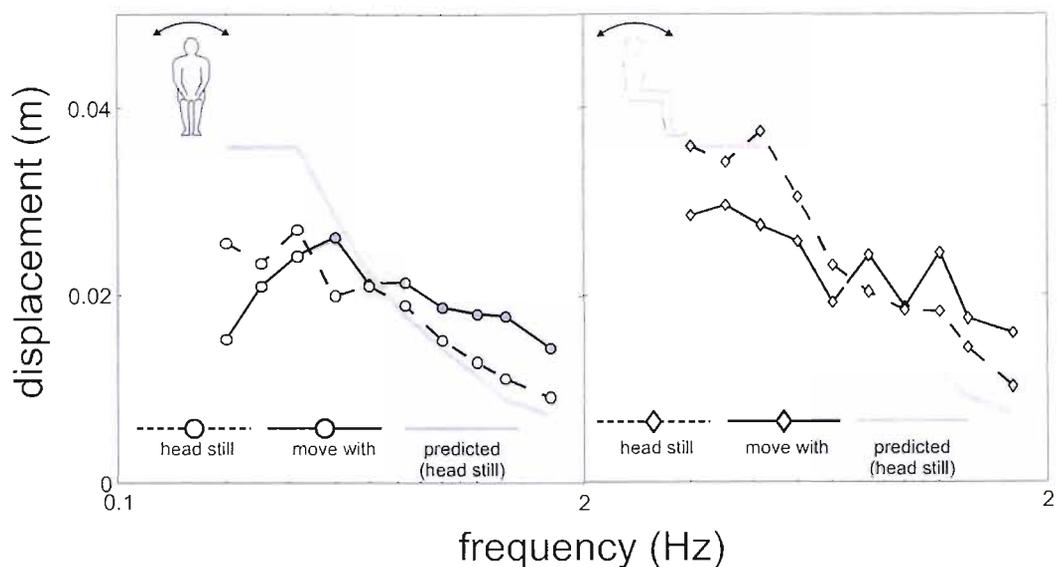


Figure 6-3 The median amplitude of shoulder displacement relative to the seat in the 'head still' and 'move with' postures during roll and pitch oscillation, together with the predicted performance for the 'head still' posture. The predicted performance for the 'move with' posture would be zero displacement.

With roll oscillation, the measured shoulder displacement was less than predicted at 0.2 and 0.25 Hz ($p = 0.019$ and 0.05 Wilcoxon, respectively). With both pitch and roll oscillation, the shoulder displacement was greater than predicted at 0.8 Hz and greater frequencies ($p < 0.028$ Wilcoxon). It is apparent from Figure 6-3 that during the 'move with' posture the subjects' movements exceeded the prediction of no relative motion.

The effects of frequency and posture on the r.m.s. magnitude of subject shoulder movement in the coronal plane passing approximately through the acromioclavicular joint are shown in Figure 6-3. Comparison of the magnitude of shoulder displacement between postures and within axes showed that during roll oscillation there was more oscillation in the 'head still' posture at 0.25 Hz ($p < 0.05$ Wilcoxon) and in the 'move with' posture at 1.25 and 1.6 Hz ($p < 0.003$ and 0.023 , respectively; Wilcoxon). During pitch oscillation there were no significant effect of posture ($p > 0.05$ Wilcoxon).

6.6 Discussion

6.6.1 Effect of the magnitude of oscillation

The results suggest that posture did not have a systematic effect on the rate of growth of discomfort caused by roll or pitch oscillation at either 0.25 or 0.5 Hz. If subjects had been able to consistently adopt the specified postures at every magnitude in one of these four conditions this would indicate that a unit increment in the physical magnitude of the stimulus was associated with a similar, though not necessarily unity, increment in discomfort whether subjects were attempting to minimise head and upper body motion relative to the seat or the

laboratory. However it would not necessarily mean that the sensations subjects judged as discomfort changed in the same way, only that the resulting change in the magnitude of discomfort was similar.

The rates of growth of discomfort (i.e. the value of n in Stevens' power law) showed a high level of inter-subject variability. The experimental design presented stimuli in a random order of frequency and magnitude, so subjects experienced motions of the same frequency at widely separated points in time. It is therefore possible that fatigue may have affected subjects' ability to obey the instructions given regarding posture.

Comparison of the rates of growth of discomfort produced in this work with those in previous studies (Wyllie and Griffin 2007a, 2007b) showed that with both roll and pitch oscillation the median rates of growth of discomfort determined in this study were lower than in previous work, but showed similar trends, particularly in the case of the 'move with' posture (Figure 6-4).

Comparison with the equivalent comfort contours obtained with identical frequencies and magnitudes but with less specific postures in previous work (Wyllie and Griffin 2007a, 2007b), as in Figure 6-5, shows that both the slopes and levels of the contours are broadly similar. During pitch oscillation, the 'head still' median contour was coincident with that found in previous work where subjects were instructed to 'sit comfortably upright', while the 'move with' contour was below the level of, and steeper than, the previous contour – indicating that subjects were more sensitive in the 'move with' posture, and that their sensitivity increased more rapidly with increasing frequency. During roll oscillation, the slope of the contour determined in previous work varied so that, in part, it is parallel with the contour from the 'head still' posture and, in part, parallel with the contour from the 'move with' contour.

6.6.2 Effect of posture on estimates of discomfort

In general there was a non-significant trend in the median data for subjects to make greater magnitude estimates of discomfort when they attempted to minimise head motion relative to the seat than when they minimised head motion relative to the laboratory. However, the inter-subject variability of these measurements is large relative to the size of the effect. A crude analysis might conclude that since there was no significant difference between the magnitude estimates in one posture relative to the other there was no effect of importance. However the inter-quartile range of magnitude estimates in the 'move with' posture was approximately twice that in the 'head still' posture, although the 25th percentiles of the 'move with' and 'head still' postures were similar. This may indicate that some subjects were unable to comply completely with the instruction to 'move with' the seat and had some mixed response, which resulted in similar discomfort to the 'head still' posture. This would indicate that the 'head still' posture is the default response which minimises discomfort.

6.6.3 Effect of posture on shoulder movement.

One interpretation of the subjective data is that the lack of difference in discomfort may be interpreted by subjects being unable or unwilling to maintain the specified postures during all or part of the experiment. Comparison of the actual and predicted displacements of the subjects' shoulders during oscillation allows an assessment of the degree to which this might be a valid explanation. The location of the plane beneath the ischial tuberosities relative to the position of the centre of rotation is an important factor in interpreting the results for the 'head still' posture. During pitch oscillation, the centre of rotation was very close to a coronal plane passing through the ischial tuberosities, hence it was easy for subjects to allow the seat to 'rotate under them' and maintain a constant position for their heads in earth-referenced co-ordinates. In contrast, during roll oscillation the median plane through the centre of rotation beneath the pelvis reacts differentially on the ischial tuberosities to angular changes associated with low frequency oscillation.

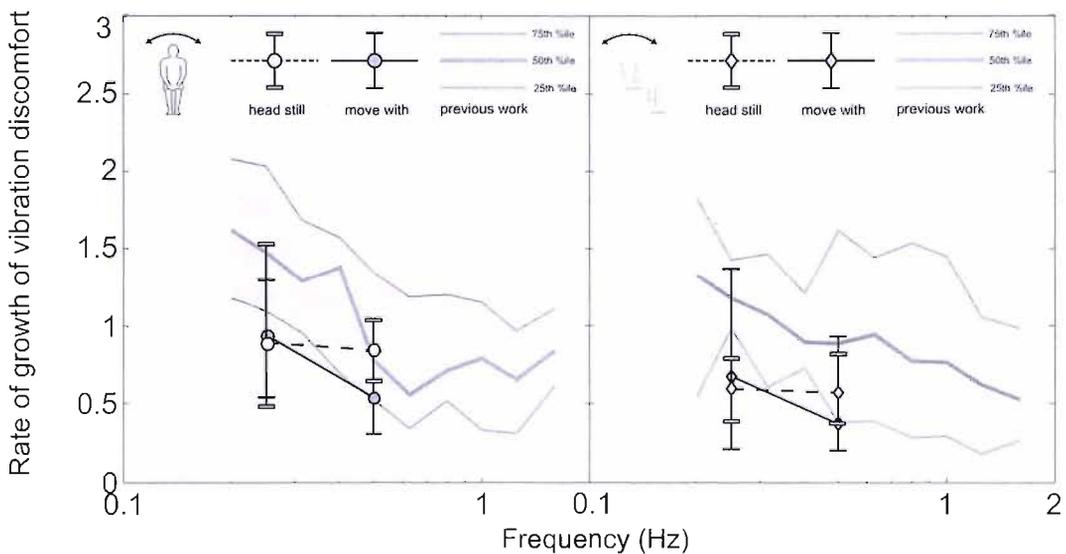


Figure 6-4 Comparison of the rate of growth of discomfort determined in this study with those from previous work: roll (Chapter 4) and pitch (Chapter 5)

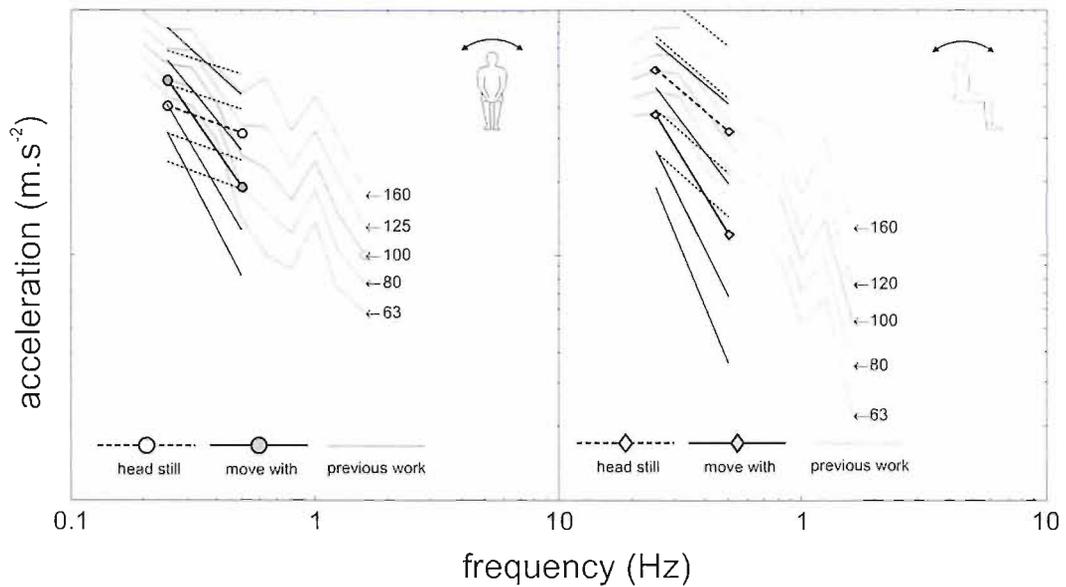


Figure 6-5 Comparison of equivalent comfort contours determined in this study with those from previous work: roll (Chapter 4) and pitch (Chapter 5).

In both axes, the performance of subjects deteriorated at the higher frequencies, above about 0.8 Hz. The reasons for this are less clear, but it might be that the frequency of input forces acting on the ischial tuberosities became such that the inertia of the head and upper body prevented adequate control. The 'move with' trials were associated with much greater relative movement than was expected in both axes and at all frequencies, indicating that subjects experienced difficulties in accurate tracking of even predictable low frequency sinusoidal motions. However, in both axes performance was best at the lowest frequencies (notably so during roll oscillation).

6.7 Conclusions

The study produced evidence that variations in posture have a practically important effect on discomfort in the frequency range 0.2 to 1.6 Hz. The measurements of shoulder movement suggest that had subjects been able to adopt the specified postures with greater accuracy the effect of posture on discomfort might have been much greater. It is clear from the movements of their bodies that subjects were 'better' at maintaining a 'head still' posture than a 'move with' posture in almost all conditions. The results imply that where posture is constrained, consideration should be given as to whether currently standardised frequency-weightings will accurately predict discomfort.

With 0.25 and 0.5 Hz oscillation, the effect of posture on the rate of growth of discomfort with increasing magnitude of oscillation varied between axes and between frequencies. Comparison of the median equivalent comfort contours resulting from this and previous studies suggest that at these frequencies most subjects in the previous studies opted to

minimise head motion relative to the laboratory when they were instructed to 'sit comfortably upright'.

Chapter 7 Discomfort arising from exposure to fore-and-aft and lateral vibration at frequencies between 0.2 and 1.6 Hz

Short summary

In some environments, notably fast ferries, agricultural tractors and military aviation there are substantial low frequency (0.1 – 2.0 Hz) components in the vibration received by passengers and operators. While the contribution of low frequency vertical oscillation is relatively well understood, the nature of human response to low frequency oscillation in the horizontal axes is less well understood. The objective of the study reported in this paper was to compare the rate of growth of discomfort and degree of discomfort arising from exposure to fore-and-aft and lateral oscillation. Twelve male subjects, seated on a flat rigid seat without a backrest, were exposed to sinusoidal stimuli in the fore-and-aft and lateral axes at ten frequencies between 0.2 and 1.6 Hz at magnitudes between 0.063 and 0.63 ms⁻² r.m.s. The method of magnitude estimation was used to determine the rate of growth of vibration discomfort. When subjects were seated on a flat rigid seat the rate of growth of vibration discomfort varied with frequency in both studied axes. The results show that fore-and-aft and lateral oscillation caused a similar degree of discomfort.

7.1 Introduction

Substantial low frequency (i.e. 0.1 to 2.0 Hz) components in the spectra of many travel environments can influence the discomfort of operators and passengers. In order to predict the discomfort caused by rotational and translational oscillations it is necessary to assume the relative discomfort arising from exposure to oscillation in the different axes. Some previous research at higher frequencies (Rao and Jones, 1978) reported that there was no statistically significant difference between the discomfort arising from exposure to fore-and-aft and lateral vibration at frequencies between 1 and 20 Hz. Griefahn and Brode (1997) used the method of adjustment to compare the discomfort arising from lateral and fore-and-aft oscillation at two frequencies (1.6 and 3.2 Hz) with the discomfort caused by a 10-Hz vertical reference motion and also concluded that sensitivity to lateral and fore-and-aft vibration was similar.

The objective of this study was to determine the relationship between the discomfort arising from exposure to fore-and-aft oscillation and lateral oscillation at 0.5 Hz on a flat rigid seat,

and to use these data to compare the results of two intra-axis studies. This paper reports the results of three experiments. There were two 'within axis' experiments which investigated the variation in discomfort with the frequency of oscillation between 0.2 and 1.6 Hz in the lateral and fore-and-aft directions. The third, 'between axes', experiment investigated the relative discomfort caused by exposure to lateral and fore-and-aft oscillation at 0.5 Hz.

7.2 Method

All three experiments employed a 'within subjects' experimental design. Subjects were exposed to a reference stimulus followed by a test stimulus and asked to judge the discomfort of the test motion relative to the reference motion using the method of magnitude estimation (Stevens, 1975b). The reference motions and all test motions were sinusoidal with durations of 30 seconds.

In the 'between axes' experiment, the reference motion was lateral oscillation at a frequency of 0.5 Hz and a magnitude of 0.315 ms^{-2} r.m.s. with subjects seated on a flat rigid seat. The test motions were also at 0.5 Hz but with a magnitude chosen randomly from an array of magnitudes in the fore-and-aft axis. This experiment was completed in one session.

In the 'within axis' experiments, the reference motion was at a frequency of 0.5 Hz and a magnitude of 0.315 ms^{-2} r.m.s. in the same axis as the test motion. The test motions had frequencies between 0.2 and 1.6 Hz and were chosen randomly from an array of frequencies and magnitudes. The 'within axis' experiments were those described in Chapter 4 and [5]

7.2.1 Stimuli

In the 'between axes' experiment there were nine 0.5-Hz stimuli with magnitudes in logarithmic series between 0.12 and 0.8 ms^{-2} r.m.s. The simulator reproduced the test stimuli with acceleration distortions less than 19% in the horizontal axes.

In the 'within axis' experiments there was one axis of oscillation in each experiment (lateral or fore-and-aft). In each axis there were 10 studied frequencies, one at each preferred one-third octave centre frequency between 0.2 and 1.6 Hz. There were 59 pairs of stimuli in each experiment: six magnitudes in logarithmic series between 0.2 and 0.63 ms^{-2} r.m.s at each frequency, except 0.2 Hz where five magnitudes were used in the range 0.2 to 0.5 ms^{-2} r.m.s. due to simulator displacement limitations.

7.2.2 Subjects

Twelve male subjects participated in each experiment but subjects were not matched between experiments. All subjects were staff or students of the University and aged between 18 and 30 years. The experiment was approved by the Human Experimentation Safety and Ethics Committee of the Institute of Sound and Vibration Research.

7.2.3 Equipment

Oscillation in the horizontal axes was produced by a 1-metre stroke horizontal hydraulic vibrator. The apparatus was located in the Human Factors Research Unit at the Institute of Sound and Vibration Research. The acceleration was measured using a capacitive accelerometer (Setra type 141A) mounted on the platform of the vibrator immediately below the seat.

The motion stimuli were generated and monitored using *HVLab* (version 3.81). The drive stimuli were converted from digital to analogue at 30 samples per second and low pass filtered at 15 Hz. Analogue to digital conversion also took place at 30 samples per second after low pass filtering at 10 Hz

A rigid seat with an aluminium or steel frame and a flat wooden seat pan was fitted to the simulator. There was no backrest. For safety purposes, in the 'within axes' experiments subjects wore a loose lap strap, and in the 'between axes' experiment they wore a loose whole-body harness which allowed them to turn through 90 degrees while still remaining attached to the seat. Subjects wore a blindfold and headphones through which noise at 85 dB(A) was delivered to mask the operating noise of the simulator.

7.2.4 Procedure

Prior to participating in the study, subjects were screened using a list of medical contraindications (BSI, 1989) and were instructed in the method of magnitude estimation and the purpose of the experiments. Subjects practiced judging the lengths of lines using the method of magnitude estimation before the experiment commenced. The headphones used to mask the noise of the simulator operation also facilitated communication between the experimenter and the subject. The experimenter was able to observe subjects at all times.

7.3 Results

The magnitudes of the physical stimuli, φ (accelerations in the plane of the floor), were related to the magnitudes of the sensations, ψ (magnitude estimates of discomfort), using Stevens' power law (Stevens, 1975b):

$$\psi = k\varphi^n \quad \text{Equation 7-1}$$

The rates of growth in discomfort, n , were determined for each subject by regression between the logarithm of the vibration magnitude, φ , and the logarithm of the magnitude estimates, ψ :

$$\log_{10} \psi = \log_{10} k + n \log_{10} \varphi \quad \text{Equation 7-2}$$

Median rates of growth at each frequency were calculated from the individual slopes, n , and individual intercepts, k (Figure 7-1). The data from one subject in the lateral 'within axis' experiment whose judgements indicated lack of comprehension of the method of magnitude estimation were discarded.

7.3.1 The rate of growth of discomfort

In the 'within axis' experiments, both during lateral oscillation and during fore-and-aft oscillation, the rates of growth of discomfort varied significantly with frequency ($p < 0.01$, Friedman) and analysis of the trend showed that the median rate of growth of discomfort was negatively correlated with increasing frequency ($p < 0.01$; Spearman). The rate of growth of discomfort was not significantly affected by whether exposure was in the fore-and-aft or lateral axis, except at 0.315 Hz where the median n value was greater during lateral oscillation than during fore-and-aft oscillation ($p = 0.023$). Adjustment of the significance level using the Bonferroni criterion indicated that this difference might have been artefactual.

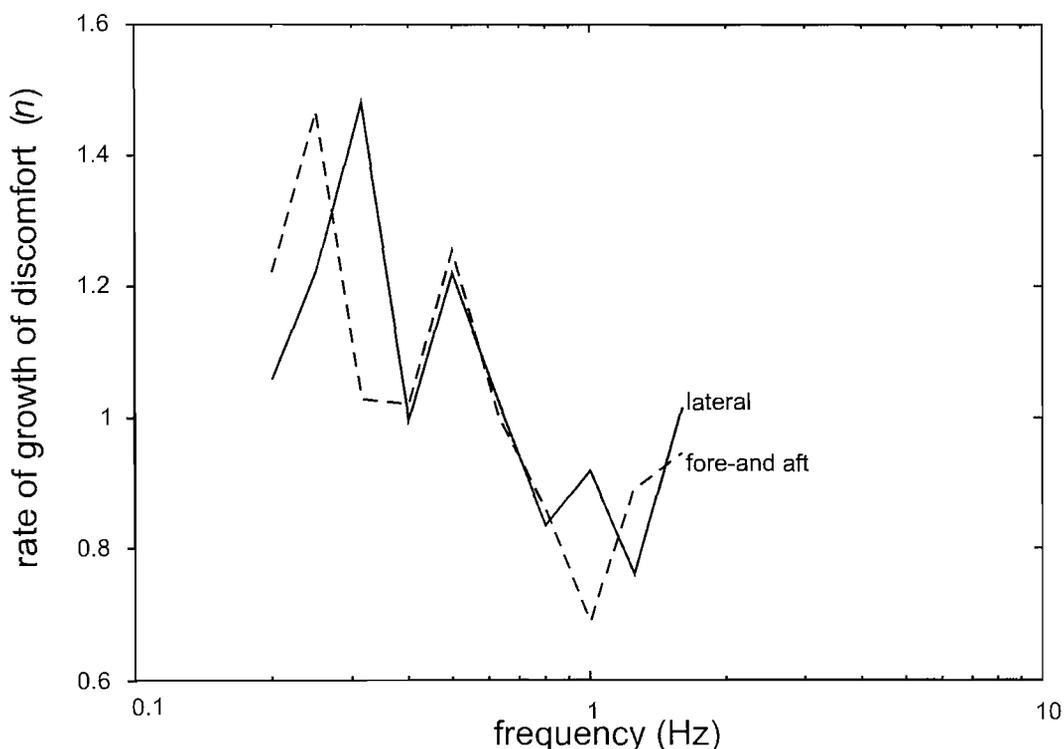


Figure 7-1 The median rate of growth of discomfort in the 'within axis' experiments.

The median rate of growth of discomfort arising from exposure to oscillation in the lateral axis at 0.5 Hz judged relative to the discomfort caused by a reference stimulus in the fore-and-aft axis during the 'between axis' experiment was 1.0. The rates of growth in discomfort determined at 0.5 Hz (Figure 7-2) with lateral oscillation during the 'between axes' experiment (where the reference was in the fore-and-aft axis) and during the 'within axis' experiment (where the reference was in the same axis as the test motion) were not significantly different ($p = 0.460$, Mann Whitney U)

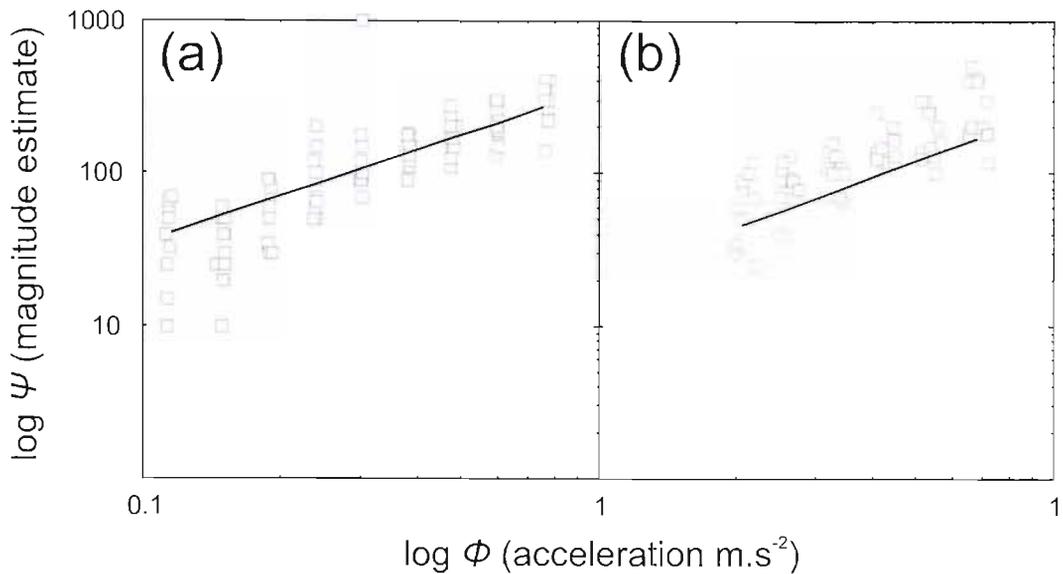


Figure 7-2 The rate of growth of discomfort arising from exposure to lateral oscillation at 0.5 Hz in the ‘between axes’ experiment: (a) where the reference was in the fore-and-aft axis, and (b) in the within axis experiment where the reference was in the same axis as the test motion.

7.3.2 Relative discomfort between lateral and fore-and-aft oscillation

7.3.2.1 Comparing the results of the ‘within axis’ experiments

The reference stimuli differed between the two ‘within axis’ experiments. These differing reference conditions may have exerted an effect on the discomfort that varied between axes. To adjust the level of the contours obtained in the ‘within axis’ experiment, which investigated lateral oscillation, to allow for the differing sensitivity found at 0.5 Hz in the ‘between axes’ experiment, a correction factor C_{Si} , was calculated:

$$C_{Si} = \varphi_{Si} / \varphi_{SR} \quad \text{Equation 7-3}$$

where φ_{Si} is the magnitude of a 0.5 Hz lateral motion in the ‘between axis’ experiment that gave discomfort equivalent to 0.5 Hz fore-and-aft oscillation at 0.315 ms^{-2} r.m.s. on a rigid seat, and φ_{SR} is the magnitude of a 0.5 Hz test motion in the ‘within axis’ experiment that corresponded to a magnitude estimate of 100 when using a 0.5 Hz 0.315 m.s^{-2} r.m.s. sinusoidal reference motion in the same axis and seating condition as the test stimulus.

The correction factors were calculated from the medians of the individual slopes and intercepts. Stevens (1975b) concluded that n values were independent of the reference condition, so it was assumed that the reference motion had a constant effect at all frequencies and the same 0.5 Hz correction factor was applied at all frequencies.

To allow statistical comparisons across axes (see below), the individual contours obtained in the ‘within axis’ experiment were adjusted by the median correction factors obtained in the ‘between axis’ experiment.

7.3.2.2 Effect of frequency on discomfort caused by lateral and roll oscillation

Equivalent comfort contours were determined within each axis for each subject by calculating the vibration acceleration, φ , corresponding to each of five subjective magnitudes, ψ , (i.e. 63, 80, 100, 125, and 160) where 100 corresponds to the discomfort produced by 0.315 ms^{-2} r.m.s. at 0.5 Hz in that axis, for each frequency (from 0.2 to 1.6 Hz) using Equation 7-2. Five median equivalent comfort contours were then generated from the medians of the contours of individual subjects. The contour equivalent to a perceptual magnitude of 100 was then adjusted according to differences between axes as stated above (Equation 7-3). The levels of the adjusted contours for a subjective magnitude of 100 were highly dependent on vibration frequency ($p < 0.01$, Friedman; Figure 7-3).

With both lateral and fore-and-aft oscillation, the levels of the 100 comfort contours decline at very approximately 3 dB per octave between 0.2 and 1.6 Hz. There were no significant differences between the levels of the adjusted contours ($p > 0.133$ Mann-Whitney U)

7.3.3 Effect of magnitude on the frequency-dependence of equivalent comfort contours

The effects of motion magnitude on the levels of the comfort contours equivalent to subjective judgements between 63 and 160 arising from oscillation in the lateral and fore-and-aft axes are shown in Figure 7-4. These median contours were calculated from individual subject contours produced using equation 2. The reference condition for these contours is 0.5 Hz, 0.315 m.s^{-2} r.m.s. sinusoidal motion in the same axis as the test motion, so the levels of these contours in one axis should not be compared with those in another axis. The shapes of the equivalent comfort contours are affected by the magnitude of the stimuli, although the effect is not very large within the range of stimuli employed in this study.

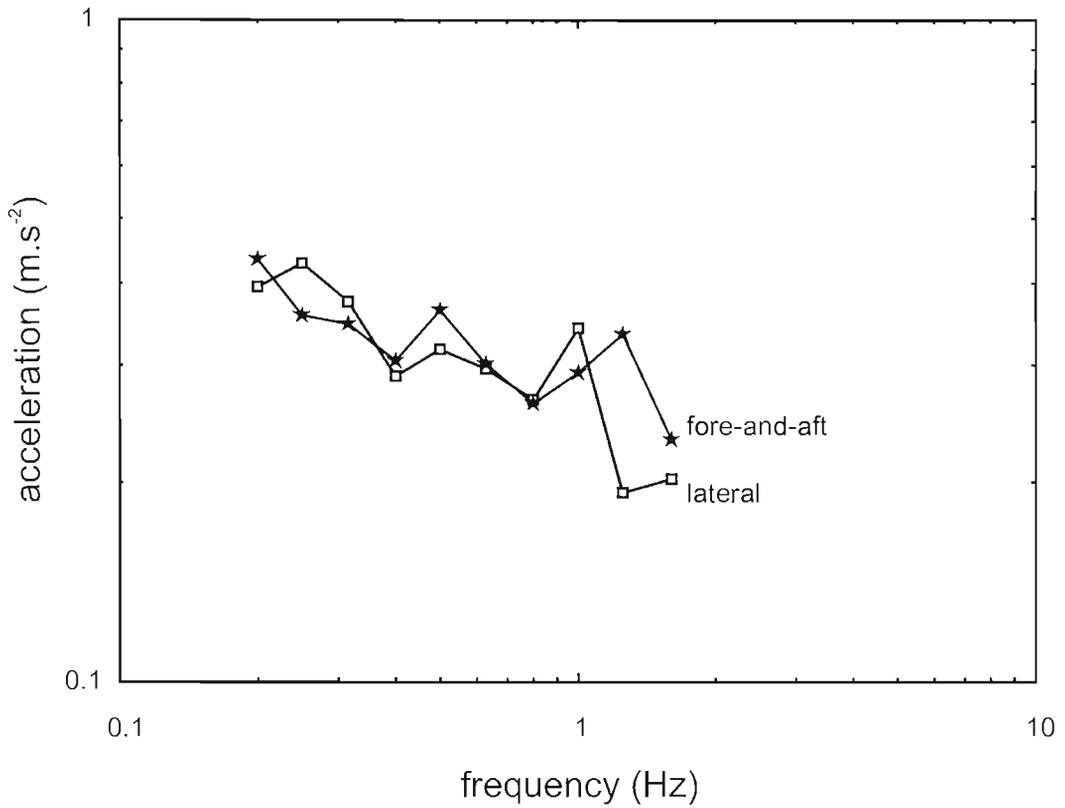


Figure 7-3 Adjusted roll and lateral contours, each producing discomfort equivalent to that arising from exposure to sinusoidal fore-and-aft oscillation on a rigid seat at 0.5 Hz, 0.315 m.s⁻² r.m.s. (□ lateral oscillation; * fore-and-aft oscillation).

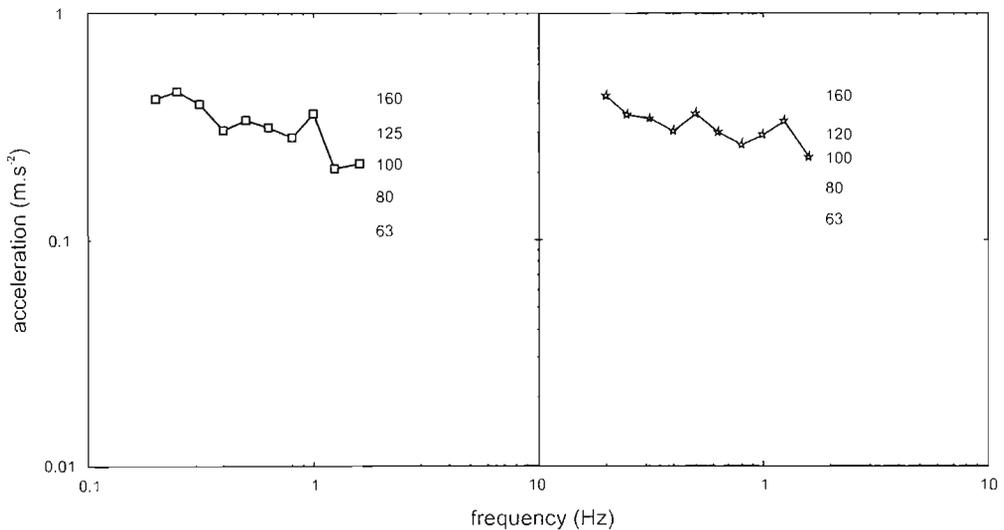


Figure 7-4 The effect of frequency and magnitude on the levels of the equivalent comfort contours arising from exposure to oscillation in the lateral and fore-and-aft axes on a flat rigid seat with no backrest. The 100 contour (bold) represents discomfort equivalent to that caused by 0.315 m.s⁻² r.m.s. 0.5 Hz oscillation in the same axis.

7.4 Discussion

7.4.1 Rate of growth of discomfort caused by fore-and-aft and lateral oscillation

The rate of growth of discomfort (the n value in Stevens' power law) describes the relationship between a unit increment in the physical magnitude of the stimulus, φ , and the resulting increment in the perceptual magnitude, ψ . These results show that a unit increment in the magnitude of oscillation was associated with a greater increment in discomfort at low frequencies, where the n value was large, than at high frequencies where the n value was less. This means that contours of equivalent discomfort change shape with the magnitude of oscillation, as seen in Figure 7-4. This affects the efficacy of predictive methods based on contours at one particular magnitude.

7.4.2 Relative discomfort between fore-and-aft and lateral oscillation

The experimental design of the 'within axis' experiments involved presenting stimuli in a random order of frequency and magnitude, so subjects experienced 0.5 Hz stimuli at widely separated points in time and may have responded differently to some presentations of the stimuli. Such variability would reduce the strength of the relationship between the physical magnitude of the stimuli and the magnitude estimates of discomfort reported by subjects. The reduced inter-subject variability observed at 0.5 Hz in the 'between axes' experiments, as compared with that in the 'within axis' experiments, is consistent with this explanation.

The adjustment required to adjust the lateral equivalent comfort contour so that it represents the same degree of discomfort as the fore-and-aft contour was not large. The change in the level of the lateral contour may have been less than the just noticeable difference (JND) at the frequencies in this study, if the JND of between 12.3 and 13.4% obtained by Morioka and Griffin (1999) and Forta (2005) at 5 Hz persists at lower frequencies.

7.4.3 Comparison with previous research

The rate of growth of discomfort in the fore-and-aft axes at frequencies between 0.5 and 1 Hz is compatible with the results of a study by Price (2002) into the effect on discomfort of differential vibration of the seat and feet which included a condition where the seat and feet moved in phase, as in this study (Figure 7-5). The magnitudes of the stimuli used by Price covered a wider range (0.05 – 0.8 m.s⁻² r.m.s.) than employed in this study.

The present study shows that the relative discomfort arising from exposure to fore-and-aft and lateral oscillation is, at least at the magnitudes investigated here, very similar. This finding is compatible with the results of Greifahn and Brode (1997) who, with a similar seating condition at similar frequencies reported that one equivalent comfort contour sufficed to predict discomfort in both horizontal axes.

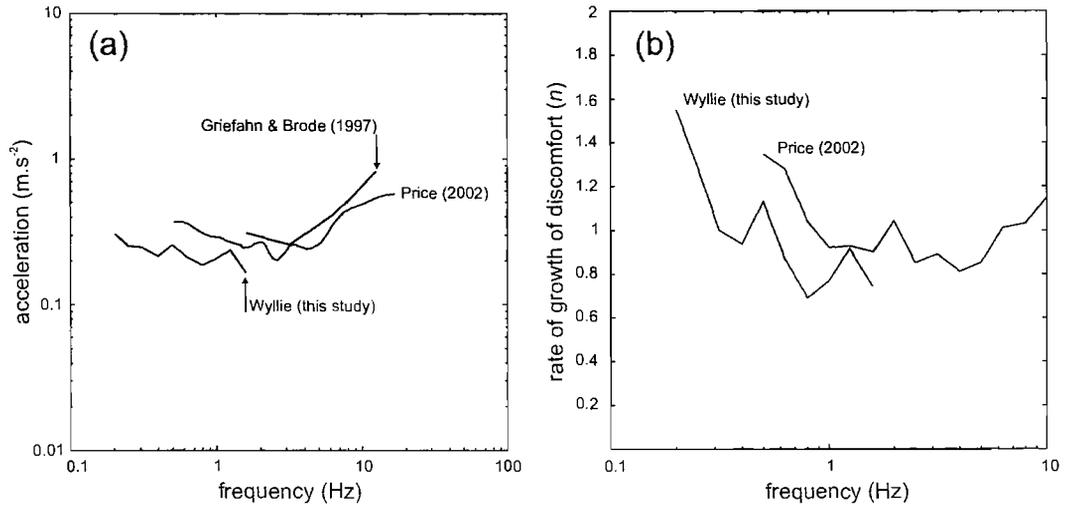


Figure 7-5 Comparison of equivalent comfort contours and rates of growth of discomfort: (a) equivalent comfort contours arising from exposure to fore-and-aft oscillation on a flat rigid seat reported by Price (2002) and Griefahn and Brode (1997) compared with those reported by this study; (b) median rate of growth of discomfort arising from exposure to fore-and-aft oscillation on a rigid seat with a footrest moving in phase reported by Price (2002) compared with this study.

The form of the equivalent comfort contours determined for fore-and-aft vibration in this study is comparable with those determined by Price (2002) at similar frequencies and with similar seating conditions (Figure 7-5a), although the level of the contours cannot be directly compared as the reference stimuli differed.

7.5 Conclusion

At frequencies between 0.2 and 1.6 Hz the discomfort caused by exposure to acceleration in the fore-and-aft and lateral axes is similar when the exposure is on a flat rigid seat with no backrest.

Chapter 8 General Discussion

This research has followed a consistent plan that was developed early in the research programme. However as is often the case, the results of one study proved curious and stimulated the production of further hypotheses – in this case concerning the effect of posture on discomfort during low frequency vibration. The over-arching objectives of this work were to determine how discomfort depends on the frequency of oscillation (at frequencies between 0.2 and 1.6 Hz), the direction of oscillation (roll, lateral, pitch, and fore-and-aft) and seating condition (with and without backrest). This chapter progresses the limited discussions found at the ends of each experimental chapter, interpreting the findings of each experiment in the light of all others. It does this by reviewing the original hypotheses found at the conclusion of Chapter 2, discussing other hypotheses which were, or might have been investigated along the way, and by evaluating the effectiveness of the present predictive methods in all axes.

8.1 The original hypotheses of this work

8.1.1 Hypothesis: acceleration in the plane of the seat

It was hypothesised that acceleration in the plane of the seat gives rise to similar discomfort whether the originating oscillation is translation, or coplanar rotation through the plane of action of the gravitational field (given that the originating oscillation is at the same frequency in both axes).

8.1.1.1 The rate of growth of discomfort: effects in coplanar axes

Comparison of the rate of growth of discomfort between coplanar axes (e.g. roll and lateral) showed that the rate of growth of discomfort was greater during rotation through the gravity vector than during translation in the horizontal plane when subjects were seated with backrest, while the opposite was generally true when they were seated with a flat rigid seat (Figure 8-1). These effects were weakly expressed, not uniform across the frequency range, and although there were many differences at the 5% level, these might have arisen by chance due to the conduct of multiple tests. The clarity of any practical effect may also have been reduced by the randomisation of stimuli by both frequency and magnitude, the large stimulus library, and particularly at low frequencies by different possible response strategies to the vibration. However the similar variation of the rate of growth of discomfort in both pairs of axes are suggestive of a real effect, although one which this work lacked sufficient power to describe authoritatively. The interpretation placed on this finding depends upon the application. This matter is further discussed in S.8.1.3 below.

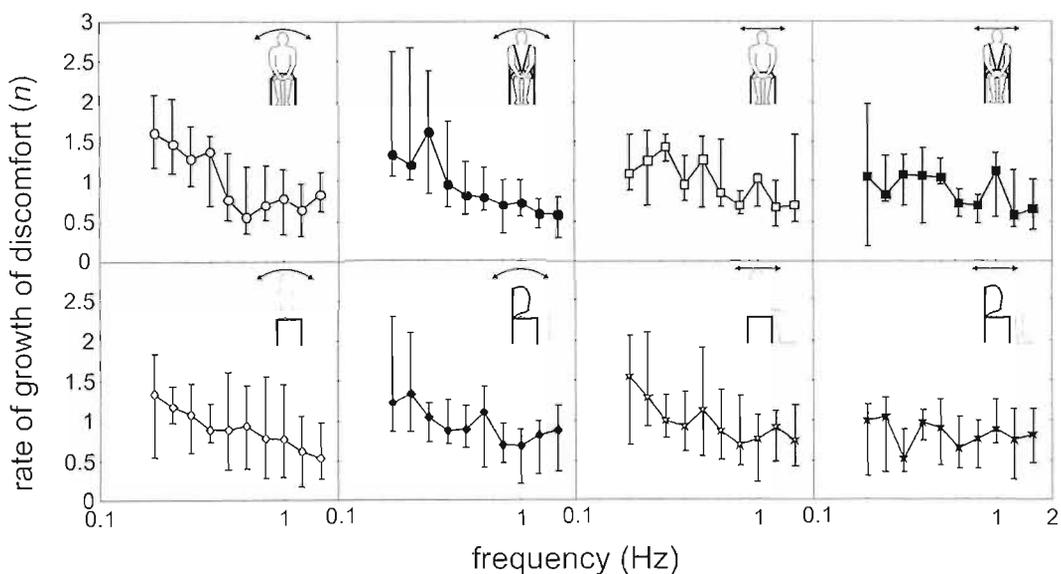


Figure 8-1 The effect of frequency and magnitude on the rate of growth of discomfort in the roll, lateral, pitch and fore-and-aft axes, when subjects were seated with and without a backrest. Error bars show the interquartile range

8.1.1.2 The level of equivalent comfort contours in coplanar axes

Comparison of the discomfort arising from exposure to matched accelerations in the plane of the seat during rotation through the gravity vector and coplanar horizontal oscillation showed that between 0.2 and 0.4 Hz when subjects were seated with a backrest during roll or pitch oscillation, and without a backrest during roll oscillation there were no significant differences within frequencies between axes, in the levels of the contours. However when subjects were seated without a backrest during pitch oscillation translation caused less discomfort than rotation between 0.2 and 0.4 Hz. Above 0.4 Hz, acceleration arising from rotation through the gravity vector rapidly became more uncomfortable than translational acceleration at the same frequency. This effect was similar for both pairs of axes. In percentage terms, at 1.6 Hz the contours relating to rotational acceleration were very approximately 70% of the value of the coplanar translational contours (Figure 8-2).

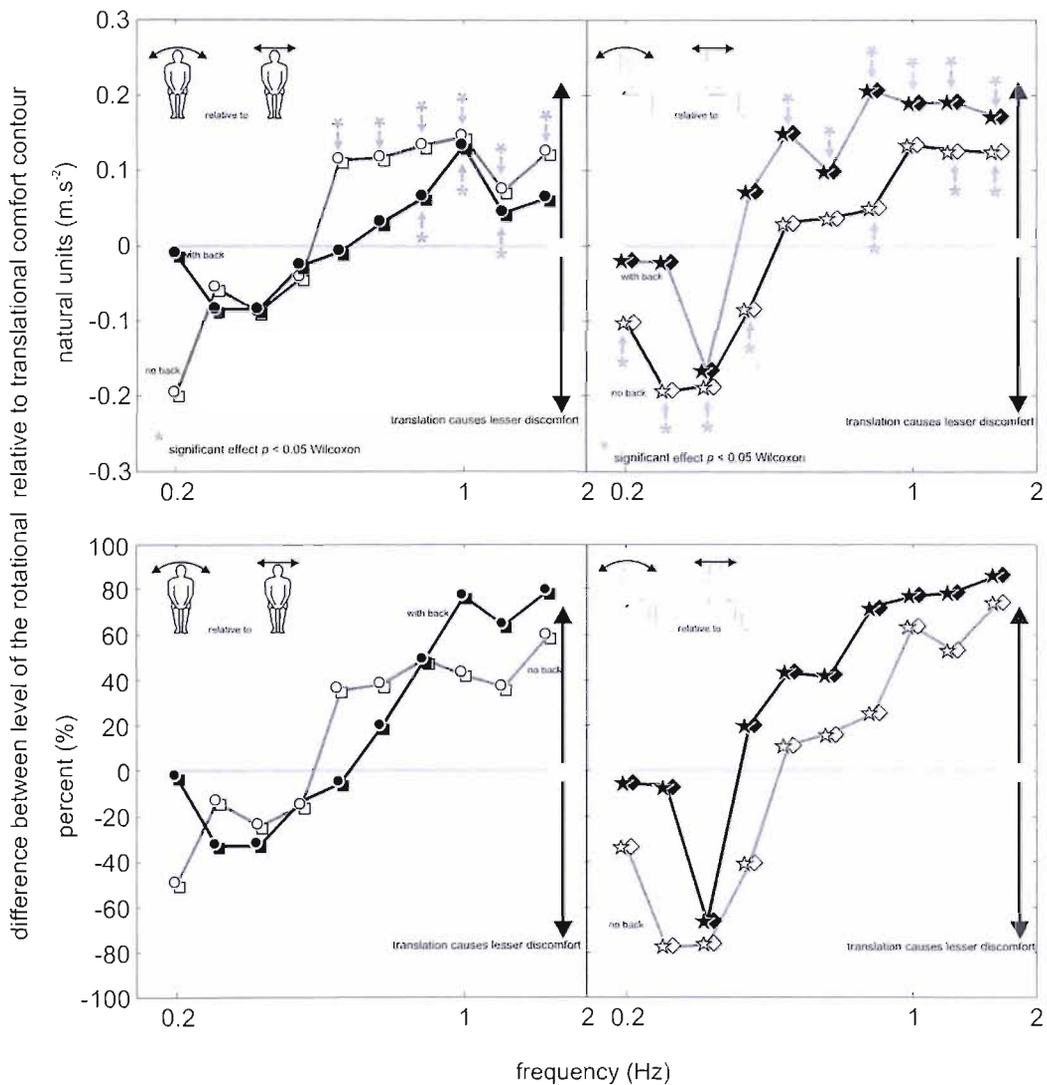


Figure 8-2 The difference (in terms of acceleration and percentage) between the median levels of the roll and lateral, and pitch and fore-and-aft equivalent acceleration contours.

8.1.1.3 The relationship between 0.2 and 0.4 Hz

Biodynamic parameters potentially explain relationships between discomfort

The differences in the cross section of the pelvis in the median sagittal and median coronal planes, provide persuasive explanation for the differences in the relative discomfort between the roll and lateral, and pitch and fore-and-aft, axes when subjects were seated with no backrest. This was discussed briefly in [CH5 S.4.3]. There the increased discomfort during oscillation in the pitch axis, compared to the fore-and-aft axis, relative to the approximate equality of discomfort during roll and lateral oscillation, was proposed to be possibly a stability related issue.

Observation indicated that rotational, and to a lesser extent translational, oscillation during most trials subjects attempted to keep their heads stable in earth referenced co-ordinates. This meant that that subjects spine were engaged in bending (either from the sacral to cervical (no backrest) or from upper thoracic to cervical (with backrest) levels in both flexion and extension or ab/adduction. Clearly the biodynamics of such bending differ markedly and it might be hypothesised that differences in the muscle activation patterns and the work done in stabilising the body would be well correlated with discomfort. Were they not to be so then it would indicate that some other aspect was responsible for mediating the discomfort arising from these low frequency rotational and translational stimuli.

Treating the situation as static, and the upper body as rigid, although neither are normally satisfactory assumptions, proves illustratively useful here in calculating sitting stability limits. Using for illustrative purposes the sample of Clauser *et al.* (1969) and estimating the width of the ischial tuberosities as approximately 0.45 of the bi-cristal breadth based on data from Moore and Agur, (1995) this implies that during lateral (and roll) oscillation the upper body could be inclined at up to around 17° to the vertical before the centre of mass lay outside the base of support (b) provided by the ischial tuberosities. (This figure might reduce during roll, but making the further crude assumption that the upper body remains perpendicular to the seat the effective minimum base of support (b^*) = $(b \sin \alpha) / \tan \alpha$ where α is the maximum angle the seat makes with the earth horizontal, implies that where α is small, as it was in these experiments, the reduction in stable angle will also be small.) With exposure to lateral and roll oscillation the problem is clearly approximately symmetrical (i.e. positive and negative deviation about the mid point have similar solutions). Given that similar approaches to the problem of standing stability have shown that in practice exposed persons perceive that there is a risk to their stability at approximately half the theoretical value, and the maximum roll angle in this study was 8.6° this appears broadly sensible.

During pitch and fore-and-aft oscillation this symmetry is lost, since the pivot point is, with an upright sitting position almost immediately underneath the subject's centre of mass. However it was observed that during both pitch and fore-and-aft oscillation most subjects adopted a mildly kyphotic posture, effectively moving their centre of mass forward in the x – axis. The implication is that the limiting condition will be caused by an anti-clockwise rotation

about the ischial tuberosities. In this case, the limiting angle α is given by the angle of kyphosis. Assuming a mild kyphosis of 10° , and applying the previous guidance of perceived risk at around half the actual theoretical angle, it can be seen that both the perceived and actual risk of backwards rotation during fore-and-aft or pitch oscillation would be higher than in the orthogonal coplanar axes.

Psychological factors: potential effects at frequencies between 0.2 and 0.4 Hz

There might have been a psychological effect caused by fear of falling backwards during pitch oscillation with no backrest during low frequency oscillation, (when consequently the pitch amplitude was greatest). Although subjects were seated with foot straps, and safety nets behind them during pitch oscillation with no backrest – and the efficacy of these precautions was demonstrated before the experiment commenced, it might have been a feature of our population that they carried some inbuilt aversion to ‘falling over backwards’ and this led to much increased discomfort during pitch oscillation.

Motion sickness: potential effects between 0.2 and 0.4 Hz

The differences between roll and pitch oscillation at frequencies between 0.2 and 0.4 Hz might also be explicable by effects related to the vestibular system if pitch oscillation at these frequencies and magnitudes was known to provoke motion sickness more rapidly than roll oscillation. In practice present research [*J Joseph in preparation*] indicates that roll and pitch oscillation are approximately equally provocative. Additionally the very short exposures combined with the mix of frequencies in this work did not lead to motion sickness type symptoms arising among this population, although a few subjects complained of disorientation during both roll and pitch oscillation and requested a short break.

8.1.1.4 The relationship at frequencies between 0.4 and 1.6 Hz

The relationship between discomfort in the coplanar axes between 0.4 and 1.6 Hz may be explicable from changes in biodynamic parameters. However only limited information is available at present.

Effects within coplanar axes: subjective and biodynamic data

At present, only apparent mass data with a matched subject set for lateral and roll oscillation are available. The normalised median lateral apparent mass increased with frequency during roll oscillation, becoming at 2 Hz about 3 times its value at 0.2 Hz when there was no backrest, and approximately 4 times the 0.2 Hz value when a backrest was present. By contrast during lateral oscillation there was a much smaller increase, although the presence of a backrest affected the order of the increase in the same way as it did during roll oscillation Gunston (2003; 2004). Comparison of these results with the median lateral and fore-and-aft comfort contours determined in this work, appears to show that above about 0.4 Hz during roll, and to a lesser extent lateral, oscillation discomfort increased as apparent mass increased. These results indicate similar trends to those observed in this work where,

with increasing frequency, rotational oscillation gave rise to much greater discomfort than translational motion.

The implications for evaluation, assessment, and prediction of these findings are discussed further below in the context of examining the applicability of simple extensions to the presently standardised predictive methods.

8.1.2 Frequency-dependence of discomfort

It was hypothesised that the frequency-dependence of discomfort would show that sensitivity to acceleration increases with increasing frequency of oscillation.

This was an hypothesis based on the observation that in a static condition there can, by definition, be no vibration discomfort, and that it was already known that there was in both translational and rotational axes evidence that the rate of increase of sensitivity to acceleration decreased as the frequency declined to approximately 2 Hz. Further, since in accordance with Ebe and Griffin's (Ebe and Griffin, 2000a; 2000b) model of the interaction of static and vibration discomfort it was expected that the detection of the vibration discomfort component would only be possible when it was positive, hence the hypothesis.

Except during fore-and-aft oscillation with a backrest, the level of all contours of equivalent discomfort varied across the studied frequency range ($p < 0.002$; Friedman), being strongly negatively correlated with increasing frequency ($p < 0.005$ Spearman). See Table 9 for summary details of tests on the contours before adjustment. The results after adjustment were, as would be expected, identical. These results, in general, support the hypothesis proposed: that sensitivity to acceleration increases with increasing frequency (Figure 8-3). The exception, fore-and-aft oscillation with backrest, serves in some sense as a partial positive control for the other axes, since subjects' bodies were extremely well supported, and able to react to the predictable and moderate levels of acceleration to which they were exposed, with the consequence that the changes in discomfort with increasing frequency were modest. This exception illuminates the differences in the nature of the increase between rotational and translational axes.

8.1.2.1 Frequency dependence: subjective and biodynamic data

Transmissibility: from seat to head

In a series of studies using similar methodology Paddan and Griffin explored the transmission of vibration to the heads of seated subjects. In these experiments there was a single input at the seat (e.g. in the fore-and-aft axis) and the transmitted vibration to the head was measured in six axes.

The input stimulus in the translational axes was a random signal band passed at 0.25 and 16 Hz, of 60 s duration, which was delivered in a back-on posture. When the input was in the fore-and-aft or lateral axis Paddan and Griffin (1988a) the dominant effect near the frequency range covered by this work in the fore-and-aft axis was a sharp peak in fore-and-

aft, vertical and pitch seat to head transmissibility around 2 Hz. When the seat input was in the lateral axis there was a similar finding in the lateral, vertical, roll, and yaw axes of head motion. In the context of the findings of this work concerning the frequency dependence of discomfort it is clear that the peaks in transmissibility (i.e. greatest head movement) occur near the same frequencies where the comparable equivalent comfort contours indicate subjects' experienced greatest discomfort.

Studies similar to those in the translational axes were conducted in the roll and pitch axes, also by Paddan and Griffin (1994a). In this case the signal was a flat random spectrum 0.122 to 5 Hz for 120 s duration, and the seating condition was with backrest (as in the translational axes). In the case of the input being roll vibration, the dominant transmissibility's were in the lateral, roll and yaw axes of head oscillation, In the case of the lateral axis of head oscillation the highest transmissibilities were at frequencies below 1.5 Hz, presumably due to the effect of the $g \cdot \sin(\theta)$ term being detected. In the roll axis of head oscillation the region of maximum motion was at approximately 1.5 Hz and in the yaw axis of head oscillation about 2 Hz. When the seat input was in the pitch axis the dominant head motion was recorded in the mid-sagittal plane, i.e. the fore-and-aft, vertical, and pitch axes. The fore-and-aft axis of head oscillation recorded high transmissibility below 1.5 Hz (presumably also due to the $g \cdot \sin(\theta)$ term being detected). In the pitch axis of head oscillation there was a broad peak in transmissibility between about 1.5 and 3.5 Hz. In the vertical axis of head oscillation there was a better defined peak at about 2 Hz. As with the translational studies above, the peaks of transmissibility (greatest head movement) are at approximately the same frequencies where subjects experienced greatest discomfort during oscillation in both the pitch and roll axes.

Both the above studies (Paddan and Griffin (1994a; Paddan and Griffin, 1988a) indicate that there was substantial inter-subject variability in transmissibility. It seems probable that at least some of the variability in the data this work may be attributable to variations in the resonance frequencies among the study population.

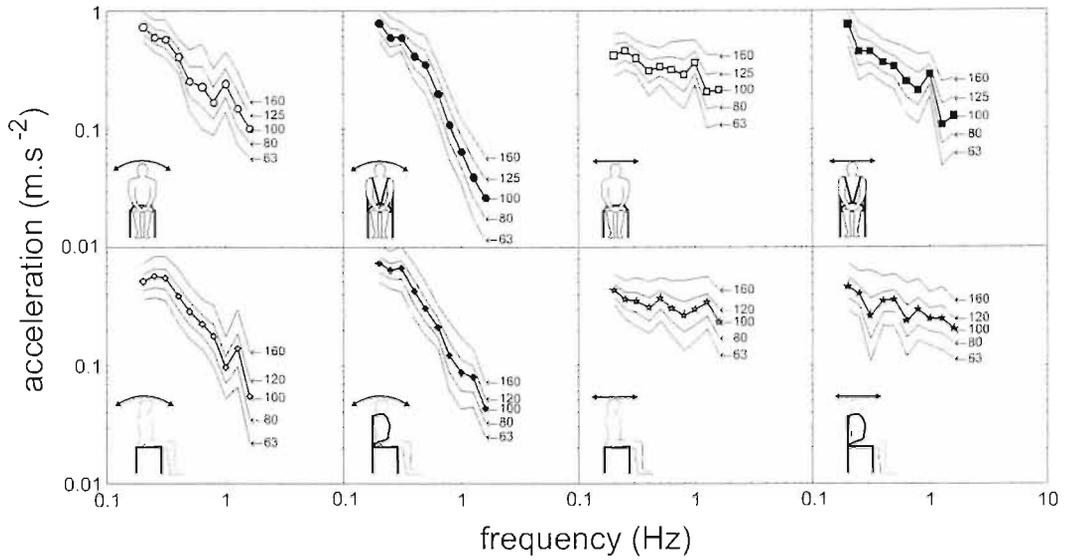


Figure 8-3 The effect of frequency and magnitude on the level of the equivalent comfort contours arising from exposure to oscillation in the rotation and translation on both a flat rigid seat and a rigid seat with a backrest. The 100 contour (bold) represents discomfort approximately equal to that caused by exposure to a 0.5 Hz, 0.315 m.s⁻² r.m.s. sinusoid in the same axis.

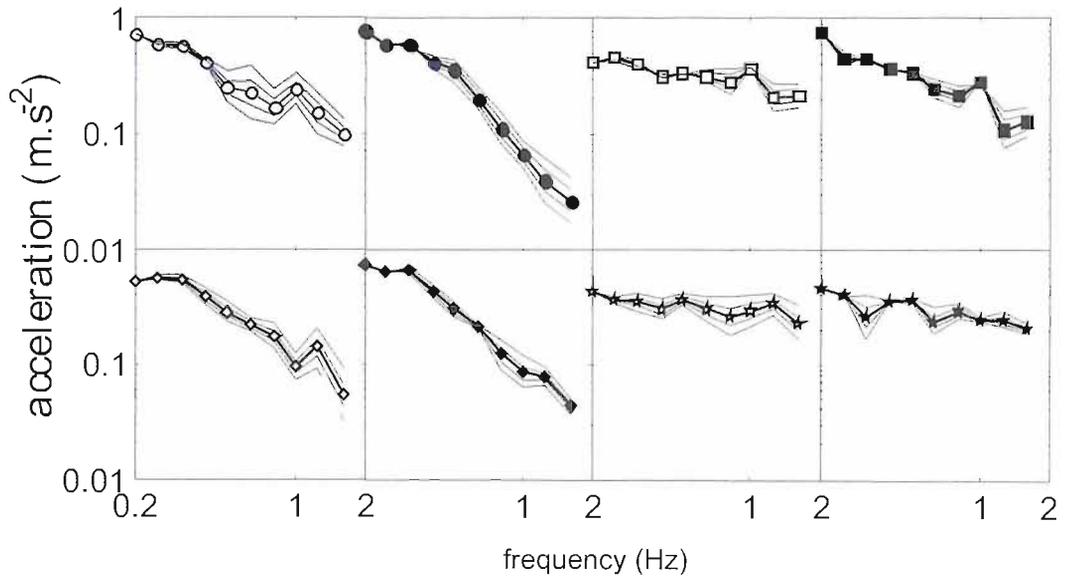


Figure 8-4 The effect of magnitude on the acceleration equivalent comfort contours in all the studied axes. The contours have been normalised to the level of the 100 contour at 0.2 Hz in order to facilitate effective comparison of the size of the effects. Circular symbols relate to roll, squares to lateral, diamonds to pitch and stars to fore-and-aft. Open symbols indicate no backrest, and filled with backrest.

Table 9 Friedman and Spearman's ρ statistics showing the significance of changes in the equivalent acceleration contours in the roll, lateral, pitch, and fore-and-aft axes together with their direction on a plot of acceleration versus frequency (i.e., negative correlation implies increasing sensitivity with increasing frequency)

| | no back | no back | with back | with back |
|--------------|------------------|---------------------------|-----------|---------------------------|
| | Friedman (p) | spearman's ρ (p) | Friedman | spearman's ρ (p) |
| Roll | <0.001 | -0.964 (< 0.001) | <0.001 | -0.988 (< 0.001) |
| Lateral | <0.001 | -0.927 (< 0.001) | <0.001 | -0.891 (= 0.001) |
| Pitch | <0.001 | -0.952 (< 0.001) | <0.001 | -1.000 (< 0.001) |
| fore-and-aft | = 0.002 | -0.806 (= 0.005) | = 0.072 | -- |

8.1.2.2 Effect of frequency during rotational oscillation

Acceleration at the head and neck:

The rate of increase of sensitivity (of the contour) with increasing frequency was greater during rotational oscillation when a backrest was present than when it was not. Much of this increase seems to have been associated with the enforced exposure of the head to acceleration components arising particularly from rotation. Using as a translational proxy for these components $r.\alpha$ (the acceleration tangential to the arc described by the top of the backrest) and comparing this with the equivalent comfort contour expressed in terms of the acceleration in the plane of the seat it is seen that at 0.2 Hz the backrest $r.\alpha$ term is very approximately 10% of the seat horizontal component, while at 1.6 Hz the reverse is true. Geometrically this occurs because, for constant angles of oscillation (i.e. constant acceleration in the plane of the seat) the tangential acceleration ($r.\alpha$ term) increases in proportion to the square of the frequency of oscillation – however, in this case the acceleration range of the stimulus set decreased with increasing frequency (for reasons of safety and psychophysical prudence), limiting the increase in the $r.\alpha$ term. Coupling this finding with observational data of subject behaviour during both rotational and translational oscillation, where there was no backrest, together with the quantitative evidence gathered during the later investigations into the effect of posture during roll and pitch oscillation was helpful in understanding subjects' tendency to attempt to keep their heads in approximately stable in earth referenced co-ordinates. Unfortunately, at frequencies towards the upper end of the studied range, the ability to execute this competently, even during exposure to predictable signals, became poor (Chapter 6). Perversely this interaction of self and externally induced oscillation may have increased, perhaps substantially, the severity (in terms of acceleration magnitude at the head) of the exposure subjects received. Investigation of these effects, particularly with more complex signals, reference to cross-axis movement of the head, and phase differences between different parts of the upper body, might offer illuminating results of practical utility.

During translational oscillation it was apparent from observation that most subjects were unable or unwilling to keep their upper bodies perpendicular to the seat surface during oscillation with no backrest. Interpreting the phase relationship visually was difficult, because

it was not always constant with time, and further apparently varied by spinal segment, which is to say, the head and cervical region were not necessarily moving monolithically with the thoracic and lumbar segments. It may be that, as with rotational oscillation subjects were attempting to minimise the acceleration at their head and neck by this behaviour. However particularly at 0.5 Hz and greater frequencies it was not clear that their control was entirely voluntary. Therefore as with rotation, the potential for subjects to exacerbate their exposure was present. When the oscillation was on a seat with a backrest it was similarly evident that subjects' heads did not always move in phase with the platform.

Despite the variability in response, it was noticeable that the variation in most subjects response, when seated with or without a backrest, was established in response to an initial phase lag between the head and the seat surface, which was subsequently overcorrected. The presence of this overcorrection, during the relatively low magnitudes of acceleration to which subjects were exposed, indicates that future modelling of this environment should consider the freedom of the upper body to behave in this way.

8.1.3 Magnitude-dependence of discomfort

It was hypothesised that the magnitude-dependence of discomfort would demonstrate similar non-linearity to that observed in other studies. In summary this work showed that except during exposure to translational oscillation on a seat with backrest the rate of growth of discomfort with increasing vibration magnitude varied significantly across the studied frequency range, being in all these cases negatively correlated with increasing frequency. (Table 9, Table 10). Normalised, and non-normalised plots of the effect, within the studied range of magnitudes, on the acceleration comfort contours are at Figure 8-5 and Figure 8-3 respectively.

Table 10 Friedman and Spearman's ρ statistics showing the significance of changes in the rate of growth of discomfort with increasing vibration in the roll, lateral, pitch, and fore-and-aft axes together with their direction on a plot of acceleration versus frequency (i.e., negative correlation implies reducing rate of growth with increasing frequency)

| | no back | | With back | |
|--------------|------------|-----------------------|------------|-----------------------|
| | Friedman p | Spearman's ρ & p | Friedman p | Spearman's ρ & p |
| Roll | < 0.001 | -0.685 (= 0.029) | < 0.001 | -0.952 (< 0.001) |
| Lateral | = 0.004 | -0.758 (= 0.011) | = 0.121 | -- |
| Pitch | = 0.003 | -0.964 (< 0.001) | = 0.001 | -0.794 (= 0.006) |
| fore-and-aft | = 0.001 | -0.842 (= 0.002) | = 0.295 | -- |

Where the rate of growth of discomfort varies with frequency the resulting equivalent comfort contours are, by definition, non linear with magnitude, since the n value describes the increment of the perceptual magnitude associated with an unit increment in the physical magnitude of the stimulus. Since, except in the case of translation with backrest, a greater perceptual increment occurred at lower frequencies than at higher frequencies per unit increment in the acceleration in the plane of the seat, the contours have differing shapes with different magnitudes. However, since the objective of this study was to investigate the

similarity (or otherwise) between the discomfort arising from exposure to acceleration in the plane of the seat during rotational and translational oscillation it was necessary to severely limit the investigated range of magnitudes in order to achieve stimuli of sufficiently similar discomfort to avoid subjects experiencing potential scaling difficulties, or being exposed to harmful stimuli. Hence the effect of magnitude is not visualised as efficiently as it might have been had each of the axes been investigated independently with a greater range of magnitudes. Except during translational oscillation on a seat with a backrest, there were large changes in the rate of growth of discomfort and hence it would be important to consider magnitude effects were applications or extension to this work proposed at greater, or lesser magnitudes than those studied.

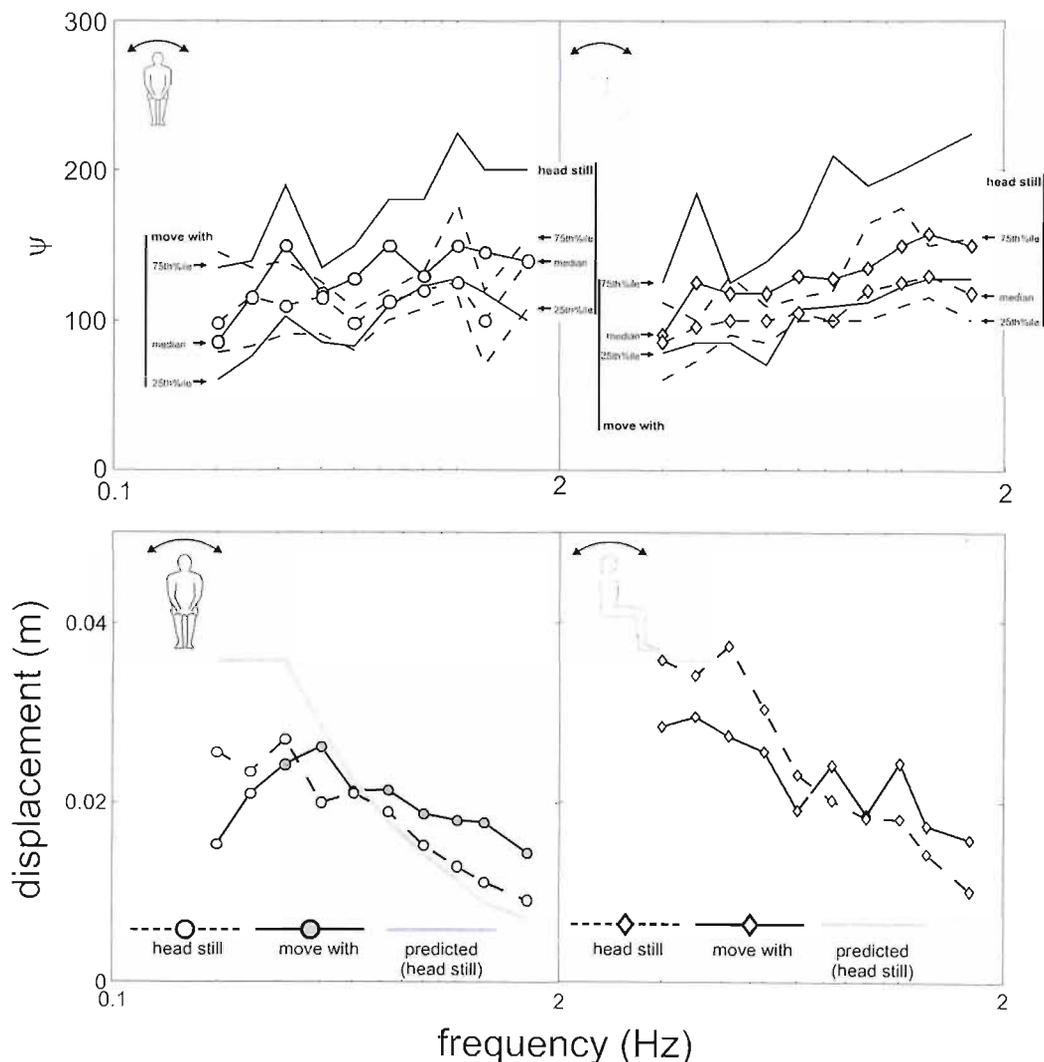


Figure 8-5 Combined figure showing variation of magnitude estimates of subject discomfort together with actual and predicted shoulder position for two postures 'head still' during which subjects attempted to keep their head still in earth referenced co-ordinates, and 'move with' during which the objective was to keep the head still in seat referenced co-ordinates.

8.1.3.1 Comparison of the rate of growth of discomfort with other studies

This author is unaware of other studies of the effect of frequency on rate of growth of vibration discomfort with increasing vibration magnitude during rotational oscillation. Accordingly, during the experiments designed to investigate the effect of posture a partial replication of the investigation into these effects was executed, and this demonstrated very similar frequency dependence, and similar variability although the n values observed in the replication were at a slightly lower median level than in the original experiments. There are more studies with which this work may be compared in the translational axes, although only with fore-and-aft oscillation is there a useful overlap. This comparison (Figure 8-6) shows similar frequency dependence during exposure to fore-and-aft oscillation where seat and feet move synchronously (Price, 2002), and the indications are that Morioka and Griffin's (2006) study during lateral oscillation would have displayed similar characteristics to those in this work, had their frequency range been extended.

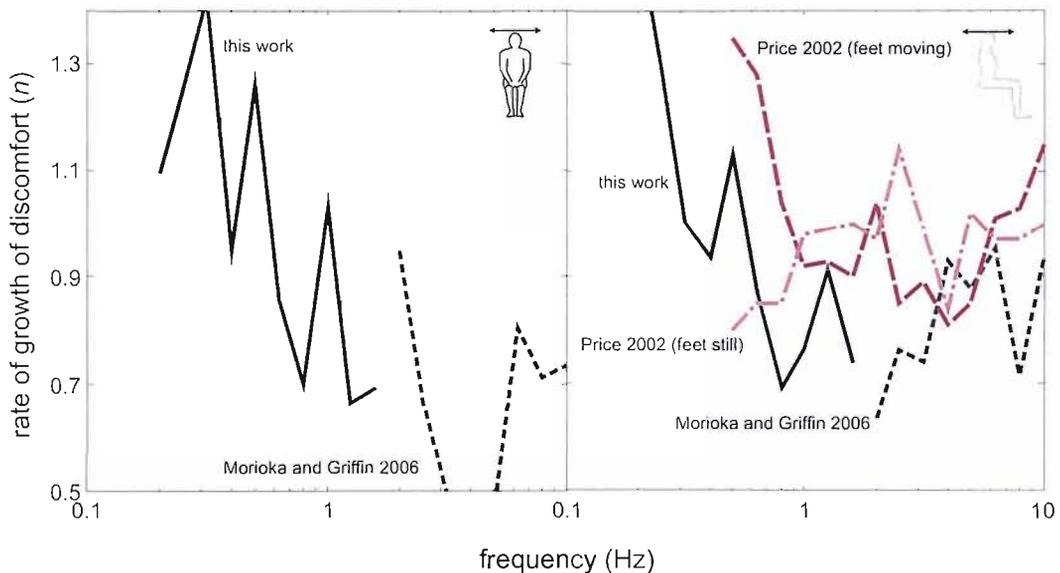


Figure 8-6 Comparison of the rates of growth of discomfort reported by other authors at comparable frequencies and in similar seating conditions.

8.1.4 Effect of backrest on discomfort

It was hypothesised that the presence of a backrest would reduce discomfort at the lowest studied frequency (due to its stabilising effect) and increase discomfort at the highest studied frequency in all axes, and further that it would alter the dominant location of discomfort.

In summary, this work found that during translational oscillation the presence of a backrest reduced discomfort during fore-and-aft oscillation and increased it during lateral oscillation. By contrast, during rotational oscillation at frequencies above 0.5 Hz the presence of a backrest increases discomfort, (dramatically so in the case of roll oscillation). At the lowest frequency, 0.2 Hz, the presence of a backrest reduced discomfort during roll oscillation. The

effect of backrest in the rotational and translational axes is effectively summarised in actual and percentage terms at Figure 8-7.

The physical explanations for the increase in discomfort during rotational oscillation centre on the increase in the $r\alpha$ term, (where α is the angle through which the seat rotates relative to an earth vertical reference) at the top of the backrest and are outlined in some detail in paragraph S.8.1.2. It is suggested that during fore-and-aft oscillation the presence of a backrest reduces discomfort because it prevents pitch oscillation of the upper-body, reducing the exposure of the upper-body to self-induced rotational acceleration and potentially reducing the psychological stressor of fearing falling backwards.

8.1.4.1 Effect of backrest: subjective and biodynamic data

Transmissibility: from seat to head

Paddan and Griffin (1988b) also investigated the effect of backrest on the way vibration was transmitted to the heads of subjects during single-axis oscillation at the seat. During fore-and-aft oscillation there was uniformly greater head motion where subjects were seated with backrest than without. This increase in head motion was particularly evident (at the frequencies this work is concerned with) in the fore-and-aft, vertical and pitch axes. When the oscillation was in the lateral axis at the seat, head motion was generally similar with and without a backrest except in the lateral and yaw axes where head motion was increased. These results are not immediately reconcilable with those in this work. The studies of discomfort in this work showed that during fore-and-aft oscillation discomfort was greater (although not markedly so) with no backrest, than with backrest. In the case of lateral oscillation discomfort, particularly at frequencies greater than 0.4 Hz, discomfort was very much greater with a backrest than without. A number of interpretations of the difference between the results in this work and those of Paddan and Griffin (1988b) may be offered: first the backrest conditions differed substantially between studies. Paddan and Griffin (1988b) did not secure their subjects to the backrest as was done in this work. Therefore, particularly during fore-and-aft oscillation there may have been a degree of 'back slap' which would have increased the degree of head motion in that work relative to this. Secondly it may indicate that although head motion is an important variable in predicting discomfort during translational oscillation it is not the only one, and that particularly where there is no backrest.

During pitch and roll oscillation (Paddan and Griffin, 1994a) there was a marked reduction in head motion when subjects were seated with no backrest relative to an exposure with backrest. Similarly in this work, exposure on a seat with no backrest reduced discomfort relative to exposure with backrest. However the degree of reduction of discomfort during pitch oscillation was relatively much smaller than the dramatic reduction observed in the transmissibility (particularly in the fore-and-aft and pitch axes). This perhaps indicates again that head motion is one of the important variables rather than the sole determining factor of discomfort during low frequency oscillation.

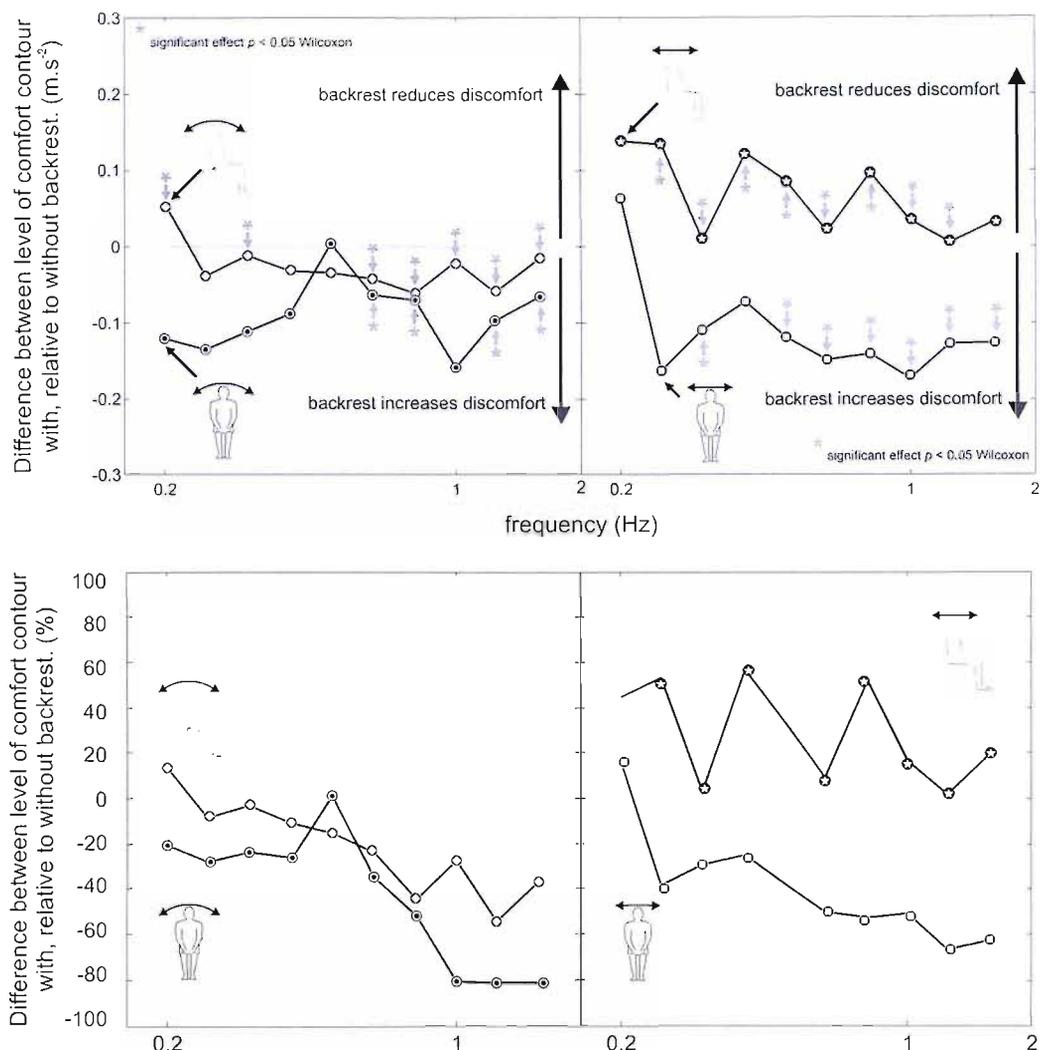


Figure 8-7 The difference between the level of the comfort contour with, relative to without backrest in acceleration and percentage terms.

8.1.5 The relationship between the discomfort arising from exposure to fore-and-aft and lateral oscillation

It was hypothesised that, in accordance with previous research at greater frequencies, the discomfort arising from exposure to lateral or fore-and-aft oscillation on a seat with no backrest at any given frequency would be approximately equal.

The findings of this work supported the hypothesis, at least in terms of the level of the median equivalent comfort contour. The rates of growth of discomfort varied with frequency as shown in Table 9, but in general the rate of growth of discomfort did not vary significantly between lateral and fore-and-aft oscillation. The finding corroborates that of other work at similar frequencies (Griefahn and Brode, 1997) and at higher frequencies (Rao and Jones, 1978) using a variety of psychophysical methods. Convincing physical and psychological explanations of the equivalence are less straightforward, since as noted above in S 8.1.1.2, the anatomy of the pelvis varies greatly between the median sagittal and median coronal

planes. However, as Whitham and Griffin (1978) showed at 2 Hz, and this work also demonstrated at lower frequencies, discomfort is poorly localised at the ischial tuberosities particularly during oscillation without a backrest. One interpretation of this finding would be that spinal flexion, extension, and adduction and abduction at the lumbar and higher levels play an important role in creating the sensations the subjects in this study reported as discomfort. This might be investigated by attempting to correlate muscular activity, measured for example by EMG, with subjective perceptual estimates.

8.1.6 Exposure with and without backrest: effects between orthogonal axes

In the course of this work it was necessary to use more than one reference condition, as the systems for generating rotational and translational oscillation during the multi-frequency studies were discrete, and it appeared that transferring subjects from one piece of apparatus to another in the middle of each magnitude estimation trial was psychophysically undesirable since the transfer was not straightforward, and also ethically unsound as repeated transfers would have increased the probability that subjects might be injured during dismounting from the rotation simulator. Therefore, as has been discussed in the course of Chapter 4 and Chapter 5 the relationship between rotational and translational oscillation was successfully determined using the 12 m longstroke facility at 0.2 Hz, resulting in contours approximately equivalent to the discomfort arising from exposure to lateral or fore-and-aft oscillation on a seat with a backrest.

The experiment presented in Chapter 7 determined the relationship between the discomfort arising from exposure to fore-and-aft and lateral oscillation at 0.5 Hz on a seat with no backrest provided information about the nature of this relationship. Technically, this information alone might not have solved the problem, since there remained the difference in the backrest conditions, but as we have seen there was only a small difference between the lateral and fore-and-aft contours at 0.5 Hz. Accordingly, the contours from Chapter 7 were used to define the relation between the discomfort arising from lateral and fore-and-aft oscillation, and the lateral with backrest and roll with and without backrest contours were adjusted by ratio so that the relationship they had with the lateral without backrest contour in Chapter 4, was also the relationship they had with the lateral without backrest contour in Chapter 7. The same process was undertaken with the relevant fore-and-aft and pitch contours. The resulting equivalent comfort contours are shown in Figure 8-8. Having regard to the level of inter-subject variability in the data, the errors introduced by this small adjustment by ratio, seem likely to be reasonable, although their magnitude can, of course, not be formally assessed. No statistical analysis of the effect of frequency or magnitude on the relative discomfort between for example roll and pitch oscillation can be meaningfully accomplished on these data, nor was this the purpose of the work. Effective and rapid investigation of these effects probably requires a q degree of freedom motion simulator capable of reproducing with good fidelity these low frequency oscillations in multiple axes.

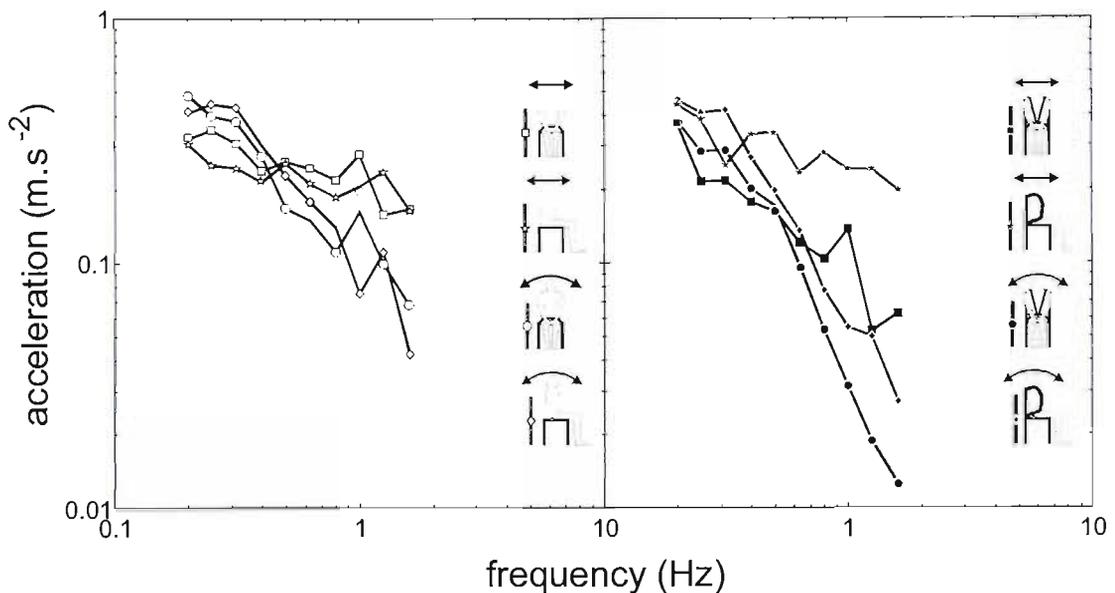


Figure 8-8 Adjusted roll, lateral, pitch, and fore-and-aft contours adjusted so that each produces discomfort approximately equivalent to that arising from exposure to sinusoidal lateral oscillation at 0.5 Hz, 0.315 m.s⁻² r.m.s.

8.2 Other hypotheses which might have been pursued

8.2.1 Correlation of perceptual estimates with physical measures arising from exposure to oscillation.

It might be hypothesised that perceptual estimates of discomfort (e.g. magnitude scaling judgements) arising from exposure to oscillation at a given frequency would be correlated with physical measures of the effect of acceleration (e.g. apparent mass or transmissibility). This would have been a reasonable approach to take but it was not initially adopted, partly because it was then unclear to what extent the acceleration in the plane of the seat could be used as a predictive parameter. It was also apparent that at the lowest frequencies of interest subjects would be able to respond in more than one way during oscillation, and it was evident that this would greatly complicate interpretation of biodynamic data. In later experiments (e.g. that described in Chapter 6 physical measures (in that case shoulder displacement) were employed to improve understanding of the psychophysical data, since by that stage there was sufficient information to describe and conduct a properly controlled experiment.

8.2.2 Effect of alternative backrest conditions

It could have been hypothesised that the discomfort arising from exposure to oscillation with a backrest height (or restraint condition) in between the apparent extremes selected in this study would have produced lesser discomfort than the conditions used in this work. With the

benefit of hindsight this would have been interesting, and at various points in this work there has been speculation about what the effect of a half height backrest (for example) might have been. Clearly these would be interesting and potentially useful studies to conduct in the future. However, at the point of departure very little was known about the effect of the presence of a backrest at these frequencies on discomfort, and in keeping with previous fundamental studies it seemed appropriate to begin with just two conditions.

8.2.3 Rotation about axes other than those passing through the plane of the seat surface

The purpose of this work was to investigate the possible similarity between the discomfort arising from exposure to translational, and rotational oscillation where the centre of rotation was at the seat surface. Parsons and Griffin (1978b) described a clear effect of off-axis rotation at frequencies similar to and greater than those in this study, whereby the discomfort arising from rotational oscillation rapidly became predictable providing the discomfort arising from pitch or fore-and-aft oscillation at the amplitude of the basal chord of the arc through which the seat surface rotation was known (see, for example, the effective prediction of the results of Shoenberger (1979) by Griffin *et al.* (1982)) Earlier authors work, e.g. Simic (1970), were also suggestive that this effect would be detected. However this study has shown that subjects respond differently to low frequency oscillation than they do to vibration at higher frequencies, and the indication is that the oscillation of the head and neck is an important factor in the discomfort subjects experience at the frequencies investigated in this work. Accordingly, given knowledge of the actual translational oscillation of the head during rotational oscillation (developed from a study similar to that described in Chapter 6) it might be hypothesised that exposure to translational oscillation of approximately this amplitude in the coplanar axis would cause similar discomfort. This might make a valuable contribution to the development of new weightings to describe the phenomena identified in this work by more precisely identifying the region of the body which is responsible for the majority of discomfort at these frequencies. Further, a study with different axes of rotation using a psychophysical method more efficient than that employed by Parsons and Griffin (1978b), for example magnitude estimation or cross-modality matching, would yield information about the effect of magnitude at different separations from the axis of rotation.

8.3 Were the independent variables correctly specified?

8.3.1 Visual conditions

In keeping with previous fundamental studies, subjects participating in this work wore blindfolds (or in one small initial study had a very restricted view). However, this restriction of view is abnormal for many (but not all – e.g. armoured fighting vehicles) of the situations

where oscillations within this frequency range form an important part of the motion spectrum. There were some limited indications in preliminary trials for the conditions where the effect of posture were investigated that vision might be an important independent variable. However it was not possible to continue with the investigation because the setting of the equipment did not permit the isolation of subjects visual fields in any meaningful way, and therefore the risk of environmental artefacts was perceived as too high.

8.3.2 Aural conditions

The levels of aural masking necessary to mask sounds of the vibrator operating were considerable, usually around 80 to 85 dB(A), and there was the potential for some subjects to find this wearisome, and possibly, in some cross modal sense, for the aural masking to contaminate the discomfort subjects reported (even though they were explicitly instructed to judge discomfort based on the vibration they received). Discreet but regular questioning by the experimenter allowed this risk to be monitored, and there was no conclusive evidence that this was an important problem. It is possible however that this problem contributed to intra-subject variability and perhaps also, since subjects were not screened for abnormal sensitivity to noise before studies commenced, to inter-subject variability. However, since all the experiments described in this thesis were fully balanced it is unlikely that these effects will have contributed to any systematic bias.

8.3.3 Seating configuration

In this work, rigid seats and backrests were used throughout. This permitted integration with data from previous authors, and avoided complications related to managing the unknown effect of the cushion on the vibration transmitted to the person, which might plausibly have been very different during rotation and translation. However the use of rigid seats also brought with it a significant disadvantage, namely substantial, and probably time variant, static discomfort. Experiments in this thesis were properly balanced preventing systematic bias due to this effect, but this time variant static discomfort is likely to have contributed to the inter-subject variability of these data.

8.3.3.1 Centre of rotation relative to anatomical landmarks

In this work the centre of rotation was at or, very close to, subjects' ischial tuberosities during experiments involving rotation. This positioning was controlled by the experimenter throughout the studies comprising this work. Due to the angles of view involved and the presence of normal clothing on subjects, the error associated with this control was, based upon observation, estimated to be ± 20 mm.

There are relatively few practical situations where the centre of roll is coincident with the ischial tuberosities, but for the purposes of determination of the frequencies between which subjects perceived rotational oscillation to produce similar discomfort to translational oscillation with an equivalent magnitude of acceleration in the plane of the seat, there was

no other useful configuration. Further, rotation where the input point is proximal to the ischial tuberosities, has become the accepted definition of 'roll' and 'pitch' for the scientific community investigating human response to vibration. Whether the results can be extrapolated to off-axis rotation has not been determined, and it would be difficult to do so without further investigation into the precise way discomfort arising from different components of motion are integrated by humans. However, there is no reason to suppose that the results are not capable of extrapolation to such oscillation, although it is likely that as the separation of the centre of rotation from the seat surface increases the rotational component will rapidly cease to be the dominant term in mediating vibration discomfort.

8.3.4 Control of airflow

The experiments described in this work were conducted in still air. However, during the majority of the studies subjects' movement relative to the laboratory would have caused them to experience apparent air flow. This would have provided weak cues to the amplitude of the underlying oscillation. Had these cues overwhelmed perception of discomfort then it would have been expected that examination of the correlations of physical and subjective magnitudes for all subjects in all conditions would show a lesser incidence of non-significant correlations where the amplitude of oscillation was greater. This was not the case, with the incidence of non-significant correlations being approximately evenly distributed across the frequency range.

8.4 Were the dependent variables the pertinent ones to study?

8.4.1 The angular and translational displacements, and their differentials as alternative dependent variables

Variation of an equivalent comfort contour expressed in terms of acceleration as a function of frequency is potentially compatible with the contour expressed in terms of velocity or displacement being independent of frequency. In such cases it might be preferable to report such an equivalent comfort contour in those terms. In the course of this work rotational acceleration has been routinely described in terms of the acceleration in the plane of the seat arising from rotation through the gravity vector, and the frequency dependence of this variable is now well established Chapter 4 and Chapter 5. Figure 8-9 shows the first and second derivatives of the angular displacement θ , which might be more conventional descriptors of such rotational acceleration.

The rotational acceleration θ'' was positively correlated with increasing frequency during roll and pitch oscillation without a backrest, and during pitch oscillation with a backrest ($p < 0.001$, Spearman). The rotational velocity θ' was negatively correlated with increasing frequency during roll and pitch oscillation with a backrest ($p = 0.005$, Spearman), and the

rotational displacement θ was negatively correlated with increasing frequency ($p < 0.001$, Spearman). Such results suggest that acceleration is an appropriate dependent variable, whereas in this study there is a mixture of backrest conditions. It is noteworthy though that at the frequencies in this work it was found that rotational velocity on a flat rigid seat was statistically independent of frequency. For completeness, Figure 8-9 also shows the translational equivalent comfort contours in terms of velocity and displacement. As is evident from inspection of the acceleration contours, the velocity and displacement contours are highly dependent on acceleration.

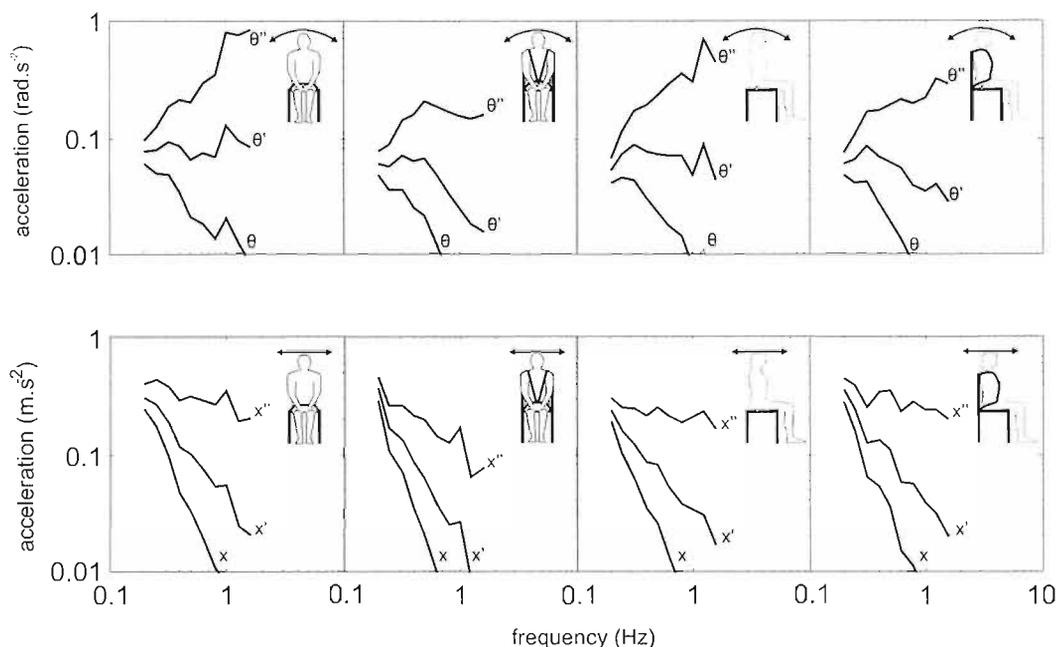


Figure 8-9 Displacement, x and θ , velocity x' and θ' and acceleration x'' and θ'' : contours equivalent to the discomfort produced by exposure to a 0.5 Hz, 0.315 m.s^{-2}

8.5 Comparison with previous studies

8.5.1 Rotational oscillation

There are only a few rotational studies with which it is possible to meaningfully compare equivalent comfort contours produced in the course of this work. This is either because of uncertainty about, or the known distance of, the seat surface from the centre of rotation; or because of incompatibility in the final form of the data. An example of the latter problem is work by Shoenberger (Shoenberger, 1984a; 1984b) where response accelerations without the rate of growth of discomfort were reported. The results of Parsons and Griffin (1982) have already been discussed with respect to the findings of this work in Chapter 4 and Chapter 5. However their results together with those of Pradko (1965) and Dempsey *et al.* (1979) are shown alongside those obtained in this work in Figure 8-10. The contribution this work makes in terms of investigating response at frequencies which have not been previously studied is immediately apparent, as are the compatible trends in frequency.

During roll and pitch oscillation, the suggestion that this work and those of other authors might be used to form a rudimentary magnitude series ought properly to be resisted on the grounds that either the seating condition varied, as in Parsons (1982), or the methodology was suspect as in Dempsey *et al.* (1979) and Pradko (1965). The magnitude difference between the contour attributable to Pradko (1965) and this work is so great, that while those magnitudes may conceivably be a matter of discomfort at higher frequencies, were they to be simply linearly extrapolated to lower frequencies the resulting contour could not conceivably represent 'discomfort'. Serious health consequences might seem a more likely outcome.

In pitch oscillation there was a notable excursion in the level of the contour, indicating a reduction in discomfort at 1.25 Hz reported in this work. Although this was not exactly mirrored in the work of Parsons (1982), their work did demonstrate a similar but less pronounced phenomenon at 1.6 Hz. These excursions might have some shared causal factor, with the difference in frequency between them being attributable to either differences in subject characteristics, or more likely to the small amount of relative motion between the moving seat and stationary feet in Parsons (1982) work which was not present in this work. Given the observed predominance of lumbar bending during pitch oscillation at these frequencies as subjects attempted to maintain their centre of mass between the forward seat-thigh contact points and their ischial tuberosities, it may be that this change in the contour is attributable to some local resonance in the lumbar-sacral-pelvic anatomical complex. However further detailed biodynamic studies would be required to demonstrate whether this was the case.

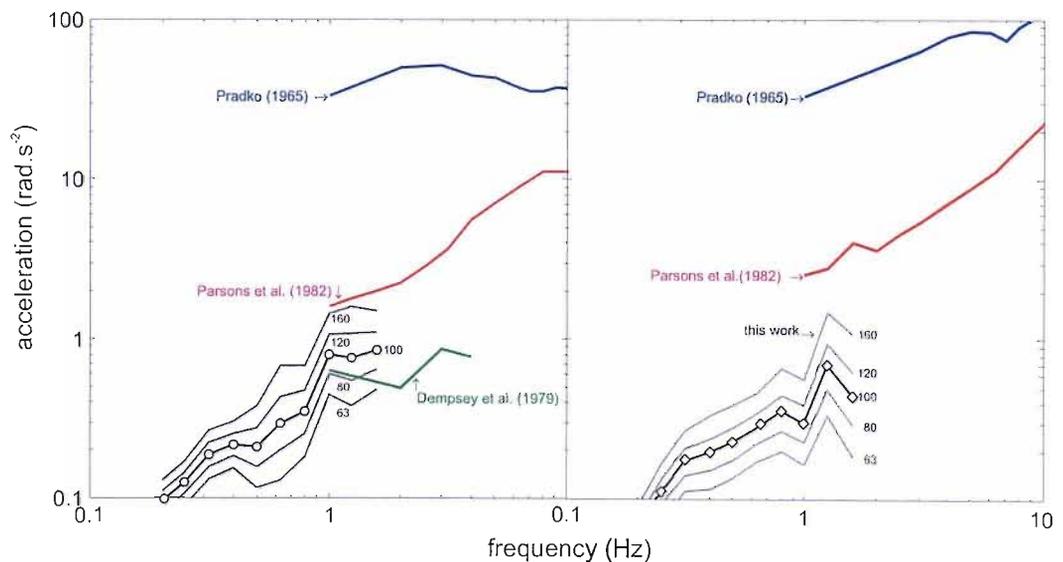


Figure 8-10 The work of previous authors compared with the results from studies in this work where subjects were exposed to oscillation on a rigid seat with no backrest in the roll and pitch directions. Contours from this work arising from exposure to 0.5 Hz, 0.315 m.s⁻²

r.m.s. (oscillation in plane of the seat during exposure in the lateral and fore-and-aft axes respectively on a rigid seat with no backrest)

8.5.2 Translational oscillation

In addition to the limited comparisons reported in Chapter 4 and Chapter 5 (where the form of the equivalent comfort contours arising from exposure to fore-and-aft oscillation on a seat with no backrest was compared with data from Price (2002) and in the lateral axis a similar comparison was made with data from reported by Corbridge and Griffin (1986)) Figure 8-11 permits comparison of contours from this work with the shape of median contours reported by a number of authors. There are some notable points. Firstly, this work reports at frequencies and magnitudes of motion which have not previously been surveyed. In view of the emerging evidence of the non linearity of discomfort with changes in magnitude this is an important contribution. Secondly, the general shape of the contours produced in this work are in keeping with previously reported work. This particularly so with regard to studies which have been recently completed using contemporary psychophysical methods (e.g. the study in the fore-and-aft axis by Price (2002)). Thirdly, as has been remarked elsewhere, the differences between this work and that by Morioka and Griffin (2006) are likely to be attributable to their use of a saddle for 5 m seat. It is not clear what the relationship between Morioka and Griffin (2006) and this work would have been had the former authors extended their range of study below 2.0 Hz. A saddle seat such as theirs might plausibly reduce discomfort during lateral oscillation by providing extended surfaces for reaction around the pelvis. Equally it is conceivable that it would increase discomfort during fore-and-aft oscillation since this could potentially become increasingly like pitch oscillation for the subject.

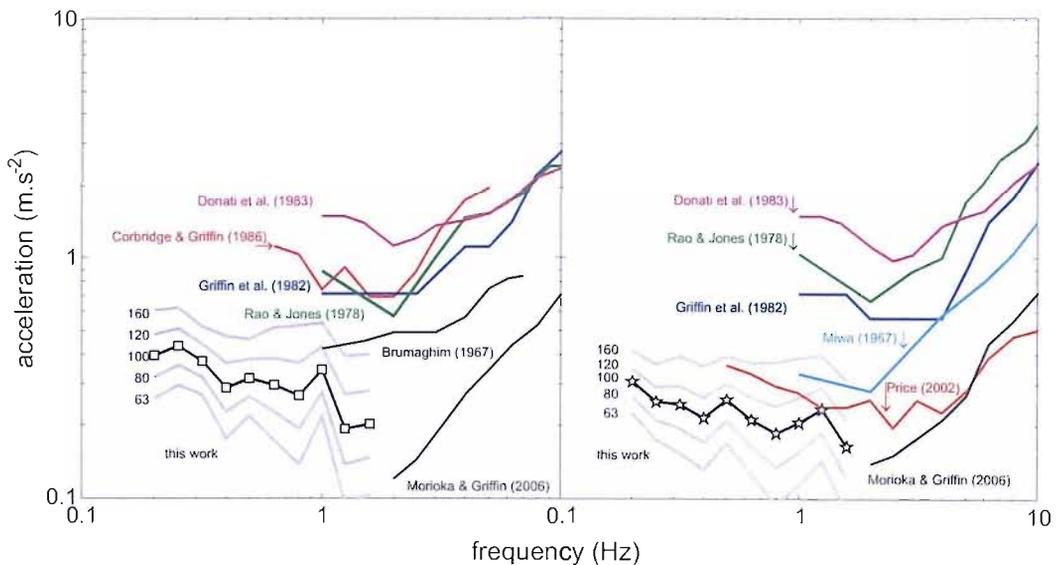


Figure 8-11 The work of previous authors compared with the results from studies in this work where subjects were exposed to oscillation on a rigid seat with no backrest in the lateral and fore-and-aft directions. Contours from this work arising from exposure to 0.5 Hz,

0.315 m.s⁻² r.m.s. oscillation in the lateral and fore-and-aft axes respectively on a seat with no backrest.

Chapter 9 Effectiveness of current predictive methods

9.1.1 The assumptions made to allow the application of the current predictive methods to this work

As was noted briefly in Chapter 4 and Chapter 5 strictly speaking the predictive methods described by BS 6841 (BSI, 1987) and ISO 2631 (ISO, 1997) are not applicable to frequencies below 0.5 Hz. Thus their application to the results of this work in the frequency range 0.2 to 0.4 Hz, where arguably the greatest density of novel information may be found was potentially problematic. It was desirable that the assumptions made should be generally applicable, reasonable, and not result in modification of the standardised weightings in the frequency range where they are claimed to be valid. Therefore an approach similar to that described in ISVR Technical Memorandum 808 (1996) for evaluating the potential health effects of hand transmitted vibration outside the range of the published weighting was adopted in order to permit the evaluation of the effectiveness of the weightings across the whole frequency range in this work. The Technical Memorandum stated: 'Where the vibration is dominated by energy ... at frequencies less than 8 Hz ... the weighting factors at 8 Hz ... should be applied'. Applying this principle in this work produced the asymptotic extension of the relevant weightings at 0.5 Hz, without band-pass filtering to lower frequencies. For the purpose of this discussion these extended weightings are those we refer to as the current weightings

9.1.2 Comparison between the frequency-dependence of the r.s.s. summed 'weighted contours' between orthogonal axes.

Previous discussions of the effectiveness of the current weightings in Chapter 4 and Chapter 5 was restricted to the coplanar pairs of axes. Therefore it was not possible to consider whether the imperfections in the model were similar between orthogonal pairs of axes (e.g. roll and pitch, or lateral and fore-and-aft). Such a comparison is important, because imperfections in the current weightings would be more tolerable if they were similar between orthogonal axes. One measure may be provided by considering whether the frequency-dependence of the 'weighted contours' (composed from r.s.s. summation of the weighted acceleration components) varies in the same way between orthogonal axes. Such a comparison (Figure 9-1) shows that except in the case of roll and pitch without backrest, the difference between the level of the r.s.s contours expressed as a percentage of their 0.2 Hz

level, was generally less than $\pm 20\%$, putting quantitative bounds on the impression from that the frequency dependence of the r.s.s. contour in these axes was broadly similar, except when roll and pitch oscillation are compared when the exposure was on a seat with no backrest where the variation increased with increasing frequency. The findings of Chapter 6 provide a partial explanation. There adopting a posture where the head was approximately stationary in earth referenced co-ordinates was shown to be associated with a marginal trend for reduced discomfort, but examination of the shoulder position of subjects during oscillation showed that they were much better able to adopt this 'head still' posture during roll oscillation than during pitch oscillation. This indicates that the accelerations subjects were exposed to at their heads during roll and pitch oscillation on a seat with no backrest are likely to have been considerably different which would explain the differences

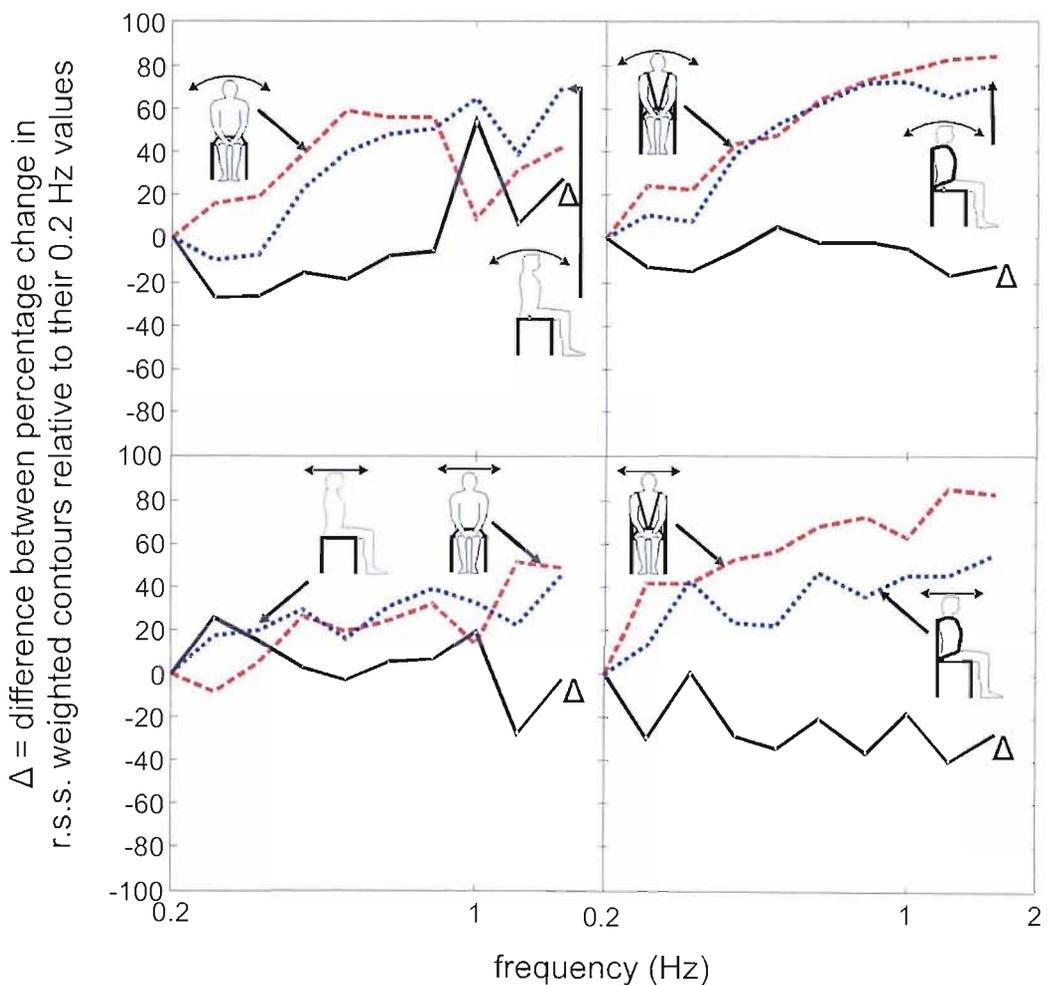


Figure 9-1 The difference (by subtraction) between the level of the relevant r.s.s. contours expressed in percentage terms relative to their value at 0.2 Hz.

9.1.3 The current weightings and the effect of magnitude determined in this work

This work demonstrates that the frequency-dependence of the equivalent comfort contours is subject to an effect of magnitude. Clearly therefore a weighting determined for one magnitude will not be precisely valid at other magnitudes. At higher frequencies, where it has become clear that there is a pronounced effect of magnitude, one weighting has sufficed as an approximate predictive model for many years. In many practical situations this approximation has given good results. In respect of this work some caution may be required as the range of magnitudes studied was much smaller than in the studies which were instrumental in forming the weightings now in use. However, before this work was completed there was no, or no adequate, information about the effect of oscillation at these frequencies and in these axes on discomfort the use of weightings derived from these data is likely to represent a real predictive improvement. This is particularly true in the case of the rotational axes where the magnitudes of oscillation at the lowest frequencies are comparable with those determined during field trials (e.g. Young and Suggs (1975)).

9.1.4 The potential importance of the phase relationship between oscillation at the feet, seat and head at these frequencies

The studies in this work have, so far as practicable, exposed subjects to oscillation which has been 'in phase' at the seat, feet, and head. Clearly, in the case of exposure on a seat with no backrest, subjects own self-motion in response to the input oscillation results in phase variation between the input and their head, but this uncontrolled variation is not the subject of this section. It is rather its purpose to consider whether variation in phase between inputs and the seat, feet, and head is likely to be an important factor in practical settings to which the experimental results from this work might be applied. Phase variation between inputs might occur in one of two ways. Firstly in the case of rotational oscillation the centre of rotation might vary, effectively altering the phase relationship. In this case, (which this work does not directly address), the discomfort is likely in practice to be predictable from the basal chord of the arc through which the seat surface moves (Parsons and Griffin (1978b)). Secondly, both during rotational and translational oscillation, phase variation might be introduced by lack of rigidity between elements of the seat, footrest and where present backrest. This lack of rigidity might be intentional (as in a suspension seat), or due to defective seat design. In the case of a suspension seat operating in the lateral or fore-and-aft axis (or potentially both simultaneously) such variation might become an important factor. Jang and Griffin (2000) conducted an investigation with stimuli in the vertical axis into the effect of phase (0 or 180 degrees) between seat and feet at frequencies between 2.5 and 6.3 Hz. Their subjects were most sensitive to the effect of phase at the lowest studied frequency, and the lowest investigated magnitudes (0.25 m.s^{-2} r.m.s.). Further investigations would be required to determine the applicability of these indications to the low frequency

lateral or fore-and-aft settings investigated in this work, and in practice given the magnitude of inter-subject variability determined in this work at these frequencies, one might suppose that such a suspension would need to be positively 'sloppy' at low magnitudes before the effects became practically important.

9.1.5 The need for modifications to the existing weightings.

As has been extensively discussed previously, the current weightings do not provide a perfect model for the discomfort arising from oscillation in the studied rotational or translational axes. The standardised weightings were constructed from knowledge of the discomfort arising from point inputs, and it is difficult to conceive logical approaches to their modification which do not rely on knowledge of which acceleration component is causing discomfort. In essence, the approach of this work, has shown that the current weightings are inadequate, but suggestions as to why the inadequacy arises, or how it might be rectified would require further work. Given that exposure to separate inputs at the seat, feet and back is inadvisable at these frequencies for reasons of safety, such work may be challenging. Other approaches able to reliably quantify the proportion of discomfort attributable to different components of acceleration might offer a productive experimental strategy. In this context the ability to simulate oscillation in q degrees of freedom with controllable magnitudes in the q^{th} degree is likely to be essential. In the absence of such information, the approach taken in this work of extension of the weightings without band-pass filtering provides a model of limited precision. When compared with the previous situation, of no information at these frequencies, this represents a considerable step forward.

9.1.5.1 Oscillation below 0.5 Hz: specific practical guidance

At frequencies less than 0.5 Hz, where the seating position of interest is very close to the centre of rotation, it is not necessary to detect whether the acceleration in the plane of the seat is due to rotational or translational oscillation when the exposure is without a backrest. This is also true when a backrest is present during roll and lateral oscillation. The ability to legitimately ignore the original source of the oscillation for evaluation purposes remains the case when the acceleration in the plane of the seat contains concurrent earth referenced translation and a $g \sin \theta$ terms, since this will only have the effect of altering the overall magnitude of the acceleration. The situation differs in pitch where there is a backrest as was outlined in Chapter 5, and in this case it is necessary to determine the relative contribution of rotation and translation to the acceleration in the plane of the seat and sum these using an appropriate procedure such as the fourth power method.

Therefore the weightings applicable to the relevant translational oscillation will be appropriate below 0.5 Hz when persons are seated with no backrest. In the case of both roll and lateral, and pitch and fore-and-aft oscillation, that is the horizontal acceleration in the plane of the seat (weighted by frequency weighting W_d)

It is possible that the phase of the rotational relative to the translational oscillation might affect the discomfort experienced, beyond the predictable change in magnitude. However this is felt to be unlikely to be important since in most practical applications rotation and translation are closely coupled. There is also some anecdotal evidence from participants into investigations into the motion sickness causing potential of differently compensated tilting train motions that where by roll compensation of the seat during lateral oscillation such that the acceleration in the plane of the seat remained approximately zero (100% compensation) that this situation did not provoke unusual discomfort.

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Subject Information Questionnaire – PART 1

About this Subject Information Questionnaire

Anonymity:

Your participation in this experiment is anonymous. In all discussions of this work and publications relating to it you will only be identified by subject number. However it is important for ethical and experimental reasons that we are able to identify those who participate in experiments. Data gathered in this way will be managed in accordance with the Data Protection Act.

Section 1 - About You

| | | | |
|----------------|-----------------|--------------------------------|-----|
| Subject ID | E2- | For completion by experimenter | 1.a |
| Forenames | | | 1.b |
| Surnames | | | 1.c |
| Status | Staff \ Student | Delete as applicable | 1.d |
| Age | | | 1.e |
| Address | | Road | 1.f |
| Address | | Area | 1.g |
| Post Code | | | 1.h |
| Contact phone | | | 1.i |
| E-mail address | | | 1.j |

Participation in further experiments

Use of the data in Section One

This experiment is part of a series that will be conducted over the coming months. If you would be willing for us to contact you to invite you, without obligation, to volunteer for further trials please answer YES to the question below:

Section 2 – Invitation to participate in further trials

| | | | |
|--|----------|----------------------|-----|
| I wish to receive information about further trials | YES \ NO | Delete as applicable | 2.a |
|--|----------|----------------------|-----|

Subject Information Questionnaire – PART 2

Section 3 – Anthropometric Data

| | | | |
|----------------|-----|--------------------------------|-----|
| Subject ID | E2- | For completion by experimenter | 3.a |
| Body Mass | | Shoulder width | 3.b |
| Total Height | | Waist Circumference | 3.c |
| Sitting Height | | Head Circumference | 3.d |

Instructions for Subjects

Introduction

Thank you for agreeing to participate in this research project. The aim of this experiment is to investigate the discomfort caused by rotational and translational whole-body vibration. This experiment will take approximately sixty minutes. The experiment consists of a preparation phase of the vibrator, and then an exposure phase. Please read and follow these instructions carefully.

Preparation Phase

- The experiment will be explained briefly to you and you will have opportunity to ask questions.
- You will be asked to give informed consent for your participation.
- You will complete a questionnaire and some anthropometric measurements will be made.
- You will practice the magnitude estimation technique.

Exposure Phase

During this phase you will be seated on the vibrator. You will be given a pair of headphones to wear and a microphone will be attached to your clothing. You will also hold an emergency stop button that you may use to stop the simulator moving at any time. You and the experimenter can speak to one another during the experiment, and the experimenter can observe you. The experiment may also be recorded on video.

- Your posture may affect the way that you feel discomfort. For this reason it is important that, **during motion**, you sit in a comfortably upright posture, **wearing the supplied eye mask and your head held as if you were looking straight ahead**, with your hands in your lap and your feet under the toe-strap. When you are seated with your back against the backrest ensure that the **whole of your back is in contact** with the backrest.
- You will be exposed to pairs of motions. The first one is a **reference motion** and the second one is a **test motion**.
- The **reference motion** represents a **discomfort** of 100. Your task is to choose a number that seems to correspond to the discomfort of the **test motion**, relative to the reference motion (e.g. 50, 200). Make sure that all your judgements are made on the **vibration you experience**, ignoring any **audible noise**. If you are unsure you may ask for the pair of motions to be repeated.
- From time to time the experimenter will ask you the location where you experienced the greatest discomfort during vibration.
- Prior to the actual tests you will have the opportunity to practice with several pairs of motions.
- You will be offered the opportunity for a short break during the experiment, and may ask the experimenter for a break at any point.

Sample of magnitude estimation training instrument

Pack 2

This material is designed to make you familiar with the method of magnitude estimation, which you will perform later in the experiment.

About magnitude estimation

Magnitude estimation is a measurement technique which relates a "reference stimulus," to one or more "test stimuli" in the following manner: Some attribute of the reference stimulus, for example, "brightness, discomfort, loudness, or length" is assigned an arbitrary reference value. The same attribute of a succession of test stimuli is then judged in relation to "reference stimulus" such that if the test stimulus is considered to display the studied attribute at twice the magnitude of the reference, it will be assigned a value twice that of the reference value. Likewise, if the test stimulus is considered to display the studied attribute at half the magnitude, it will be assigned a value half that of the reference value.

Examples of magnitude estimation

In the experiment you will be asked to judge the discomfort of a series of "test motions", relative to a "reference motion." Before this you will have an opportunity to practice magnitude estimation, judging the length of a series of "test lines" compared to a "reference line."

To prepare you for this task, please study the examples of magnitude estimates of the length of the "test line" relative to the "reference line." In this case the reference line has a value of 100

| | |
|---------------------------|----------------------------------|
| reference line = 100 | answer |
| ref: _____ test: _____ | <input type="text" value="500"/> |
| ref: _____ test: _____ | <input type="text" value="200"/> |
| ref: _____ test: _____ | <input type="text" value="50"/> |

When you are satisfied that you understand the relationship between the "reference line" and the "test line" turn over the page

Magnitude Estimation Practice - one

Write your magnitude estimates of the length of these four lines in the boxes provided. When you have finished, hand this sheet to the experimenter and study sheet 2, where the "reference line" is shown.

| | |
|---------------------------------|--------------------------------|
| Reference: _____ test: _____ | answer <input type="text"/> |
|---------------------------------|--------------------------------|

| | |
|---------------------------------|--------------------------------|
| Reference: _____ test: _____ | answer <input type="text"/> |
|---------------------------------|--------------------------------|

| | |
|---------------------------------|--------------------------------|
| Reference: _____ test: _____ | answer <input type="text"/> |
|---------------------------------|--------------------------------|

| | |
|---------------------------------|--------------------------------|
| Reference: _____ test: _____ | answer <input type="text"/> |
|---------------------------------|--------------------------------|

Magnitude Estimation Practice -two

Write your magnitude estimates of the length of these four lines in the boxes provided. When you have finished, hand this sheet to the experimenter and study sheet 2, where the "reference line" is shown.

| | |
|------------------|----------------------|
| Reference: _____ | answer |
| test: _____ | <input type="text"/> |

| | |
|------------------|----------------------|
| Reference: _____ | answer |
| test: _____ | <input type="text"/> |

| | |
|------------------|----------------------|
| Reference: _____ | answer |
| test: _____ | <input type="text"/> |

| | |
|------------------|----------------------|
| Reference: _____ | answer |
| test: _____ | <input type="text"/> |

Annex 2 Raw Data

The table below contains information about all the conditions used to conduct the major studies in this work, namely those concerning the relative discomfort of roll and lateral, and pitch and fore-and-aft oscillation. Subsequently, and on the CD of data the condition letters are important for identifying the relevant files. In conditions A – L the magnitude of the reference exposure was 0.45 m.s^{-2} r.m.s, while M – T the magnitude was 0.315 m.s^{-2} r.m.s.

| Condition | Test | Seat | Reference | Seating | Frequency Range |
|-----------|----------|------------|-----------|------------|-----------------|
| A | ROLL | FRS + BACK | LATERAL | FRS + BACK | 0.2 |
| F | LATERAL | FRS | LATERAL | FRS + BACK | 0.2 |
| G | ROLL | FRS | LATERAL | FRS + BACK | 0.2 |
| I | FORE-AFT | FRS + BACK | FORE-AFT | FRS + BACK | 0.2 |
| J | FORE-AFT | FRS | FORE-AFT | FRS + BACK | 0.2 |
| K | PITCH | FRS + BACK | FORE-AFT | FRS + BACK | 0.2 |
| L | PITCH | FRS | FORE-AFT | FRS + BACK | 0.2 |
| M | ROLL | FRS | ROLL | FRS | 0.2-1.6 |
| N | ROLL | FRS + BACK | ROLL | FRS + BACK | 0.2-1.6 |
| O | LATERAL | FRS | LATERAL | FRS | 0.2-1.6 |
| P | LATERAL | FRS + BACK | LATERAL | FRS + BACK | 0.2-1.6 |
| Q | PITCH | FRS | PITCH | FRS | 0.2-1.6 |
| R | PITCH | FRS + BACK | PITCH | FRS + BACK | 0.2-1.6 |
| S | FORE-AFT | FRS | FORE-AFT | FRS | 0.2-1.6 |
| T | FORE-AFT | FRS + BACK | FORE-AFT | FRS + BACK | 0.2-1.6 |

Condition A

| Frequency 0.2 Hz | | 1 | 2 | 3 | 4 | 5 | Coef.Var | Max | Min | Ind. n | Ind. k | |
|------------------|--------------------|--------|--------|--------|--------|--------|----------|--------|--------|---------|------------|----------|
| subject | 1 Ind. Judgements | 20 | 40 | 90 | 80 | 120 | 0.57143 | 120 | 20 | 1.1342 | 152.9347 | |
| | Test Magnitudes | 0.2014 | 0.2872 | 0.4371 | 0.653 | 0.8826 | 0.56361 | 0.8826 | 0.2014 | | | |
| | Ref Magnitudes | 0.467 | 0.4635 | 0.4649 | 0.4668 | 0.4659 | 0.00311 | 0.467 | 0.4635 | | | |
| subject | 2 Ind. Judgements | 85 | 105 | 110 | 200 | 300 | 0.56207 | 300 | 85 | 0.83113 | 284.3625 | |
| | Test Magnitudes | 0.205 | 0.2907 | 0.4435 | 0.6631 | 0.8964 | 0.56399 | 0.8964 | 0.205 | | | |
| | Ref Magnitudes | 0.4618 | 0.467 | 0.4654 | 0.4608 | 0.4597 | 0.006737 | 0.467 | 0.4597 | | | |
| subject | 3 Ind. Judgements | 10 | 50 | 70 | 120 | 200 | 0.81271 | 200 | 10 | 1.8197 | 274.7757 | |
| | Test Magnitudes | 0.2066 | 0.2923 | 0.4442 | 0.6627 | 0.897 | 0.56188 | 0.897 | 0.2066 | | | |
| | Ref Magnitudes | 0.4629 | 0.4638 | 0.4698 | 0.4662 | 0.4694 | 0.006747 | 0.4698 | 0.4629 | | | |
| subject | 4 Ind. Judgements | 50 | 60 | 80 | 110 | 140 | 0.42061 | 140 | 50 | 5.2185 | 6280810984 | |
| | Test Magnitudes | 0.0285 | 0.0286 | 0.0306 | 0.0329 | 0.034 | 0.080445 | 0.034 | 0.0285 | | | |
| | Ref Magnitudes | 0.4639 | 0.4587 | 0.4772 | 0.464 | 0.4641 | 0.015964 | 0.4772 | 0.4567 | | | |
| subject | 5 Ind. Judgements | 30 | 70 | 90 | 150 | 180 | 0.5833 | 180 | 30 | 1.1614 | 226.9417 | |
| | Test Magnitudes | 0.2051 | 0.2984 | 0.4501 | 0.6651 | 0.8979 | 0.5581 | 0.8979 | 0.2051 | | | |
| | Ref Magnitudes | 0.4616 | 0.4845 | 0.4629 | 0.4684 | 0.4769 | 0.013208 | 0.4769 | 0.4616 | | | |
| subject | 6 Ind. Judgements | 70 | 110 | 130 | 170 | 200 | 0.37348 | 200 | 70 | 0.66728 | 222.2077 | |
| | Test Magnitudes | 0.2027 | 0.2912 | 0.4507 | 0.6632 | 0.8959 | 0.56289 | 0.8959 | 0.2027 | | | |
| | Ref Magnitudes | 0.4554 | 0.458 | 0.4616 | 0.4586 | 0.4578 | 0.004846 | 0.4616 | 0.4554 | | | |
| subject | 7 Ind. Judgements | 60 | 130 | 80 | 100 | 150 | 0.35067 | 150 | 60 | 0.39841 | 137.3229 | |
| | Test Magnitudes | 0.2047 | 0.2922 | 0.4426 | 0.6654 | 0.8982 | 0.56463 | 0.8982 | 0.2047 | | | |
| | Ref Magnitudes | 0.4581 | 0.4566 | 0.4599 | 0.4589 | 0.4538 | 0.005193 | 0.4599 | 0.4538 | | | |
| subject | 8 Ind. Judgements | 60 | 70 | 100 | 180 | 200 | 0.52612 | 200 | 60 | 0.88612 | 227.5274 | |
| | Test Magnitudes | 0.2019 | 0.2913 | 0.4418 | 0.6624 | 0.8958 | 0.56619 | 0.8958 | 0.2019 | | | |
| | Ref Magnitudes | 0.459 | 0.4574 | 0.4602 | 0.4624 | 0.4585 | 0.004152 | 0.4624 | 0.4574 | | | |
| subject | 9 Ind. Judgements | 10 | 25 | 85 | 100 | 175 | 0.83415 | 175 | 10 | 1.8924 | 248.1039 | |
| | Test Magnitudes | 0.205 | 0.2937 | 0.4439 | 0.6646 | 0.8962 | 0.56208 | 0.8962 | 0.205 | | | |
| | Ref Magnitudes | 0.4744 | 0.4649 | 0.4773 | 0.4679 | 0.4729 | 0.010633 | 0.4773 | 0.4649 | | | |
| subject | 10 Ind. Judgements | 10 | 25 | 75 | 150 | 175 | 0.84524 | 175 | 10 | 2.0066 | 289.5424 | |
| | Test Magnitudes | 0.2049 | 0.2918 | 0.4433 | 0.6636 | 0.8964 | 0.56351 | 0.8964 | 0.2049 | | | |
| | Ref Magnitudes | 0.4668 | 0.4631 | 0.4705 | 0.4642 | 0.4587 | 0.009433 | 0.4705 | 0.4587 | | | |
| subject | 11 Ind. Judgements | 10 | 20 | 60 | 115 | 185 | 0.93181 | 185 | 10 | 2.0286 | 256.5658 | |
| | Test Magnitudes | 0.208 | 0.2908 | 0.4455 | 0.6647 | 0.8975 | 0.56168 | 0.8975 | 0.208 | | | |
| | Ref Magnitudes | 0.4725 | 0.4661 | 0.4708 | 0.4748 | 0.4672 | 0.00771 | 0.4748 | 0.4661 | | | |
| subject | 12 Ind. Judgements | 110 | 80 | 110 | 180 | 240 | 0.45166 | 240 | 80 | 0.62511 | 223.597 | |
| | Test Magnitudes | 0.204 | 0.2924 | 0.4447 | 0.6639 | 0.8974 | 0.56387 | 0.8974 | 0.204 | | | |
| | Ref Magnitudes | 0.4663 | 0.464 | 0.4717 | 0.4694 | 0.4706 | 0.006793 | 0.4717 | 0.464 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | +++ | +++ | Median | 1.1478 | 237.8157 |

Condition F

| Frequency 0.2 Hz | | 1 | 2 | 3 | 4 | 5 | Coef.Var | Max | Min | Ind. n | Ind. k | |
|------------------|--------------------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|----------|
| subject | 1 Ind. Judgements | 70 | 90 | 110 | 120 | 130 | 0.23157 | 130 | 70 | 0.42153 | 141.5394 | |
| | Test Magnitudes | 0.2198 | 0.3132 | 0.4578 | 0.674 | 0.9194 | 0.5472 | 0.9194 | 0.2198 | | | |
| | Ref Magnitudes | 0.4622 | 0.4617 | 0.4617 | 0.4577 | 0.4518 | 0.009642 | 0.4622 | 0.4518 | | | |
| subject | 2 Ind. Judgements | 85 | 95 | 105 | 165 | 300 | 0.59628 | 300 | 85 | 0.84415 | 257.2164 | |
| | Test Magnitudes | 0.2244 | 0.3126 | 0.4565 | 0.6864 | 0.924 | 0.54762 | 0.924 | 0.2244 | | | |
| | Ref Magnitudes | 0.4593 | 0.4589 | 0.4521 | 0.4599 | 0.4605 | 0.007488 | 0.4605 | 0.4521 | | | |
| subject | 3 Ind. Judgements | 40 | 80 | 100 | 150 | 200 | 0.5464 | 200 | 40 | 1.0769 | 228.2164 | |
| | Test Magnitudes | 0.232 | 0.3119 | 0.4595 | 0.6787 | 0.9254 | 0.54188 | 0.9254 | 0.232 | | | |
| | Ref Magnitudes | 0.4561 | 0.4556 | 0.461 | 0.4597 | 0.46 | 0.005355 | 0.461 | 0.4556 | | | |
| subject | 4 Ind. Judgements | 90 | 80 | 150 | 110 | 90 | 0.26854 | 150 | 80 | 0.41508 | 140.0001 | |
| | Test Magnitudes | 0.3112 | 0.2346 | 0.9104 | 0.6748 | 0.455 | 0.53444 | 0.9104 | 0.2346 | | | |
| | Ref Magnitudes | 0.4643 | 0.4637 | 0.4493 | 0.4552 | 0.4601 | 0.01374 | 0.4643 | 0.4493 | | | |
| subject | 5 Ind. Judgements | 140 | 200 | 70 | 60 | 120 | 0.48069 | 200 | 60 | 0.85931 | 208.9076 | |
| | Test Magnitudes | 0.6821 | 0.919 | 0.3086 | 0.2239 | 0.474 | 0.5423 | 0.919 | 0.2239 | | | |
| | Ref Magnitudes | 0.4665 | 0.4539 | 0.4634 | 0.4591 | 0.4563 | 0.011163 | 0.4665 | 0.4539 | | | |
| subject | 6 Ind. Judgements | 100 | 160 | 120 | 250 | 250 | 0.40297 | 250 | 100 | 0.66659 | 277.7851 | |
| | Test Magnitudes | 0.3051 | 0.4622 | 0.222 | 0.9201 | 0.6781 | 0.54943 | 0.9201 | 0.222 | | | |
| | Ref Magnitudes | 0.4505 | 0.4545 | 0.4615 | 0.4642 | 0.4595 | 0.012029 | 0.4642 | 0.4505 | | | |
| subject | 7 Ind. Judgements | 100 | 50 | 250 | 120 | 100 | 0.60511 | 250 | 50 | 0.91393 | 228.1783 | |
| | Test Magnitudes | 0.4004 | 0.2242 | 0.9193 | 0.6812 | 0.3039 | 0.57037 | 0.9193 | 0.2242 | | | |
| | Ref Magnitudes | 0.4638 | 0.4554 | 0.4548 | 0.4549 | 0.4589 | 0.008471 | 0.4638 | 0.4548 | | | |
| subject | 8 Ind. Judgements | 250 | 100 | 400 | 80 | 120 | 0.71004 | 400 | 80 | 1.1359 | 384.6404 | |
| | Test Magnitudes | 0.6856 | 0.3066 | 0.9158 | 0.2224 | 0.4548 | 0.54908 | 0.9158 | 0.2224 | | | |
| | Ref Magnitudes | 0.4624 | 0.4546 | 0.4566 | 0.4599 | 0.4563 | 0.006851 | 0.4624 | 0.4546 | | | |
| subject | 9 Ind. Judgements | 40 | 100 | 60 | 140 | 210 | 0.61658 | 210 | 40 | 1.149 | 228.4342 | |
| | Test Magnitudes | 0.2265 | 0.4597 | 0.308 | 0.6793 | 0.9309 | 0.55054 | 0.9309 | 0.2265 | | | |
| | Ref Magnitudes | 0.4626 | 0.4614 | 0.4597 | 0.4634 | 0.465 | 0.004337 | 0.465 | 0.4597 | | | |
| subject | 10 Ind. Judgements | 175 | 110 | 300 | 75 | 500 | 0.74417 | 500 | 75 | 1.3315 | 522.0362 | |
| | Test Magnitudes | 0.4614 | 0.3074 | 0.6847 | 0.2275 | 0.9198 | 0.54474 | 0.9198 | 0.2275 | | | |
| | Ref Magnitudes | 0.4588 | 0.4527 | 0.4554 | 0.4633 | 0.4545 | 0.009169 | 0.4633 | 0.4527 | | | |
| subject | 11 Ind. Judgements | 85 | 95 | 400 | 210 | 110 | 0.73729 | 400 | 85 | 1.0081 | 331.6598 | |
| | Test Magnitudes | 0.224 | 0.4582 | 0.9188 | 0.6867 | 0.2965 | 0.55419 | 0.9188 | 0.224 | | | |
| | Ref Magnitudes | 0.4535 | 0.4578 | 0.4546 | 0.458 | 0.4666 | 0.012225 | 0.4666 | 0.4535 | | | |
| subject | 12 Ind. Judgements | 180 | 120 | 160 | 100 | 130 | 0.23143 | 180 | 100 | 0.37769 | 180.9988 | |
| | Test Magnitudes | 0.6859 | 0.3095 | 0.9228 | 0.2268 | 0.4664 | 0.544 | 0.9228 | 0.2268 | | | |
| | Ref Magnitudes | 0.4605 | 0.4614 | 0.4548 | 0.459 | 0.4518 | 0.008895 | 0.4614 | 0.4518 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | +++ | +++ | Median | 0.88662 | 228.3253 |

Condition G

| Frequency 0.2 Hz | | 1 | 2 | 3 | 4 | 5 | Coef.Var | Max | Min | Ind. n | Ind. k | |
|------------------|--------------------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|----------|
| subject | 1 Ind. Judgements | 40 | 70 | 100 | 130 | 140 | 0.43326 | 140 | 40 | 0.8188 | 168.0392 | |
| | Test Magnitudes | 0.2081 | 0.3 | 0.4581 | 0.6897 | 0.9353 | 0.57141 | 0.9353 | 0.2081 | | | |
| | Ref Magnitudes | 0.4671 | 0.4558 | 0.4564 | 0.4545 | 0.456 | 0.011265 | 0.4671 | 0.4545 | | | |
| subject | 2 Ind. Judgements | 60 | 110 | 120 | 160 | 350 | 0.70017 | 350 | 60 | 1.0168 | 302.0921 | |
| | Test Magnitudes | 0.2129 | 0.3019 | 0.4588 | 0.6873 | 0.9298 | 0.56395 | 0.9298 | 0.2129 | | | |
| | Ref Magnitudes | 0.4658 | 0.4663 | 0.4646 | 0.4556 | 0.4612 | 0.009595 | 0.4663 | 0.4556 | | | |
| subject | 3 Ind. Judgements | 50 | 100 | 105 | 120 | 150 | 0.34667 | 150 | 50 | 0.62432 | 162.5095 | |
| | Test Magnitudes | 0.211 | 0.3022 | 0.4593 | 0.6876 | 0.9285 | 0.56441 | 0.9285 | 0.211 | | | |
| | Ref Magnitudes | 0.4599 | 0.458 | 0.4639 | 0.4641 | 0.4606 | 0.005729 | 0.4641 | 0.458 | | | |
| subject | 4 Ind. Judgements | 20 | 50 | 90 | 100 | 120 | 0.53123 | 120 | 20 | 1.1405 | 158.0816 | |
| | Test Magnitudes | 0.213 | 0.304 | 0.4602 | 0.689 | 0.9292 | 0.56206 | 0.9292 | 0.213 | | | |
| | Ref Magnitudes | 0.4599 | 0.4698 | 0.4645 | 0.4659 | 0.4633 | 0.007796 | 0.4698 | 0.4599 | | | |
| subject | 5 Ind. Judgements | 40 | 30 | 70 | 120 | 160 | 0.6553 | 160 | 30 | 1.1019 | 167.2668 | |
| | Test Magnitudes | 0.21 | 0.3014 | 0.4581 | 0.6871 | 0.9286 | 0.56599 | 0.9286 | 0.21 | | | |
| | Ref Magnitudes | 0.4499 | 0.4495 | 0.45 | 0.4523 | 0.4562 | 0.006215 | 0.4562 | 0.4495 | | | |
| subject | 6 Ind. Judgements | 40 | 60 | 80 | 130 | 160 | 0.52978 | 160 | 40 | 0.93809 | 175.3377 | |
| | Test Magnitudes | 0.2111 | 0.3037 | 0.4595 | 0.6878 | 0.9301 | 0.56417 | 0.9301 | 0.2111 | | | |
| | Ref Magnitudes | 0.4634 | 0.4579 | 0.4585 | 0.4626 | 0.4548 | 0.00773 | 0.4634 | 0.4548 | | | |
| subject | 7 Ind. Judgements | 60 | 100 | 100 | 160 | 200 | 0.44756 | 200 | 60 | 0.76039 | 208.336 | |
| | Test Magnitudes | 0.2129 | 0.3031 | 0.459 | 0.6871 | 0.9288 | 0.56272 | 0.9288 | 0.2129 | | | |
| | Ref Magnitudes | 0.4592 | 0.4584 | 0.4641 | 0.4552 | 0.4555 | 0.007845 | 0.4641 | 0.4552 | | | |
| subject | 8 Ind. Judgements | 110 | 100 | 250 | 300 | 450 | 0.59981 | 450 | 100 | 1.0467 | 472.5427 | |
| | Test Magnitudes | 0.2134 | 0.3036 | 0.459 | 0.6863 | 0.929 | 0.56212 | 0.929 | 0.2134 | | | |
| | Ref Magnitudes | 0.4566 | 0.4465 | 0.4595 | 0.4584 | 0.4564 | 0.011378 | 0.4595 | 0.4465 | | | |
| subject | 9 Ind. Judgements | 15 | 50 | 40 | 100 | 115 | 0.6569 | 115 | 15 | 1.2546 | 138.2198 | |
| | Test Magnitudes | 0.2107 | 0.3029 | 0.4604 | 0.6883 | 0.93 | 0.56461 | 0.93 | 0.2107 | | | |
| | Ref Magnitudes | 0.468 | 0.4604 | 0.4616 | 0.4577 | 0.4661 | 0.009113 | 0.468 | 0.4577 | | | |
| subject | 10 Ind. Judgements | 10 | 90 | 75 | 150 | 200 | 0.69334 | 200 | 10 | 1.7056 | 283.0352 | |
| | Test Magnitudes | 0.2101 | 0.3016 | 0.4585 | 0.6874 | 0.9297 | 0.5662 | 0.9297 | 0.2101 | | | |
| | Ref Magnitudes | 0.4547 | 0.4492 | 0.4486 | 0.4507 | 0.4482 | 0.005879 | 0.4547 | 0.4482 | | | |
| subject | 11 Ind. Judgements | 30 | 45 | 85 | 130 | 180 | 0.6573 | 180 | 30 | 1.2437 | 204.5611 | |
| | Test Magnitudes | 0.2157 | 0.3056 | 0.461 | 0.6903 | 0.9322 | 0.56042 | 0.9322 | 0.2157 | | | |
| | Ref Magnitudes | 0.4588 | 0.4579 | 0.4611 | 0.4585 | 0.456 | 0.004 | 0.4611 | 0.456 | | | |
| subject | 12 Ind. Judgements | 80 | 70 | 110 | 160 | 150 | 0.35415 | 160 | 70 | 0.56049 | 168.5606 | |
| | Test Magnitudes | 0.2125 | 0.3023 | 0.4594 | 0.6913 | 0.9342 | 0.56609 | 0.9342 | 0.2125 | | | |
| | Ref Magnitudes | 0.4585 | 0.4586 | 0.4634 | 0.4604 | 0.4662 | 0.007211 | 0.4662 | 0.4585 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | +++ | +++ | Median | 1.0317 | 171.9492 |

Condition I

| Frequency 0.2 Hz | | 1 | 2 | 3 | 4 | 5 | Coef.Var | Max | Min | Ind. n | Ind. k | |
|------------------|--------------------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|----------|
| subject | 1 Ind. Judgements | 40 | 60 | 80 | 130 | 170 | 0.55414 | 170 | 40 | 0.98173 | 188.7971 | |
| | Test Magnitudes | 0.2069 | 0.2996 | 0.4414 | 0.6687 | 0.8969 | 0.55864 | 0.8969 | 0.2069 | | | |
| | Ref Magnitudes | 0.4406 | 0.4418 | 0.4425 | 0.4402 | 0.4396 | 0.002691 | 0.4425 | 0.4396 | | | |
| subject | 2 Ind. Judgements | 30 | 40 | 100 | 170 | 300 | 0.86891 | 300 | 30 | 1.6402 | 344.5007 | |
| | Test Magnitudes | 0.2108 | 0.3034 | 0.4459 | 0.6647 | 0.9009 | 0.55371 | 0.9009 | 0.2108 | | | |
| | Ref Magnitudes | 0.4405 | 0.4414 | 0.4416 | 0.441 | 0.4425 | 0.001688 | 0.4425 | 0.4405 | | | |
| subject | 3 Ind. Judgements | 60 | 90 | 130 | 180 | 250 | 0.53028 | 250 | 60 | 0.97999 | 276.8561 | |
| | Test Magnitudes | 0.2196 | 0.3051 | 0.4443 | 0.6645 | 0.9059 | 0.54921 | 0.9059 | 0.2196 | | | |
| | Ref Magnitudes | 0.4437 | 0.4422 | 0.4425 | 0.4424 | 0.4425 | 0.001342 | 0.4437 | 0.4422 | | | |
| subject | 4 Ind. Judgements | 80 | 50 | 100 | 250 | 350 | 0.77451 | 350 | 50 | 1.2666 | 353.396 | |
| | Test Magnitudes | 0.2187 | 0.3025 | 0.4598 | 0.6721 | 0.9009 | 0.54457 | 0.9009 | 0.2187 | | | |
| | Ref Magnitudes | 0.444 | 0.4442 | 0.4442 | 0.4454 | 0.444 | 0.001328 | 0.4454 | 0.444 | | | |
| subject | 5 Ind. Judgements | 20 | 75 | 100 | 150 | 200 | 0.63429 | 200 | 20 | 1.4096 | 267.1739 | |
| | Test Magnitudes | 0.2092 | 0.3006 | 0.4459 | 0.6831 | 0.9075 | 0.56093 | 0.9075 | 0.2092 | | | |
| | Ref Magnitudes | 0.4405 | 0.4426 | 0.4386 | 0.4446 | 0.4423 | 0.005141 | 0.4446 | 0.4386 | | | |
| subject | 6 Ind. Judgements | 50 | 100 | 100 | 150 | 200 | 0.47507 | 200 | 50 | 0.87187 | 219.5269 | |
| | Test Magnitudes | 0.2198 | 0.3003 | 0.4448 | 0.667 | 0.8948 | 0.54648 | 0.8948 | 0.2198 | | | |
| | Ref Magnitudes | 0.4364 | 0.4388 | 0.4367 | 0.4385 | 0.4371 | 0.002478 | 0.4388 | 0.4364 | | | |
| subject | 7 Ind. Judgements | 40 | 50 | 100 | 150 | 150 | 0.50498 | 150 | 40 | 0.97128 | 194.3196 | |
| | Test Magnitudes | 0.218 | 0.2898 | 0.4516 | 0.6726 | 0.904 | 0.55661 | 0.904 | 0.218 | | | |
| | Ref Magnitudes | 0.4402 | 0.4403 | 0.4414 | 0.4408 | 0.441 | 0.00113 | 0.4414 | 0.4402 | | | |
| subject | 8 Ind. Judgements | 60 | 90 | 120 | 180 | 170 | 0.41358 | 180 | 60 | 0.77211 | 213.1368 | |
| | Test Magnitudes | 0.2214 | 0.2991 | 0.4541 | 0.6657 | 0.9022 | 0.54654 | 0.9022 | 0.2214 | | | |
| | Ref Magnitudes | 0.4412 | 0.4426 | 0.4427 | 0.4424 | 0.4429 | 0.001522 | 0.4429 | 0.4412 | | | |
| subject | 9 Ind. Judgements | 115 | 100 | 100 | 125 | 125 | 0.11106 | 125 | 100 | 0.11299 | 123.2507 | |
| | Test Magnitudes | 0.2198 | 0.2928 | 0.4456 | 0.6666 | 0.8985 | 0.55239 | 0.8985 | 0.2198 | | | |
| | Ref Magnitudes | 0.4393 | 0.4382 | 0.4367 | 0.4352 | 0.4361 | 0.003763 | 0.4393 | 0.4352 | | | |
| subject | 10 Ind. Judgements | 50 | 75 | 105 | 150 | 200 | 0.5167 | 200 | 50 | 0.968 | 225.0756 | |
| | Test Magnitudes | 0.2199 | 0.3087 | 0.445 | 0.6632 | 0.8976 | 0.54259 | 0.8976 | 0.2199 | | | |
| | Ref Magnitudes | 0.4417 | 0.4415 | 0.4375 | 0.4392 | 0.4367 | 0.005167 | 0.4417 | 0.4367 | | | |
| subject | 11 Ind. Judgements | 60 | 90 | 100 | 120 | 250 | 0.59426 | 250 | 60 | 0.86497 | 219.6242 | |
| | Test Magnitudes | 0.2227 | 0.3056 | 0.454 | 0.6681 | 0.8961 | 0.53908 | 0.8961 | 0.2227 | | | |
| | Ref Magnitudes | 0.4419 | 0.4425 | 0.4433 | 0.4411 | 0.4427 | 0.001892 | 0.4433 | 0.4411 | | | |
| subject | 12 Ind. Judgements | 60 | 90 | 120 | 100 | 140 | 0.29737 | 140 | 60 | 0.48206 | 145.1103 | |
| | Test Magnitudes | 0.2148 | 0.2965 | 0.4493 | 0.6647 | 0.9034 | 0.55489 | 0.9034 | 0.2148 | | | |
| | Ref Magnitudes | 0.4367 | 0.4369 | 0.438 | 0.4401 | 0.4384 | 0.00312 | 0.4401 | 0.4367 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | +++ | +++ | Median | 0.86964 | 219.5756 |

Condition J

| Frequency 0.2 Hz | | 1 | 2 | 3 | 4 | 5 | Coef.Var | Max | Min | Ind. n | Ind. k | |
|------------------|--------------------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|----------|
| subject | 1 Ind. Judgements | 40 | 60 | 100 | 80 | 120 | 0.39528 | 120 | 40 | 0.66829 | 128.6757 | |
| | Test Magnitudes | 0.21 | 0.3028 | 0.444 | 0.6626 | 0.9012 | 0.55528 | 0.9012 | 0.21 | | | |
| | Ref Magnitudes | 0.4432 | 0.4494 | 0.4561 | 0.4513 | 0.4464 | 0.010897 | 0.4561 | 0.4432 | | | |
| subject | 2 Ind. Judgements | 120 | 140 | 280 | 500 | 400 | 0.5697 | 500 | 120 | 1.0365 | 579.7775 | |
| | Test Magnitudes | 0.2196 | 0.2943 | 0.4412 | 0.6544 | 0.8936 | 0.54991 | 0.8936 | 0.2196 | | | |
| | Ref Magnitudes | 0.4437 | 0.4481 | 0.4401 | 0.4451 | 0.447 | 0.007031 | 0.4481 | 0.4401 | | | |
| subject | 3 Ind. Judgements | 115 | 130 | 190 | 200 | 350 | 0.47265 | 350 | 115 | 0.70979 | 323.807 | |
| | Test Magnitudes | 0.2101 | 0.3044 | 0.4473 | 0.6708 | 0.8948 | 0.55071 | 0.8948 | 0.2101 | | | |
| | Ref Magnitudes | 0.4408 | 0.4476 | 0.4475 | 0.4464 | 0.4502 | 0.007791 | 0.4502 | 0.4408 | | | |
| subject | 4 Ind. Judgements | 30 | 60 | 100 | 180 | 200 | 0.64936 | 200 | 30 | 1.3403 | 274.2022 | |
| | Test Magnitudes | 0.2129 | 0.2977 | 0.4483 | 0.6625 | 0.8923 | 0.55042 | 0.8923 | 0.2129 | | | |
| | Ref Magnitudes | 0.4507 | 0.4589 | 0.4504 | 0.0637 | 0.4474 | 0.464 | 0.4589 | 0.0637 | | | |
| subject | 5 Ind. Judgements | 60 | 100 | 190 | 250 | 450 | 0.73076 | 450 | 60 | 1.3578 | 498.3474 | |
| | Test Magnitudes | 0.2226 | 0.2951 | 0.4461 | 0.6665 | 0.9053 | 0.55212 | 0.9053 | 0.2226 | | | |
| | Ref Magnitudes | 0.4393 | 0.4478 | 0.4508 | 0.4556 | 0.4414 | 0.014995 | 0.4556 | 0.4393 | | | |
| subject | 6 Ind. Judgements | 50 | 100 | 120 | 200 | 300 | 0.83557 | 300 | 50 | 1.155 | 333.4769 | |
| | Test Magnitudes | 0.2113 | 0.2954 | 0.4468 | 0.6616 | 0.8909 | 0.55211 | 0.8909 | 0.2113 | | | |
| | Ref Magnitudes | 0.4449 | 0.447 | 0.4479 | 0.445 | 0.4466 | 0.002919 | 0.4479 | 0.4449 | | | |
| subject | 7 Ind. Judgements | 50 | 80 | 100 | 130 | 200 | 0.51057 | 200 | 50 | 0.87029 | 206.5689 | |
| | Test Magnitudes | 0.2088 | 0.2943 | 0.4475 | 0.6583 | 0.8948 | 0.55666 | 0.8948 | 0.2088 | | | |
| | Ref Magnitudes | 0.447 | 0.4528 | 0.4425 | 0.4449 | 0.446 | 0.008573 | 0.4528 | 0.4425 | | | |
| subject | 8 Ind. Judgements | 80 | 100 | 160 | 120 | 350 | 0.67394 | 350 | 80 | 0.83166 | 272.5353 | |
| | Test Magnitudes | 0.2156 | 0.3084 | 0.447 | 0.6788 | 0.9033 | 0.54909 | 0.9033 | 0.2156 | | | |
| | Ref Magnitudes | 0.442 | 0.4467 | 0.4448 | 0.4498 | 0.4547 | 0.010903 | 0.4547 | 0.442 | | | |
| subject | 9 Ind. Judgements | 50 | 125 | 90 | 100 | 150 | 0.36585 | 150 | 50 | 0.51835 | 146.3191 | |
| | Test Magnitudes | 0.2212 | 0.3007 | 0.4494 | 0.6773 | 0.9054 | 0.54957 | 0.9054 | 0.2212 | | | |
| | Ref Magnitudes | 0.4486 | 0.4449 | 0.4472 | 0.4443 | 0.4462 | 0.003989 | 0.4486 | 0.4486 | | | |
| subject | 10 Ind. Judgements | 75 | 80 | 150 | 200 | 250 | 0.5024 | 250 | 75 | 0.93303 | 286.9916 | |
| | Test Magnitudes | 0.2222 | 0.2977 | 0.4479 | 0.6638 | 0.8968 | 0.546 | 0.8968 | 0.2222 | | | |
| | Ref Magnitudes | 0.4498 | 0.4447 | 0.4494 | 0.4433 | 0.4406 | 0.008919 | 0.4498 | 0.4406 | | | |
| subject | 11 Ind. Judgements | 90 | 110 | 100 | 130 | 140 | 0.1819 | 140 | 90 | 0.28331 | 141.7695 | |
| | Test Magnitudes | 0.2104 | 0.3015 | 0.443 | 0.6665 | 0.9012 | 0.55631 | 0.9012 | 0.2104 | | | |
| | Ref Magnitudes | 0.4496 | 0.447 | 0.4428 | 0.4474 | 0.4501 | 0.006464 | 0.4501 | 0.4428 | | | |
| subject | 12 Ind. Judgements | 100 | 130 | 130 | 130 | 170 | 0.18863 | 170 | 100 | 0.28283 | 163.7993 | |
| | Test Magnitudes | 0.2182 | 0.2989 | 0.4384 | 0.6723 | 0.893 | 0.55013 | 0.893 | 0.2182 | | | |
| | Ref Magnitudes | 0.4399 | 0.4495 | 0.4557 | 0.4491 | 0.4609 | 0.017499 | 0.4609 | 0.4399 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | +++ | +++ | Median | 0.85098 | 273.3688 |

Condition K

| Frequency 0.2 Hz | | 1 | 2 | 3 | 4 | 5 | Coef.Var | Max | Min | Ind. n | Ind. k | |
|------------------|--------------------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|----------|
| subject | 1 Ind. Judgements | 25 | 30 | 50 | 70 | 150 | 0.76068 | 150 | 25 | 1.1573 | 137.9799 | |
| | Test Magnitudes | 0.2019 | 0.2903 | 0.4409 | 0.6586 | 0.8934 | 0.5657 | 0.8934 | 0.2019 | | | |
| | Ref Magnitudes | 0.4421 | 0.4415 | 0.4438 | 0.4458 | 0.4414 | 0.004234 | 0.4458 | 0.4414 | | | |
| subject | 2 Ind. Judgements | 100 | 120 | 140 | 220 | 250 | 0.39411 | 250 | 100 | 0.64119 | 266.8545 | |
| | Test Magnitudes | 0.2019 | 0.2889 | 0.4406 | 0.6605 | 0.8957 | 0.56785 | 0.8957 | 0.2019 | | | |
| | Ref Magnitudes | 0.4465 | 0.4448 | 0.4515 | 0.4492 | 0.4475 | 0.005734 | 0.4515 | 0.4448 | | | |
| subject | 3 Ind. Judgements | 80 | 110 | 120 | 380 | 300 | 0.6742 | 380 | 80 | 1.0379 | 391.2725 | |
| | Test Magnitudes | 0.2032 | 0.2903 | 0.4412 | 0.6619 | 0.8926 | 0.56444 | 0.8926 | 0.2032 | | | |
| | Ref Magnitudes | 0.448 | 0.448 | 0.4511 | 0.4533 | 0.4448 | 0.007262 | 0.4533 | 0.4448 | | | |
| subject | 4 Ind. Judgements | 30 | 40 | 100 | 175 | 180 | 0.88014 | 180 | 30 | 1.3476 | 254.404 | |
| | Test Magnitudes | 0.2021 | 0.2893 | 0.4412 | 0.6593 | 0.8937 | 0.56623 | 0.8937 | 0.2021 | | | |
| | Ref Magnitudes | 0.4428 | 0.4452 | 0.4462 | 0.4492 | 0.4536 | 0.009458 | 0.4536 | 0.4428 | | | |
| subject | 5 Ind. Judgements | 30 | 70 | 80 | 90 | 105 | 0.37712 | 105 | 30 | 0.72566 | 126.8925 | |
| | Test Magnitudes | 0.202 | 0.2907 | 0.4414 | 0.6626 | 0.8933 | 0.56542 | 0.8933 | 0.202 | | | |
| | Ref Magnitudes | 0.4453 | 0.4478 | 0.4498 | 0.449 | 0.4533 | 0.006517 | 0.4533 | 0.4453 | | | |
| subject | 6 Ind. Judgements | 25 | 60 | 100 | 200 | 200 | 0.68616 | 200 | 25 | 1.4187 | 296.1119 | |
| | Test Magnitudes | 0.2006 | 0.2904 | 0.4413 | 0.6619 | 0.8936 | 0.56679 | 0.8936 | 0.2006 | | | |
| | Ref Magnitudes | 0.4484 | 0.4397 | 0.4391 | 0.4387 | 0.4323 | 0.013056 | 0.4484 | 0.4323 | | | |
| subject | 7 Ind. Judgements | 10 | 80 | 40 | 100 | 120 | 0.53888 | 120 | 10 | 1.3586 | 162.2134 | |
| | Test Magnitudes | 0.2016 | 0.291 | 0.4402 | 0.6629 | 0.8941 | 0.56634 | 0.8941 | 0.2016 | | | |
| | Ref Magnitudes | 0.4457 | 0.447 | 0.4471 | 0.4537 | 0.4479 | 0.006984 | 0.4537 | 0.4457 | | | |
| subject | 8 Ind. Judgements | 75 | 80 | 125 | 170 | 220 | 0.45958 | 220 | 75 | 0.76375 | 232.869 | |
| | Test Magnitudes | 0.2011 | 0.2905 | 0.4408 | 0.6623 | 0.8939 | 0.56688 | 0.8939 | 0.2011 | | | |
| | Ref Magnitudes | 0.4578 | 0.441 | 0.4407 | 0.4497 | 0.4519 | 0.016402 | 0.4578 | 0.4407 | | | |
| subject | 9 Ind. Judgements | 125 | 150 | 175 | 200 | 150 | 0.17815 | 200 | 125 | 0.182 | 183.9633 | |
| | Test Magnitudes | 0.2024 | 0.2898 | 0.4403 | 0.6617 | 0.894 | 0.56629 | 0.894 | 0.2024 | | | |
| | Ref Magnitudes | 0.4433 | 0.4426 | 0.4465 | 0.4454 | 0.4397 | 0.005955 | 0.4465 | 0.4397 | | | |
| subject | 10 Ind. Judgements | 20 | 45 | 80 | 110 | 125 | 0.57617 | 125 | 20 | 1.2046 | 172.3293 | |
| | Test Magnitudes | 0.2011 | 0.2904 | 0.4426 | 0.6621 | 0.8951 | 0.56671 | 0.8951 | 0.2011 | | | |
| | Ref Magnitudes | 0.4496 | 0.452 | 0.4557 | 0.4527 | 0.4496 | 0.005605 | 0.4557 | 0.4496 | | | |
| subject | 11 Ind. Judgements | 80 | 50 | 60 | 80 | 300 | 0.91917 | 300 | 50 | 0.78814 | 173.3816 | |
| | Test Magnitudes | 0.2022 | 0.2874 | 0.4417 | 0.6613 | 0.8912 | 0.56606 | 0.8912 | 0.2022 | | | |
| | Ref Magnitudes | 0.4469 | 0.4497 | 0.46 | 0.4546 | 0.4527 | 0.011016 | 0.46 | 0.4469 | | | |
| subject | 12 Ind. Judgements | 50 | 100 | 130 | 180 | 200 | 0.45894 | 200 | 50 | 0.8875 | 249.0987 | |
| | Test Magnitudes | 0.2025 | 0.2889 | 0.4415 | 0.6606 | 0.8931 | 0.56586 | 0.8931 | 0.2025 | | | |
| | Ref Magnitudes | 0.4519 | 0.4493 | 0.443 | 0.4441 | 0.4435 | 0.008955 | 0.4519 | 0.443 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | +++ | +++ | Median | 0.96269 | 208.4162 |

Condition L

| Frequency 0.2 Hz | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|----------|--------|--------|-----------|------------------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 60 | 25 | 25 | 50 | 40 | 0.38528 | 60 | 25 | -0.022525 | 36.883 |
| | Test Magnitudes | 0.2027 | 0.2898 | 0.44 | 0.6601 | 0.8929 | 0.56554 | 0.8929 | 0.2027 | | |
| | Ref Magnitudes | 0.4481 | 0.4404 | 0.4561 | 0.4443 | 0.4479 | 0.012988 | 0.4561 | 0.4404 | | |
| subject | 2 Ind. Judgements | 130 | 180 | 200 | 250 | 400 | 0.44524 | 400 | 130 | 0.66607 | 377.1791 |
| | Test Magnitudes | 0.2004 | 0.2897 | 0.4419 | 0.6595 | 0.8938 | 0.56711 | 0.8938 | 0.2004 | | |
| | Ref Magnitudes | 0.4446 | 0.4529 | 0.4482 | 0.4459 | 0.4488 | 0.007113 | 0.4529 | 0.4446 | | |
| subject | 3 Ind. Judgements | 150 | 200 | 300 | 400 | 600 | 0.54208 | 600 | 150 | 0.90452 | 625.959 |
| | Test Magnitudes | 0.2001 | 0.2889 | 0.4421 | 0.6598 | 0.8929 | 0.56733 | 0.8929 | 0.2001 | | |
| | Ref Magnitudes | 0.4488 | 0.4418 | 0.4429 | 0.4487 | 0.4423 | 0.007948 | 0.4488 | 0.4418 | | |
| subject | 4 Ind. Judgements | 40 | 90 | 150 | 200 | 300 | 0.64518 | 300 | 40 | 1.2737 | 366.398 |
| | Test Magnitudes | 0.203 | 0.291 | 0.4404 | 0.6614 | 0.894 | 0.56507 | 0.894 | 0.203 | | |
| | Ref Magnitudes | 0.4489 | 0.4487 | 0.4524 | 0.4464 | 0.4512 | 0.005206 | 0.4524 | 0.4464 | | |
| subject | 5 Ind. Judgements | 30 | 105 | 125 | 140 | 200 | 0.51286 | 200 | 30 | 1.0768 | 250.1568 |
| | Test Magnitudes | 0.2039 | 0.2916 | 0.4418 | 0.6615 | 0.8919 | 0.56258 | 0.8919 | 0.2039 | | |
| | Ref Magnitudes | 0.4441 | 0.449 | 0.4439 | 0.4448 | 0.4498 | 0.006376 | 0.4498 | 0.4439 | | |
| subject | 6 Ind. Judgements | 50 | 70 | 100 | 140 | 180 | 0.48732 | 180 | 50 | 0.85134 | 199.2154 |
| | Test Magnitudes | 0.1995 | 0.2901 | 0.4403 | 0.6608 | 0.8947 | 0.56859 | 0.8947 | 0.1995 | | |
| | Ref Magnitudes | 0.4365 | 0.4492 | 0.4405 | 0.4431 | 0.443 | 0.010449 | 0.4492 | 0.4365 | | |
| subject | 7 Ind. Judgements | 20 | 50 | 50 | 120 | 150 | 0.69869 | 150 | 20 | 1.2905 | 181.5475 |
| | Test Magnitudes | 0.2021 | 0.2913 | 0.44 | 0.6619 | 0.8955 | 0.56846 | 0.8955 | 0.2021 | | |
| | Ref Magnitudes | 0.4455 | 0.442 | 0.4439 | 0.4514 | 0.4492 | 0.008622 | 0.4514 | 0.442 | | |
| subject | 8 Ind. Judgements | 60 | 100 | 130 | 130 | 150 | 0.30764 | 150 | 60 | 0.55163 | 172.5357 |
| | Test Magnitudes | 0.2013 | 0.2903 | 0.441 | 0.6615 | 0.8942 | 0.56668 | 0.8942 | 0.2013 | | |
| | Ref Magnitudes | 0.4506 | 0.445 | 0.457 | 0.446 | 0.444 | 0.011976 | 0.457 | 0.444 | | |
| subject | 9 Ind. Judgements | 125 | 100 | 150 | 125 | 200 | 0.27082 | 200 | 100 | 0.29619 | 174.5741 |
| | Test Magnitudes | 0.1995 | 0.2915 | 0.4411 | 0.6605 | 0.8941 | 0.56718 | 0.8941 | 0.1995 | | |
| | Ref Magnitudes | 0.4469 | 0.4479 | 0.4462 | 0.449 | 0.4529 | 0.005876 | 0.4529 | 0.4462 | | |
| subject | 10 Ind. Judgements | 50 | 80 | 150 | 200 | 280 | 0.60904 | 280 | 50 | 1.1505 | 333.3669 |
| | Test Magnitudes | 0.2023 | 0.2901 | 0.4409 | 0.6609 | 0.8951 | 0.56647 | 0.8951 | 0.2023 | | |
| | Ref Magnitudes | 0.4457 | 0.4567 | 0.4526 | 0.4455 | 0.4447 | 0.011882 | 0.4567 | 0.4447 | | |
| subject | 11 Ind. Judgements | 130 | 100 | 140 | 150 | 300 | 0.4774 | 300 | 100 | 0.5363 | 238.3245 |
| | Test Magnitudes | 0.2031 | 0.29 | 0.4417 | 0.6616 | 0.8927 | 0.56456 | 0.8927 | 0.2031 | | |
| | Ref Magnitudes | 0.453 | 0.4652 | 0.4543 | 0.4487 | 0.4531 | 0.01354 | 0.4652 | 0.4487 | | |
| subject | 12 Ind. Judgements | 40 | 40 | 90 | 150 | 150 | 0.58569 | 150 | 40 | 1.0584 | 193.1953 |
| | Test Magnitudes | 0.2017 | 0.2943 | 0.4389 | 0.6598 | 0.8936 | 0.5643 | 0.8936 | 0.2017 | | |
| | Ref Magnitudes | 0.4469 | 0.442 | 0.447 | 0.4477 | 0.4377 | 0.009711 | 0.4477 | 0.4377 | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | +++ | +++ | Median | 0.87793 218.7699 |

Condition M

| Frequency 0.2 Hz | | Test: | Roll no backrest | Reference | Roll no backrest | 0.315 m.s ⁻² | r.m.s. | | | | | | | | | | | | | |
|------------------|--------------------|--------|------------------|-----------|------------------|-------------------------|--------|----------|----------|--------|--------|--------|----------|----------|--|--|--|--|--|--|
| | Ind. Data-> | | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | | | | | | | |
| subject | 1 Ind. Judgements | | 3 | 40 | 5 | 100 | 100 | 100 | 0.82507 | | 100 | 3 | 3.0751 | 675.6987 | | | | | | |
| | Test Magnitudes | 0.2055 | 0.2603 | 0.3234 | 0.4103 | 0.4911 | 0.6177 | 0.39866 | 0.6177 | 0.2055 | | | | | | | | | | |
| | Ref Magnitudes | 0.326 | 0.323 | 0.3243 | 0.3238 | 0.3246 | 0.3248 | 0.00311 | 0.326 | 0.323 | | | | | | | | | | |
| subject | 2 Ind. Judgements | | 5 | 25 | 75 | 110 | 175 | 150 | 0.75195 | | 175 | 5 | 3.0174 | 1251.475 | | | | | | |
| | Test Magnitudes | 0.2016 | 0.2547 | 0.3193 | 0.4063 | 0.4855 | 0.6146 | 0.40404 | 0.6146 | 0.2016 | | | | | | | | | | |
| | Ref Magnitudes | 0.3195 | 0.3198 | 0.3209 | 0.3212 | 0.3205 | 0.3216 | 0.002537 | 0.3216 | 0.3195 | | | | | | | | | | |
| subject | 3 Ind. Judgements | | 20 | 40 | 40 | 25 | 40 | 130 | 0.82471 | | 130 | 20 | 1.1366 | 135.651 | | | | | | |
| | Test Magnitudes | 0.1959 | 0.2446 | 0.3072 | 0.3909 | 0.4691 | 0.5956 | 0.4059 | 0.5956 | 0.1959 | | | | | | | | | | |
| | Ref Magnitudes | 0.3099 | 0.312 | 0.3107 | 0.3128 | 0.3132 | 0.3113 | 0.004042 | 0.3132 | 0.3099 | | | | | | | | | | |
| subject | 4 Ind. Judgements | | 5 | 20 | 5 | 25 | 30 | 50 | 0.75359 | | 50 | 5 | 1.8464 | 111.2802 | | | | | | |
| | Test Magnitudes | 0.2019 | 0.2519 | 0.3167 | 0.4072 | 0.4845 | 0.6122 | 0.40476 | 0.6122 | 0.2019 | | | | | | | | | | |
| | Ref Magnitudes | 0.3218 | 0.3181 | 0.3193 | 0.3218 | 0.3216 | 0.3186 | 0.005384 | 0.3218 | 0.3181 | | | | | | | | | | |
| subject | 5 Ind. Judgements | | 30 | 10 | 70 | 70 | 160 | 90 | 0.72995 | | 160 | 10 | 1.7662 | 325.2989 | | | | | | |
| | Test Magnitudes | 0.2034 | 0.2552 | 0.3188 | 0.4093 | 0.4883 | 0.6199 | 0.40806 | 0.6199 | 0.2034 | | | | | | | | | | |
| | Ref Magnitudes | 0.3119 | 0.3156 | 0.3225 | 0.3137 | 0.3154 | 0.3134 | 0.011948 | 0.3226 | 0.3119 | | | | | | | | | | |
| subject | 6 Ind. Judgements | | 10 | 30 | 80 | 20 | 85 | 90 | 0.69138 | | 90 | 10 | 1.6125 | 200.365 | | | | | | |
| | Test Magnitudes | 0.2075 | 0.2617 | 0.3256 | 0.4177 | 0.4984 | 0.6321 | 0.40497 | 0.6321 | 0.2075 | | | | | | | | | | |
| | Ref Magnitudes | 0.3295 | 0.3306 | 0.3283 | 0.3258 | 0.3293 | 0.3296 | 0.005062 | 0.3306 | 0.3295 | | | | | | | | | | |
| subject | 7 Ind. Judgements | | 20 | 35 | 30 | 40 | 40 | 60 | 0.35528 | | 60 | 20 | 0.80322 | 83.4995 | | | | | | |
| | Test Magnitudes | 0.1968 | 0.248 | 0.3111 | 0.3949 | 0.4733 | 0.5972 | 0.40293 | 0.5972 | 0.1968 | | | | | | | | | | |
| | Ref Magnitudes | 0.3216 | 0.3189 | 0.3182 | 0.319 | 0.3219 | 0.3212 | 0.005028 | 0.3219 | 0.3216 | | | | | | | | | | |
| subject | 6 Ind. Judgements | | 20 | 10 | 50 | 40 | 60 | 70 | 0.55599 | | 70 | 10 | 1.4695 | 164.1681 | | | | | | |
| | Test Magnitudes | 0.1973 | 0.2497 | 0.3095 | 0.3963 | 0.4728 | 0.5982 | 0.40253 | 0.5982 | 0.1973 | | | | | | | | | | |
| | Ref Magnitudes | 0.3144 | 0.3239 | 0.3174 | 0.3169 | 0.3169 | 0.3217 | 0.011102 | 0.3239 | 0.3144 | | | | | | | | | | |
| subject | 9 Ind. Judgements | | 10 | 10 | 20 | 80 | 50 | 80 | 0.79478 | | 80 | 10 | 2.1651 | 295.8155 | | | | | | |
| | Test Magnitudes | 0.1948 | 0.2473 | 0.3126 | 0.3941 | 0.469 | 0.5956 | 0.40265 | 0.5956 | 0.1948 | | | | | | | | | | |
| | Ref Magnitudes | 0.3173 | 0.3167 | 0.3192 | 0.317 | 0.3184 | 0.3191 | 0.003438 | 0.3192 | 0.3167 | | | | | | | | | | |
| subject | 10 Ind. Judgements | | 50 | 30 | 50 | 60 | 90 | 90 | 0.38941 | | 90 | 30 | 0.80681 | 134.2791 | | | | | | |
| | Test Magnitudes | 0.1967 | 0.2447 | 0.3233 | 0.3919 | 0.494 | 0.6115 | 0.41397 | 0.6115 | 0.1967 | | | | | | | | | | |
| | Ref Magnitudes | 0.3108 | 0.314 | 0.3302 | 0.3124 | 0.3243 | 0.327 | 0.02615 | 0.3302 | 0.3108 | | | | | | | | | | |
| subject | 11 Ind. Judgements | | 5 | 15 | 10 | 15 | 25 | 25 | 0.50592 | | 25 | 5 | 1.2772 | 53.4653 | | | | | | |
| | Test Magnitudes | 0.1976 | 0.2474 | 0.3132 | 0.3995 | 0.4762 | 0.6006 | 0.40415 | 0.6006 | 0.1976 | | | | | | | | | | |
| | Ref Magnitudes | 0.3172 | 0.3204 | 0.3203 | 0.3196 | 0.3174 | 0.32 | 0.004578 | 0.3204 | 0.3172 | | | | | | | | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 1.6125 | 164.1681 | | | | | | | |

| Frequency 0.25 Hz | | Test: | Roll no backrest | Reference | Roll no backrest | 0.315 m.s ⁻² | r.m.s. | | | | | | | | | | | | | |
|-------------------|--------------------|--------|------------------|-----------|------------------|-------------------------|--------|----------|----------|--------|--------|----------|---------|----------|--|--|--|--|--|--|
| | Ind. Data-> | | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | | | | | | | |
| subject | 1 Ind. Judgements | | 15 | 8 | 35 | 50 | 45 | 180 | 1.1383 | | 180 | 8 | 2.2112 | 319.9714 | | | | | | |
| | Test Magnitudes | 0.2048 | 0.2572 | 0.3232 | 0.4153 | 0.5156 | 0.6536 | 0.42692 | 0.6536 | 0.2048 | | | | | | | | | | |
| | Ref Magnitudes | 0.3228 | 0.326 | 0.3259 | 0.323 | 0.326 | 0.3249 | 0.004636 | 0.326 | 0.3228 | | | | | | | | | | |
| subject | 2 Ind. Judgements | | 10 | 25 | 150 | 180 | 250 | 300 | 0.76801 | | 300 | 10 | 2.9405 | 1811.849 | | | | | | |
| | Test Magnitudes | 0.2009 | 0.2532 | 0.3177 | 0.4044 | 0.5097 | 0.6452 | 0.42969 | 0.6452 | 0.2009 | | | | | | | | | | |
| | Ref Magnitudes | 0.3194 | 0.3193 | 0.3225 | 0.319 | 0.3205 | 0.3203 | 0.004018 | 0.3225 | 0.319 | | | | | | | | | | |
| subject | 3 Ind. Judgements | | 70 | 30 | 40 | 60 | 80 | 70 | 0.33271 | | 80 | 30 | 0.41562 | 85.6336 | | | | | | |
| | Test Magnitudes | 0.1948 | 0.2439 | 0.3064 | 0.3921 | 0.4921 | 0.6251 | 0.43066 | 0.6251 | 0.1948 | | | | | | | | | | |
| | Ref Magnitudes | 0.3142 | 0.314 | 0.31 | 0.312 | 0.3114 | 0.3116 | 0.005189 | 0.3142 | 0.31 | | | | | | | | | | |
| subject | 4 Ind. Judgements | | 10 | 30 | 30 | 25 | 50 | 50 | 0.47419 | | 50 | 10 | 1.1397 | 92.4759 | | | | | | |
| | Test Magnitudes | 0.2001 | 0.2517 | 0.3172 | 0.4063 | 0.5077 | 0.6446 | 0.43042 | 0.6446 | 0.2001 | | | | | | | | | | |
| | Ref Magnitudes | 0.3182 | 0.32 | 0.3192 | 0.3216 | 0.318 | 0.3186 | 0.004243 | 0.3216 | 0.318 | | | | | | | | | | |
| subject | 5 Ind. Judgements | | 40 | 20 | 70 | 120 | 90 | 170 | 0.6433 | | 170 | 20 | 1.5072 | 318.1399 | | | | | | |
| | Test Magnitudes | 0.2023 | 0.254 | 0.3177 | 0.4081 | 0.5119 | 0.647 | 0.42917 | 0.647 | 0.2023 | | | | | | | | | | |
| | Ref Magnitudes | 0.3155 | 0.318 | 0.3217 | 0.3151 | 0.3149 | 0.3214 | 0.009871 | 0.3217 | 0.3149 | | | | | | | | | | |
| subject | 6 Ind. Judgements | | 20 | 20 | 30 | 80 | 80 | 80 | 0.60487 | | 80 | 20 | 1.4758 | 165.7932 | | | | | | |
| | Test Magnitudes | 0.206 | 0.2608 | 0.3268 | 0.4182 | 0.5242 | 0.6644 | 0.4301 | 0.6644 | 0.206 | | | | | | | | | | |
| | Ref Magnitudes | 0.3298 | 0.328 | 0.3288 | 0.3212 | 0.3264 | 0.3277 | 0.009333 | 0.3298 | 0.3212 | | | | | | | | | | |
| subject | 7 Ind. Judgements | | 30 | 70 | 40 | 60 | 70 | 180 | 0.71926 | | 180 | 30 | 1.1484 | 210.0235 | | | | | | |
| | Test Magnitudes | 0.1957 | 0.2481 | 0.3112 | 0.3969 | 0.4971 | 0.6302 | 0.42886 | 0.6302 | 0.1957 | | | | | | | | | | |
| | Ref Magnitudes | 0.3201 | 0.3194 | 0.321 | 0.322 | 0.321 | 0.3189 | 0.003591 | 0.322 | 0.3189 | | | | | | | | | | |
| subject | 8 Ind. Judgements | | 20 | 60 | 30 | 80 | 120 | 50 | 0.60553 | | 120 | 20 | 0.93656 | 134.8021 | | | | | | |
| | Test Magnitudes | 0.1949 | 0.2501 | 0.3131 | 0.4009 | 0.4987 | 0.635 | 0.43023 | 0.635 | 0.1949 | | | | | | | | | | |
| | Ref Magnitudes | 0.3206 | 0.3238 | 0.3214 | 0.3226 | 0.3178 | 0.321 | 0.006338 | 0.3238 | 0.3178 | | | | | | | | | | |
| subject | 9 Ind. Judgements | | 10 | 10 | 20 | 50 | 110 | 130 | 0.96037 | | 130 | 10 | 2.5597 | 493.5444 | | | | | | |
| | Test Magnitudes | 0.1955 | 0.2459 | 0.3097 | 0.3958 | 0.4954 | 0.6284 | 0.42969 | 0.6284 | 0.1955 | | | | | | | | | | |
| | Ref Magnitudes | 0.3175 | 0.3185 | 0.3167 | 0.3185 | 0.3164 | 0.3166 | 0.003007 | 0.3185 | 0.3164 | | | | | | | | | | |
| subject | 10 Ind. Judgements | | 60 | 30 | 70 | 120 | 120 | 130 | 0.46078 | | 130 | 30 | 1.0847 | 241.4853 | | | | | | |
| | Test Magnitudes | 0.2034 | 0.2436 | 0.322 | 0.3935 | 0.5093 | 0.6292 | 0.42381 | 0.6292 | 0.2034 | | | | | | | | | | |
| | Ref Magnitudes | 0.3192 | 0.3132 | 0.3134 | 0.3153 | 0.3241 | 0.3148 | 0.013376 | 0.3241 | 0.3132 | | | | | | | | | | |
| subject | 11 Ind. Judgements | | 15 | 5 | 25 | 25 | 40 | 50 | 0.61237 | | 50 | 5 | 1.5065 | 102.1986 | | | | | | |
| | Test Magnitudes | 0.1977 | 0.2473 | 0.3137 | 0.4002 | 0.5006 | 0.6325 | 0.42843 | 0.6325 | 0.1977 | | | | | | | | | | |
| | Ref Magnitudes | 0.3166 | 0.3208 | 0.3218 | 0.3199 | 0.3196 | 0.3195 | 0.005475 | 0.3218 | 0.3166 | | | | | | | | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 1.4758</ | | | | | | | | |

| Frequency 0.315 Hz | | Test: | Roll no backrest | | Reference | Roll no backrest 0.315 m.s ⁻² r.m.s. | | 6 Coef.Var | Max | Min | Ind. n | Ind. k | |
|--------------------|--------------------|--------|------------------|--------|-----------|---|--------|------------|--------|--------|---------|----------|----------|
| Ind. Data--> | | 1 | 2 | 3 | 4 | 5 | 6 | | | | | | |
| subject | 1 Ind. Judgements | 30 | 10 | 25 | 90 | 60 | 140 | 0.82526 | 140 | 10 | 1.7399 | 243.8352 | |
| | Test Magnitudes | 0.2021 | 0.2575 | 0.3256 | 0.4103 | 0.5191 | 0.6555 | 0.43025 | 0.6555 | 0.2021 | | | |
| | Ref Magnitudes | 0.3252 | 0.3239 | 0.3293 | 0.3239 | 0.3288 | 0.3232 | 0.008186 | 0.3293 | 0.3232 | | | |
| subject | 2 Ind. Judgements | 50 | 60 | 80 | 200 | 160 | 275 | 0.65283 | 275 | 50 | 1.5024 | 526.4838 | |
| | Test Magnitudes | 0.1996 | 0.2533 | 0.3173 | 0.4061 | 0.5103 | 0.6509 | 0.43413 | 0.6509 | 0.1996 | | | |
| | Ref Magnitudes | 0.3194 | 0.3198 | 0.3203 | 0.3201 | 0.3189 | 0.3189 | 0.001874 | 0.3203 | 0.3189 | | | |
| subject | 3 Ind. Judgements | 20 | 40 | 60 | 70 | 100 | 60 | 0.46342 | 100 | 20 | 1.185 | 190.8846 | |
| | Test Magnitudes | 0.1949 | 0.2441 | 0.3061 | 0.3941 | 0.4943 | 0.6312 | 0.43456 | 0.6312 | 0.1949 | | | |
| | Ref Magnitudes | 0.3134 | 0.3135 | 0.3105 | 0.3127 | 0.3119 | 0.3124 | 0.003553 | 0.3135 | 0.3105 | | | |
| subject | 4 Ind. Judgements | 20 | 80 | 50 | 30 | 50 | 120 | 0.62675 | 120 | 20 | 0.89068 | 123.9872 | |
| | Test Magnitudes | 0.2004 | 0.2529 | 0.3147 | 0.4031 | 0.4813 | 0.6497 | 0.43004 | 0.6497 | 0.2004 | | | |
| | Ref Magnitudes | 0.3196 | 0.3218 | 0.321 | 0.3177 | 0.3009 | 0.3205 | 0.025153 | 0.3218 | 0.3009 | | | |
| subject | 5 Ind. Judgements | 20 | 110 | 110 | 160 | 250 | 400 | 0.76217 | 400 | 20 | 2.1665 | 1140.744 | |
| | Test Magnitudes | 0.202 | 0.2533 | 0.3195 | 0.4043 | 0.5131 | 0.6505 | 0.43194 | 0.6505 | 0.202 | | | |
| | Ref Magnitudes | 0.3132 | 0.3142 | 0.3142 | 0.3145 | 0.3215 | 0.3127 | 0.010265 | 0.3215 | 0.3127 | | | |
| subject | 6 Ind. Judgements | 20 | 40 | 50 | 50 | 80 | 130 | 0.62735 | 130 | 20 | 1.3903 | 208.3163 | |
| | Test Magnitudes | 0.2065 | 0.2614 | 0.3269 | 0.4189 | 0.5258 | 0.6688 | 0.43209 | 0.6688 | 0.2065 | | | |
| | Ref Magnitudes | 0.3247 | 0.3253 | 0.3276 | 0.3244 | 0.3264 | 0.3292 | 0.005697 | 0.3292 | 0.3244 | | | |
| subject | 7 Ind. Judgements | 50 | 70 | 40 | 80 | 50 | 140 | 0.46532 | 140 | 40 | 0.65784 | 133.626 | |
| | Test Magnitudes | 0.1977 | 0.2472 | 0.3142 | 0.3985 | 0.4999 | 0.6394 | 0.43265 | 0.6394 | 0.1977 | | | |
| | Ref Magnitudes | 0.3208 | 0.3161 | 0.321 | 0.3201 | 0.3193 | 0.3219 | 0.006385 | 0.3219 | 0.3161 | | | |
| subject | 8 Ind. Judgements | 40 | 40 | 50 | 50 | 140 | 120 | 0.6078 | 140 | 40 | 1.1189 | 202.6742 | |
| | Test Magnitudes | 0.1978 | 0.2502 | 0.3165 | 0.4037 | 0.4996 | 0.6416 | 0.43042 | 0.6416 | 0.1978 | | | |
| | Ref Magnitudes | 0.3233 | 0.3253 | 0.3226 | 0.3228 | 0.3164 | 0.3226 | 0.009326 | 0.3253 | 0.3164 | | | |
| subject | 9 Ind. Judgements | 10 | 20 | 25 | 30 | 120 | 90 | 0.91053 | 120 | 10 | 2.005 | 278.6416 | |
| | Test Magnitudes | 0.1951 | 0.2466 | 0.3137 | 0.3972 | 0.4978 | 0.6332 | 0.43119 | 0.6332 | 0.1951 | | | |
| | Ref Magnitudes | 0.3174 | 0.3167 | 0.3178 | 0.3188 | 0.3173 | 0.3173 | 0.002192 | 0.3188 | 0.3173 | | | |
| subject | 10 Ind. Judgements | 90 | 70 | 80 | 70 | 110 | 130 | 0.26197 | 130 | 70 | 0.36673 | 129.8069 | |
| | Test Magnitudes | 0.195 | 0.2591 | 0.3201 | 0.3959 | 0.5204 | 0.6506 | 0.43644 | 0.6506 | 0.195 | | | |
| | Ref Magnitudes | 0.3111 | 0.3285 | 0.3108 | 0.3043 | 0.3322 | 0.3245 | 0.035496 | 0.3322 | 0.3043 | | | |
| subject | 11 Ind. Judgements | 10 | 25 | 30 | 50 | 50 | 50 | 0.47043 | 50 | 10 | 1.2911 | 118.9912 | |
| | Test Magnitudes | 0.1982 | 0.2475 | 0.3155 | 0.4035 | 0.5046 | 0.6388 | 0.43138 | 0.6388 | 0.1982 | | | |
| | Ref Magnitudes | 0.3199 | 0.3185 | 0.3215 | 0.3211 | 0.3204 | 0.3199 | 0.003307 | 0.3215 | 0.3185 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 1.2911 | 202.6742 |

| Frequency 0.4 Hz | | Test: | Roll no backrest | | Reference | Roll no backrest 0.315 m.s ⁻² r.m.s. | | 6 Coef.Var | Max | Min | Ind. n | Ind. k | |
|------------------|--------------------|--------|------------------|--------|-----------|---|--------|------------|--------|--------|---------|----------|----------|
| Ind. Data--> | | 1 | 2 | 3 | 4 | 5 | 6 | | | | | | |
| subject | 1 Ind. Judgements | 20 | 60 | 60 | 100 | 125 | 170 | 0.60229 | 170 | 20 | 1.5932 | 364.577 | |
| | Test Magnitudes | 0.1995 | 0.2566 | 0.3207 | 0.4109 | 0.5217 | 0.6701 | 0.44377 | 0.6701 | 0.1995 | | | |
| | Ref Magnitudes | 0.3263 | 0.3239 | 0.3235 | 0.3232 | 0.3247 | 0.3248 | 0.003477 | 0.3263 | 0.3232 | | | |
| subject | 2 Ind. Judgements | 50 | 75 | 150 | 200 | 200 | 300 | 0.56527 | 300 | 50 | 1.4511 | 602.6606 | |
| | Test Magnitudes | 0.1988 | 0.2519 | 0.3182 | 0.4094 | 0.5166 | 0.6584 | 0.44042 | 0.6584 | 0.1988 | | | |
| | Ref Magnitudes | 0.3207 | 0.3205 | 0.321 | 0.3215 | 0.3185 | 0.3207 | 0.003221 | 0.3215 | 0.3185 | | | |
| subject | 3 Ind. Judgements | 150 | 70 | 80 | 40 | 130 | 120 | 0.4238 | 150 | 40 | 0.01134 | 90.8637 | |
| | Test Magnitudes | 0.1944 | 0.2452 | 0.3105 | 0.3959 | 0.5039 | 0.6409 | 0.43999 | 0.6409 | 0.1944 | | | |
| | Ref Magnitudes | 0.3122 | 0.3138 | 0.314 | 0.3118 | 0.3124 | 0.3105 | 0.004177 | 0.314 | 0.3105 | | | |
| subject | 4 Ind. Judgements | 15 | 85 | 60 | 90 | 120 | 150 | 0.54079 | 150 | 15 | 1.5316 | 335.4845 | |
| | Test Magnitudes | 0.2004 | 0.2507 | 0.3181 | 0.408 | 0.5174 | 0.6614 | 0.44212 | 0.6614 | 0.2004 | | | |
| | Ref Magnitudes | 0.3217 | 0.3191 | 0.3215 | 0.3206 | 0.32 | 0.3215 | 0.00322 | 0.3217 | 0.3191 | | | |
| subject | 5 Ind. Judgements | 120 | 80 | 130 | 250 | 280 | 500 | 0.68442 | 500 | 80 | 1.3739 | 764.077 | |
| | Test Magnitudes | 0.1968 | 0.2528 | 0.3199 | 0.4057 | 0.5123 | 0.657 | 0.43963 | 0.657 | 0.1968 | | | |
| | Ref Magnitudes | 0.3191 | 0.3145 | 0.3155 | 0.3176 | 0.3165 | 0.3152 | 0.005401 | 0.3191 | 0.3145 | | | |
| subject | 6 Ind. Judgements | 90 | 60 | 70 | 110 | 90 | 160 | 0.36818 | 160 | 60 | 0.54411 | 157.2921 | |
| | Test Magnitudes | 0.2044 | 0.2604 | 0.3294 | 0.4194 | 0.5306 | 0.6765 | 0.43858 | 0.6765 | 0.2044 | | | |
| | Ref Magnitudes | 0.324 | 0.3269 | 0.3266 | 0.3261 | 0.3215 | 0.3288 | 0.008674 | 0.3269 | 0.3216 | | | |
| subject | 7 Ind. Judgements | 30 | 80 | 90 | 140 | 170 | 350 | 0.78397 | 350 | 30 | 1.7977 | 699.8404 | |
| | Test Magnitudes | 0.1989 | 0.2494 | 0.3153 | 0.4034 | 0.5113 | 0.6501 | 0.4379 | 0.6501 | 0.1989 | | | |
| | Ref Magnitudes | 0.3207 | 0.3177 | 0.318 | 0.3196 | 0.321 | 0.3189 | 0.004282 | 0.321 | 0.3177 | | | |
| subject | 8 Ind. Judgements | 50 | 90 | 80 | 100 | 110 | 130 | 0.29277 | 130 | 50 | 0.67551 | 179.09 | |
| | Test Magnitudes | 0.1987 | 0.2525 | 0.3124 | 0.408 | 0.5047 | 0.6553 | 0.43879 | 0.6553 | 0.1987 | | | |
| | Ref Magnitudes | 0.3218 | 0.3243 | 0.3153 | 0.3235 | 0.3149 | 0.324 | 0.013643 | 0.3243 | 0.3149 | | | |
| subject | 9 Ind. Judgements | 30 | 70 | 20 | 100 | 90 | 120 | 0.55405 | 120 | 20 | 1.1193 | 190.1986 | |
| | Test Magnitudes | 0.1962 | 0.2482 | 0.3132 | 0.4014 | 0.5078 | 0.6464 | 0.43895 | 0.6464 | 0.1962 | | | |
| | Ref Magnitudes | 0.317 | 0.3189 | 0.3173 | 0.3185 | 0.3179 | 0.3185 | 0.002357 | 0.3189 | 0.317 | | | |
| subject | 10 Ind. Judgements | 80 | 60 | 80 | 120 | 180 | 140 | 0.41106 | 180 | 60 | 0.7634 | 224.0111 | |
| | Test Magnitudes | 0.1951 | 0.2448 | 0.3098 | 0.417 | 0.53 | 0.6569 | 0.45178 | 0.6569 | 0.1951 | | | |
| | Ref Magnitudes | 0.3108 | 0.3107 | 0.3069 | 0.3296 | 0.3292 | 0.3224 | 0.031648 | 0.3296 | 0.3069 | | | |
| subject | 11 Ind. Judgements | 25 | 25 | 25 | 50 | 150 | 200 | 0.96647 | 200 | 25 | 1.9805 | 407.7814 | |
| | Test Magnitudes | 0.1983 | 0.2511 | 0.317 | 0.4055 | 0.5103 | 0.651 | 0.43671 | 0.651 | 0.1983 | | | |
| | Ref Magnitudes | 0.3177 | 0.3211 | 0.3184 | 0.3167 | 0.3169 | 0.3162 | 0.005599 | 0.3211 | 0.3162 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 1.3739 | 335.4845 |

| Frequency 0.5 Hz | | | | | | | | | | | |
|----------------------------|---------|----------|--------|--------|-----------|---------|----------|--------|--------|--------------------------------|------------------|
| Test: | Roll no | backrest | | | Reference | Roll no | backrest | | | 0.315 m.s ⁻² r.m.s. | |
| Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject 1 Ind. Judgements | 75 | 85 | 70 | 105 | 140 | 130 | 0.28985 | 140 | 70 | 0.55839 | 171.1505 |
| Test Magnitudes | 0.2016 | 0.2493 | 0.3239 | 0.4189 | 0.5288 | 0.6478 | 0.43265 | 0.6478 | 0.2016 | | |
| Ref Magnitudes | 0.3229 | 0.3196 | 0.3241 | 0.3247 | 0.3223 | 0.3253 | 0.006389 | 0.3253 | 0.3196 | | |
| subject 2 Ind. Judgements | 100 | 133 | 100 | 100 | 225 | 300 | 0.52664 | 300 | 100 | 0.84371 | 339.5268 |
| Test Magnitudes | 0.1997 | 0.2535 | 0.3214 | 0.4147 | 0.5249 | 0.6386 | 0.42693 | 0.6386 | 0.1997 | | |
| Ref Magnitudes | 0.3205 | 0.3207 | 0.3214 | 0.3213 | 0.32 | 0.3203 | 0.001731 | 0.3214 | 0.32 | | |
| subject 3 Ind. Judgements | 40 | 90 | 50 | 60 | 140 | 70 | 0.48259 | 140 | 40 | 0.52113 | 118.5873 |
| Test Magnitudes | 0.1947 | 0.2427 | 0.3144 | 0.4035 | 0.5075 | 0.6205 | 0.42719 | 0.6205 | 0.1947 | | |
| Ref Magnitudes | 0.3124 | 0.309 | 0.3136 | 0.3124 | 0.3092 | 0.311 | 0.006009 | 0.3136 | 0.309 | | |
| subject 4 Ind. Judgements | 50 | 80 | 105 | 175 | 200 | 250 | 0.53846 | 250 | 50 | 1.3675 | 501.9545 |
| Test Magnitudes | 0.1991 | 0.2491 | 0.3197 | 0.4142 | 0.5221 | 0.6367 | 0.4291 | 0.6367 | 0.1991 | | |
| Ref Magnitudes | 0.3191 | 0.3205 | 0.3193 | 0.3209 | 0.3166 | 0.3205 | 0.004963 | 0.3209 | 0.3166 | | |
| subject 5 Ind. Judgements | 80 | 90 | 130 | 120 | 200 | 450 | 0.78297 | 450 | 80 | 1.3062 | 568.2661 |
| Test Magnitudes | 0.1955 | 0.2492 | 0.3137 | 0.4047 | 0.5143 | 0.6317 | 0.43075 | 0.6317 | 0.1955 | | |
| Ref Magnitudes | 0.3147 | 0.3143 | 0.3148 | 0.3144 | 0.3148 | 0.3179 | 0.004326 | 0.3179 | 0.3143 | | |
| subject 6 Ind. Judgements | 80 | 130 | 130 | 120 | 150 | 175 | 0.24221 | 175 | 80 | 0.52156 | 214.009 |
| Test Magnitudes | 0.2062 | 0.2596 | 0.3262 | 0.4205 | 0.5312 | 0.8479 | 0.4217 | 0.6479 | 0.2062 | | |
| Ref Magnitudes | 0.3292 | 0.3268 | 0.3284 | 0.3261 | 0.3281 | 0.3279 | 0.003424 | 0.3292 | 0.3261 | | |
| subject 7 Ind. Judgements | 100 | 80 | 100 | 240 | 460 | 490 | 0.7735 | 490 | 80 | 1.7339 | 1109.244 |
| Test Magnitudes | 0.1983 | 0.2548 | 0.3195 | 0.4106 | 0.5193 | 0.6329 | 0.42593 | 0.6329 | 0.1983 | | |
| Ref Magnitudes | 0.3174 | 0.3207 | 0.3196 | 0.3194 | 0.3205 | 0.3209 | 0.004067 | 0.3209 | 0.3174 | | |
| subject 8 Ind. Judgements | 70 | 80 | 80 | 120 | 120 | 180 | 0.39022 | 180 | 70 | 0.78446 | 228.8508 |
| Test Magnitudes | 0.2016 | 0.2537 | 0.3165 | 0.4106 | 0.5162 | 0.627 | 0.41913 | 0.627 | 0.2016 | | |
| Ref Magnitudes | 0.3232 | 0.3245 | 0.3172 | 0.3233 | 0.318 | 0.3168 | 0.010984 | 0.3245 | 0.3168 | | |
| subject 9 Ind. Judgements | 125 | 90 | 110 | 130 | 120 | 130 | 0.13116 | 130 | 90 | 0.15148 | 136.2605 |
| Test Magnitudes | 0.1983 | 0.2491 | 0.3184 | 0.4071 | 0.5155 | 0.6269 | 0.42391 | 0.6269 | 0.1983 | | |
| Ref Magnitudes | 0.3176 | 0.3184 | 0.3181 | 0.3179 | 0.3173 | 0.3172 | 0.001473 | 0.3184 | 0.3172 | | |
| subject 10 Ind. Judgements | 130 | 120 | 150 | 210 | 200 | 220 | 0.25369 | 220 | 120 | 0.54067 | 291.9362 |
| Test Magnitudes | 0.1963 | 0.2456 | 0.3277 | 0.3946 | 0.5041 | 0.643 | 0.43309 | 0.643 | 0.1963 | | |
| Ref Magnitudes | 0.3203 | 0.3114 | 0.3311 | 0.3096 | 0.3136 | 0.3297 | 0.029294 | 0.3311 | 0.3096 | | |
| subject 11 Ind. Judgements | 40 | 100 | 100 | 60 | 200 | 350 | 0.81884 | 350 | 40 | 1.4995 | 507.0885 |
| Test Magnitudes | 0.201 | 0.2502 | 0.3185 | 0.4105 | 0.5151 | 0.6299 | 0.42238 | 0.6299 | 0.201 | | |
| Ref Magnitudes | 0.3206 | 0.3197 | 0.3165 | 0.3192 | 0.3172 | 0.3197 | 0.005032 | 0.3206 | 0.3165 | | |
| +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | Median | 0.78446 291.9362 |

| Frequency 0.63 Hz | | | | | | | | | | | |
|----------------------------|---------|----------|--------|--------|-----------|---------|----------|--------|--------|--------------------------------|------------------|
| Test: | Roll no | backrest | | | Reference | Roll no | backrest | | | 0.315 m.s ⁻² r.m.s. | |
| Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject 1 Ind. Judgements | 65 | 35 | 90 | 135 | 160 | 190 | 0.52644 | 190 | 35 | 1.2518 | 460.3953 |
| Test Magnitudes | 0.1584 | 0.2017 | 0.2587 | 0.3258 | 0.4239 | 0.5055 | 0.42657 | 0.5055 | 0.1584 | | |
| Ref Magnitudes | 0.3219 | 0.3234 | 0.3268 | 0.3244 | 0.3246 | 0.3257 | 0.005287 | 0.3268 | 0.3219 | | |
| subject 2 Ind. Judgements | 50 | 100 | 166 | 200 | 200 | 250 | 0.45668 | 250 | 50 | 1.2561 | 681.5593 |
| Test Magnitudes | 0.159 | 0.2003 | 0.2564 | 0.3253 | 0.4211 | 0.5031 | 0.42571 | 0.5031 | 0.159 | | |
| Ref Magnitudes | 0.319 | 0.3198 | 0.3221 | 0.3204 | 0.3209 | 0.3216 | 0.003576 | 0.3221 | 0.319 | | |
| subject 3 Ind. Judgements | 40 | 110 | 110 | 100 | 80 | 120 | 0.31542 | 120 | 40 | 0.53117 | 172.7772 |
| Test Magnitudes | 0.1581 | 0.1967 | 0.2478 | 0.3188 | 0.4098 | 0.4873 | 0.41986 | 0.4873 | 0.1581 | | |
| Ref Magnitudes | 0.3131 | 0.3124 | 0.3112 | 0.3144 | 0.3121 | 0.3094 | 0.005453 | 0.3144 | 0.3094 | | |
| subject 4 Ind. Judgements | 130 | 50 | 110 | 75 | 130 | 200 | 0.44893 | 200 | 50 | 0.56289 | 215.6101 |
| Test Magnitudes | 0.1573 | 0.1995 | 0.2523 | 0.3212 | 0.3947 | 0.499 | 0.42039 | 0.499 | 0.1573 | | |
| Ref Magnitudes | 0.3187 | 0.3217 | 0.3195 | 0.3173 | 0.2992 | 0.3209 | 0.026822 | 0.3217 | 0.2992 | | |
| subject 5 Ind. Judgements | 110 | 100 | 90 | 200 | 270 | 400 | 0.62786 | 400 | 90 | 1.2512 | 812.1485 |
| Test Magnitudes | 0.1574 | 0.1971 | 0.2494 | 0.319 | 0.4112 | 0.495 | 0.42541 | 0.495 | 0.1574 | | |
| Ref Magnitudes | 0.3146 | 0.3122 | 0.314 | 0.3219 | 0.3126 | 0.3158 | 0.011245 | 0.3219 | 0.3122 | | |
| subject 6 Ind. Judgements | 90 | 120 | 140 | 125 | 140 | 140 | 0.15576 | 140 | 90 | 0.30798 | 182.4945 |
| Test Magnitudes | 0.1581 | 0.1988 | 0.2568 | 0.3279 | 0.4274 | 0.5052 | 0.43056 | 0.5052 | 0.1581 | | |
| Ref Magnitudes | 0.3281 | 0.3223 | 0.3291 | 0.3292 | 0.3278 | 0.3212 | 0.010943 | 0.3292 | 0.3212 | | |
| subject 7 Ind. Judgements | 250 | 240 | 350 | 400 | 400 | 460 | 0.25298 | 460 | 240 | 0.58713 | 712.4115 |
| Test Magnitudes | 0.1606 | 0.1972 | 0.2526 | 0.3208 | 0.4117 | 0.4938 | 0.41959 | 0.4938 | 0.1606 | | |
| Ref Magnitudes | 0.3206 | 0.3179 | 0.32 | 0.3205 | 0.3193 | 0.3187 | 0.003342 | 0.3206 | 0.3179 | | |
| subject 8 Ind. Judgements | 90 | 150 | 110 | 100 | 200 | 160 | 0.3134 | 200 | 90 | 0.45681 | 230.3798 |
| Test Magnitudes | 0.1587 | 0.2006 | 0.25 | 0.3198 | 0.4143 | 0.4991 | 0.42494 | 0.4991 | 0.1587 | | |
| Ref Magnitudes | 0.315 | 0.3186 | 0.3136 | 0.3136 | 0.3168 | 0.3231 | 0.011525 | 0.3231 | 0.3136 | | |
| subject 9 Ind. Judgements | 110 | 110 | 120 | 110 | 120 | 170 | 0.18957 | 170 | 110 | 0.28059 | 173.2003 |
| Test Magnitudes | 0.1593 | 0.1995 | 0.2537 | 0.3218 | 0.4146 | 0.4961 | 0.42093 | 0.4961 | 0.1593 | | |
| Ref Magnitudes | 0.3168 | 0.3184 | 0.3174 | 0.3173 | 0.3172 | 0.3187 | 0.002345 | 0.3187 | 0.3168 | | |
| subject 10 Ind. Judgements | 90 | 120 | 140 | 170 | 190 | 80 | 0.33077 | 190 | 80 | 0.13005 | 148.3427 |
| Test Magnitudes | 0.1567 | 0.1934 | 0.2395 | 0.3133 | 0.4007 | 0.4896 | 0.42801 | 0.4896 | 0.1567 | | |
| Ref Magnitudes | 0.3106 | 0.3141 | 0.3272 | 0.3132 | 0.312 | 0.3169 | 0.019123 | 0.3272 | 0.3106 | | |
| subject 11 Ind. Judgements | 100 | 90 | 90 | 175 | 175 | 300 | 0.52651 | 300 | 90 | 0.9955 | 492.0404 |
| Test Magnitudes | 0.1583 | 0.197 | 0.25 | 0.3198 | 0.4125 | 0.4928 | 0.42298 | 0.4928 | 0.1583 | | |
| Ref Magnitudes | 0.3152 | 0.3198 | 0.3195 | 0.3187 | 0.3191 | 0.3207 | 0.005976 | 0.3207 | 0.3152 | | |
| +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | Median | 0.56289 230.3798 |

| Frequency 0.8 Hz | | | | | | | | | | | | |
|------------------|--------------------|------------------|--------|--------|-----------|---|--------|----------|--------|--------|-----------|------------------|
| | Test: | Roll no backrest | | | Reference | Roll no backrest 0.315 m.s ⁻² r.m.s. | | | | | Ind. n | Ind. k |
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | | |
| subject | 1 Ind. Judgements | 50 | 35 | 75 | 70 | 110 | 190 | 0.63302 | 190 | 35 | 1.1849 | 450.5045 |
| | Test Magnitudes | 0.1205 | 0.1582 | 0.1971 | 0.2553 | 0.3137 | 0.4043 | 0.43607 | 0.4043 | 0.1205 | | |
| | Ref Magnitudes | 0.3235 | 0.3239 | 0.3193 | 0.3266 | 0.3235 | 0.3241 | 0.007285 | 0.3266 | 0.3193 | | |
| subject | 2 Ind. Judgements | 90 | 50 | 200 | 200 | 150 | 350 | 0.60691 | 350 | 50 | 1.2109 | 897.3709 |
| | Test Magnitudes | 0.1166 | 0.1587 | 0.203 | 0.2557 | 0.3122 | 0.3975 | 0.4272 | 0.3975 | 0.1186 | | |
| | Ref Magnitudes | 0.3188 | 0.3198 | 0.3224 | 0.3198 | 0.3209 | 0.3206 | 0.00384 | 0.3224 | 0.3188 | | |
| subject | 3 Ind. Judgements | 80 | 50 | 80 | 130 | 70 | 140 | 0.38672 | 140 | 50 | 0.52137 | 190.6097 |
| | Test Magnitudes | 0.1178 | 0.1561 | 0.1975 | 0.249 | 0.3034 | 0.3893 | 0.42481 | 0.3893 | 0.1178 | | |
| | Ref Magnitudes | 0.3137 | 0.3146 | 0.3132 | 0.3128 | 0.3125 | 0.3128 | 0.00247 | 0.3146 | 0.3125 | | |
| subject | 4 Ind. Judgements | 80 | 110 | 90 | 120 | 150 | 200 | 0.35327 | 200 | 80 | 0.71278 | 356.5526 |
| | Test Magnitudes | 0.1165 | 0.1568 | 0.1969 | 0.2367 | 0.292 | 0.3938 | 0.43094 | 0.3938 | 0.1165 | | |
| | Ref Magnitudes | 0.3212 | 0.3223 | 0.3192 | 0.2982 | 0.3007 | 0.3201 | 0.035237 | 0.3223 | 0.2982 | | |
| subject | 5 Ind. Judgements | 60 | 90 | 90 | 160 | 350 | 300 | 0.69588 | 350 | 60 | 1.5404 | 1497.066 |
| | Test Magnitudes | 0.1181 | 0.1562 | 0.1992 | 0.2373 | 0.3034 | 0.3907 | 0.42741 | 0.3907 | 0.1181 | | |
| | Ref Magnitudes | 0.3171 | 0.3151 | 0.3139 | 0.305 | 0.3147 | 0.314 | 0.013495 | 0.3171 | 0.305 | | |
| subject | 6 Ind. Judgements | 70 | 60 | 75 | 80 | 120 | 150 | 0.41725 | 150 | 60 | 0.65899 | 224.1975 |
| | Test Magnitudes | 0.1199 | 0.159 | 0.2026 | 0.257 | 0.3144 | 0.4006 | 0.42887 | 0.4006 | 0.1199 | | |
| | Ref Magnitudes | 0.3274 | 0.3283 | 0.3236 | 0.3224 | 0.3257 | 0.3318 | 0.01043 | 0.3318 | 0.3224 | | |
| subject | 7 Ind. Judgements | 140 | 250 | 200 | 380 | 450 | 450 | 0.42731 | 450 | 140 | 1.0073 | 1320.682 |
| | Test Magnitudes | 0.1175 | 0.1573 | 0.1973 | 0.2493 | 0.306 | 0.3899 | 0.42543 | 0.3899 | 0.1175 | | |
| | Ref Magnitudes | 0.3192 | 0.319 | 0.3194 | 0.3213 | 0.3212 | 0.3211 | 0.00345 | 0.3213 | 0.319 | | |
| subject | 8 Ind. Judgements | 110 | 150 | 110 | 160 | 80 | 140 | 0.24133 | 160 | 80 | -0.025674 | 117.0905 |
| | Test Magnitudes | 0.1202 | 0.1561 | 0.2008 | 0.2524 | 0.309 | 0.3936 | 0.42502 | 0.3936 | 0.1202 | | |
| | Ref Magnitudes | 0.3234 | 0.3184 | 0.3175 | 0.3181 | 0.3256 | 0.321 | 0.010217 | 0.3256 | 0.3175 | | |
| subject | 9 Ind. Judgements | 110 | 120 | 100 | 140 | 170 | 200 | 0.27479 | 200 | 100 | 0.52294 | 299.7482 |
| | Test Magnitudes | 0.1195 | 0.1567 | 0.1996 | 0.2516 | 0.3078 | 0.3932 | 0.42535 | 0.3932 | 0.1195 | | |
| | Ref Magnitudes | 0.3172 | 0.3181 | 0.3185 | 0.3172 | 0.3195 | 0.3186 | 0.002793 | 0.3195 | 0.3172 | | |
| subject | 10 Ind. Judgements | 80 | 130 | 120 | 170 | 80 | 170 | 0.32299 | 170 | 80 | 0.34519 | 203.0765 |
| | Test Magnitudes | 0.1145 | 0.1541 | 0.1956 | 0.2458 | 0.3019 | 0.3777 | 0.42086 | 0.3777 | 0.1145 | | |
| | Ref Magnitudes | 0.332 | 0.311 | 0.3127 | 0.3105 | 0.3112 | 0.3309 | 0.032735 | 0.332 | 0.3105 | | |
| subject | 11 Ind. Judgements | 30 | 75 | 50 | 50 | 150 | 200 | 0.72823 | 200 | 30 | 1.4054 | 628.2417 |
| | Test Magnitudes | 0.1193 | 0.1565 | 0.1982 | 0.249 | 0.3054 | 0.3922 | 0.42551 | 0.3922 | 0.1193 | | |
| | Ref Magnitudes | 0.3184 | 0.3211 | 0.3181 | 0.3175 | 0.3164 | 0.32 | 0.005354 | 0.3211 | 0.3164 | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.71278 356.5526 |

| Frequency 1 Hz | | | | | | | | | | | | |
|----------------|--------------------|------------------|--------|--------|-----------|---|--------|----------|--------|--------|----------|------------------|
| | Test: | Roll no backrest | | | Reference | Roll no backrest 0.315 m.s ⁻² r.m.s. | | | | | Ind. n | Ind. k |
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | | |
| subject | 1 Ind. Judgements | 25 | 50 | 65 | 75 | 80 | 130 | 0.49596 | 130 | 25 | 1.1519 | 481.5138 |
| | Test Magnitudes | 0.0926 | 0.1167 | 0.1575 | 0.196 | 0.2362 | 0.3219 | 0.45055 | 0.3219 | 0.0926 | | |
| | Ref Magnitudes | 0.3251 | 0.3247 | 0.3241 | 0.3248 | 0.3214 | 0.326 | 0.00485 | 0.326 | 0.3214 | | |
| subject | 2 Ind. Judgements | 75 | 50 | 200 | 200 | 300 | 180 | 0.54839 | 300 | 50 | 1.149 | 1078.163 |
| | Test Magnitudes | 0.092 | 0.1182 | 0.1566 | 0.1943 | 0.2385 | 0.3168 | 0.44469 | 0.3168 | 0.092 | | |
| | Ref Magnitudes | 0.3201 | 0.3204 | 0.3208 | 0.3204 | 0.3212 | 0.3189 | 0.00245 | 0.3212 | 0.3189 | | |
| subject | 3 Ind. Judgements | 50 | 50 | 70 | 80 | 80 | 140 | 0.42276 | 140 | 50 | 0.79377 | 304.8992 |
| | Test Magnitudes | 0.0896 | 0.1155 | 0.1522 | 0.187 | 0.2318 | 0.3107 | 0.44791 | 0.3107 | 0.0896 | | |
| | Ref Magnitudes | 0.3122 | 0.3131 | 0.3134 | 0.3098 | 0.3136 | 0.3117 | 0.004565 | 0.3136 | 0.3098 | | |
| subject | 4 Ind. Judgements | 120 | 80 | 130 | 200 | 110 | 150 | 0.30913 | 200 | 80 | 0.26922 | 205.5623 |
| | Test Magnitudes | 0.0824 | 0.1171 | 0.1525 | 0.1882 | 0.2346 | 0.3135 | 0.46191 | 0.3135 | 0.0824 | | |
| | Ref Magnitudes | 0.2982 | 0.3197 | 0.3184 | 0.3172 | 0.3231 | 0.3169 | 0.02791 | 0.3231 | 0.2982 | | |
| subject | 5 Ind. Judgements | 90 | 80 | 90 | 120 | 70 | 140 | 0.26842 | 140 | 70 | 0.2414 | 147.2242 |
| | Test Magnitudes | 0.0846 | 0.1161 | 0.1546 | 0.192 | 0.2363 | 0.3146 | 0.45845 | 0.3146 | 0.0846 | | |
| | Ref Magnitudes | 0.3042 | 0.3148 | 0.3156 | 0.3166 | 0.3127 | 0.3174 | 0.015496 | 0.3174 | 0.3042 | | |
| subject | 6 Ind. Judgements | 30 | 80 | 80 | 75 | 90 | 75 | 0.2349 | 90 | 30 | 0.57207 | 184.5423 |
| | Test Magnitudes | 0.0938 | 0.12 | 0.1585 | 0.1964 | 0.2416 | 0.3248 | 0.44855 | 0.3248 | 0.0938 | | |
| | Ref Magnitudes | 0.3221 | 0.3289 | 0.331 | 0.3262 | 0.3292 | 0.328 | 0.009809 | 0.331 | 0.3221 | | |
| subject | 7 Ind. Judgements | 80 | 90 | 220 | 70 | 320 | 450 | 0.75743 | 450 | 70 | 1.3526 | 1768.943 |
| | Test Magnitudes | 0.0913 | 0.1175 | 0.154 | 0.1898 | 0.2319 | 0.3112 | 0.44089 | 0.3112 | 0.0913 | | |
| | Ref Magnitudes | 0.319 | 0.3219 | 0.3205 | 0.317 | 0.3195 | 0.3188 | 0.005188 | 0.3219 | 0.317 | | |
| subject | 8 Ind. Judgements | 60 | 80 | 90 | 70 | 110 | 130 | 0.28974 | 130 | 60 | 0.53685 | 226.001 |
| | Test Magnitudes | 0.0916 | 0.1164 | 0.1528 | 0.1918 | 0.2371 | 0.3122 | 0.44501 | 0.3122 | 0.0916 | | |
| | Ref Magnitudes | 0.3229 | 0.3162 | 0.3146 | 0.3217 | 0.3251 | 0.3224 | 0.012886 | 0.3251 | 0.3146 | | |
| subject | 9 Ind. Judgements | 40 | 150 | 150 | 140 | 150 | 200 | 0.38092 | 200 | 40 | 0.9577 | 685.9395 |
| | Test Magnitudes | 0.0912 | 0.1174 | 0.1538 | 0.1908 | 0.2341 | 0.3141 | 0.44551 | 0.3141 | 0.0912 | | |
| | Ref Magnitudes | 0.3194 | 0.3165 | 0.318 | 0.3192 | 0.3193 | 0.319 | 0.003555 | 0.3194 | 0.3165 | | |
| subject | 10 Ind. Judgements | 120 | 120 | 150 | 140 | 140 | 90 | 0.17055 | 150 | 80 | -0.11992 | 100.6853 |
| | Test Magnitudes | 0.0898 | 0.1116 | 0.1517 | 0.1882 | 0.2301 | 0.3057 | 0.44558 | 0.3057 | 0.0898 | | |
| | Ref Magnitudes | 0.3325 | 0.304 | 0.3129 | 0.3205 | 0.3096 | 0.3246 | 0.033052 | 0.3325 | 0.304 | | |
| subject | 11 Ind. Judgements | 25 | 75 | 125 | 75 | 150 | 275 | 0.72167 | 275 | 25 | 1.6195 | 1702.601 |
| | Test Magnitudes | 0.0917 | 0.1163 | 0.1527 | 0.1903 | 0.2328 | 0.3123 | 0.4444 | 0.3123 | 0.0917 | | |
| | Ref Magnitudes | 0.3196 | 0.3175 | 0.3168 | 0.3186 | 0.3174 | 0.3211 | 0.005078 | 0.3211 | 0.3168 | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.79377 304.8992 |

| Frequency 1.25 Hz | | Test: | Roll no backrest | Reference | Roll no backrest | 0.315 m.s ⁻² r.m.s. | Coef.Var | Max | Min | Ind. n | Ind. k | | |
|-------------------|--------------------|--------|------------------|-----------|------------------|--------------------------------|----------|----------|--------|--------|---------|----------|----------|
| Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | | | | | | | |
| subject | 1 Ind. Judgements | 50 | 115 | 80 | 145 | 100 | 120 | 0.32721 | 145 | 50 | 0.52692 | 286.148 | |
| | Test Magnitudes | 0.0661 | 0.0881 | 0.1088 | 0.1473 | 0.1863 | 0.2383 | 0.46556 | 0.2383 | 0.0661 | | | |
| | Ref Magnitudes | 0.3238 | 0.3247 | 0.3246 | 0.3246 | 0.3248 | 0.3189 | 0.007152 | 0.3248 | 0.3189 | | | |
| subject | 2 Ind. Judgements | 100 | 120 | 120 | 175 | 150 | 450 | 0.71072 | 450 | 100 | 0.96908 | 1201.212 | |
| | Test Magnitudes | 0.0662 | 0.0873 | 0.1065 | 0.1449 | 0.1828 | 0.2362 | 0.46531 | 0.2362 | 0.0662 | | | |
| | Ref Magnitudes | 0.3204 | 0.3197 | 0.3188 | 0.3207 | 0.3195 | 0.32 | 0.002118 | 0.3207 | 0.3188 | | | |
| subject | 3 Ind. Judgements | 60 | 75 | 50 | 140 | 120 | 160 | 0.45058 | 160 | 50 | 0.83567 | 533.7494 | |
| | Test Magnitudes | 0.0642 | 0.0842 | 0.1039 | 0.1408 | 0.1795 | 0.2314 | 0.47034 | 0.2314 | 0.0642 | | | |
| | Ref Magnitudes | 0.3113 | 0.3126 | 0.3126 | 0.3122 | 0.3128 | 0.313 | 0.001946 | 0.313 | 0.3113 | | | |
| subject | 4 Ind. Judgements | 120 | 80 | 110 | 115 | 150 | 200 | 0.3196 | 200 | 80 | 0.48455 | 341.8534 | |
| | Test Magnitudes | 0.0639 | 0.0863 | 0.1054 | 0.1437 | 0.1809 | 0.234 | 0.46936 | 0.234 | 0.0639 | | | |
| | Ref Magnitudes | 0.3176 | 0.3223 | 0.3209 | 0.3216 | 0.3104 | 0.3195 | 0.013816 | 0.3223 | 0.3104 | | | |
| subject | 5 Ind. Judgements | 90 | 30 | 40 | 110 | 90 | 120 | 0.46098 | 120 | 30 | 0.64986 | 275.8146 | |
| | Test Magnitudes | 0.0655 | 0.0861 | 0.1055 | 0.1423 | 0.1818 | 0.2357 | 0.46993 | 0.2357 | 0.0655 | | | |
| | Ref Magnitudes | 0.3144 | 0.3145 | 0.3167 | 0.3208 | 0.3141 | 0.3214 | 0.010492 | 0.3214 | 0.3141 | | | |
| subject | 6 Ind. Judgements | 25 | 60 | 50 | 40 | 85 | 150 | 0.65555 | 150 | 25 | 1.1042 | 562.973 | |
| | Test Magnitudes | 0.0681 | 0.0889 | 0.1087 | 0.1476 | 0.1857 | 0.2411 | 0.46426 | 0.2411 | 0.0681 | | | |
| | Ref Magnitudes | 0.3292 | 0.3283 | 0.3235 | 0.3218 | 0.3301 | 0.3274 | 0.010161 | 0.3301 | 0.3218 | | | |
| subject | 7 Ind. Judgements | 160 | 60 | 140 | 190 | 270 | 330 | 0.50197 | 330 | 60 | 0.96358 | 1264.69 | |
| | Test Magnitudes | 0.0666 | 0.0854 | 0.1047 | 0.1423 | 0.1795 | 0.2314 | 0.46126 | 0.2314 | 0.0666 | | | |
| | Ref Magnitudes | 0.3202 | 0.3182 | 0.3185 | 0.3221 | 0.3194 | 0.3193 | 0.004404 | 0.3221 | 0.3182 | | | |
| subject | 8 Ind. Judgements | 130 | 80 | 60 | 60 | 200 | 120 | 0.49681 | 200 | 60 | 0.25442 | 167.5739 | |
| | Test Magnitudes | 0.0647 | 0.0842 | 0.1049 | 0.1437 | 0.1785 | 0.2311 | 0.46581 | 0.2311 | 0.0647 | | | |
| | Ref Magnitudes | 0.3172 | 0.317 | 0.3155 | 0.3231 | 0.3153 | 0.318 | 0.008969 | 0.3231 | 0.3153 | | | |
| subject | 9 Ind. Judgements | 120 | 150 | 140 | 130 | 120 | 200 | 0.21008 | 200 | 120 | 0.20346 | 215.9804 | |
| | Test Magnitudes | 0.0654 | 0.0854 | 0.1046 | 0.1413 | 0.1805 | 0.2326 | 0.46701 | 0.2326 | 0.0654 | | | |
| | Ref Magnitudes | 0.3172 | 0.3179 | 0.3172 | 0.3179 | 0.3174 | 0.3182 | 0.001331 | 0.3182 | 0.3172 | | | |
| subject | 10 Ind. Judgements | 120 | 80 | 110 | 130 | 150 | 120 | 0.19577 | 150 | 80 | 0.22312 | 185.7132 | |
| | Test Magnitudes | 0.0644 | 0.086 | 0.1045 | 0.1416 | 0.1787 | 0.232 | 0.46629 | 0.232 | 0.0644 | | | |
| | Ref Magnitudes | 0.3135 | 0.3276 | 0.3118 | 0.3299 | 0.307 | 0.3217 | 0.029039 | 0.3299 | 0.307 | | | |
| subject | 11 Ind. Judgements | 15 | 75 | 75 | 80 | 175 | 300 | 0.85055 | 300 | 15 | 1.9898 | 5422.545 | |
| | Test Magnitudes | 0.0654 | 0.0861 | 0.105 | 0.1421 | 0.1797 | 0.232 | 0.46352 | 0.232 | 0.0654 | | | |
| | Ref Magnitudes | 0.3178 | 0.3206 | 0.3207 | 0.3147 | 0.3213 | 0.3203 | 0.007929 | 0.3213 | 0.3147 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.64986 | 341.8534 |

| Frequency 1.6 Hz | | Test: | Roll no backrest | Reference | Roll no backrest | 0.315 m.s ⁻² r.m.s. | Coef.Var | Max | Min | Ind. n | Ind. k | | |
|------------------|--------------------|--------|------------------|-----------|------------------|--------------------------------|----------|----------|--------|--------|----------|----------|----------|
| Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | | | | | | | |
| subject | 1 Ind. Judgements | 35 | 30 | 80 | 135 | 75 | 170 | 0.63287 | 170 | 30 | 1.3193 | 1808.15 | |
| | Test Magnitudes | 0.0483 | 0.0619 | 0.0757 | 0.0975 | 0.1253 | 0.16 | 0.44256 | 0.16 | 0.0483 | | | |
| | Ref Magnitudes | 0.3279 | 0.3241 | 0.3238 | 0.3257 | 0.3239 | 0.3234 | 0.005276 | 0.3279 | 0.3234 | | | |
| subject | 2 Ind. Judgements | 60 | 180 | 120 | 120 | 200 | 200 | 0.38247 | 200 | 60 | 0.76787 | 904.9705 | |
| | Test Magnitudes | 0.0475 | 0.0597 | 0.0732 | 0.0944 | 0.1197 | 0.1544 | 0.43839 | 0.1544 | 0.0475 | | | |
| | Ref Magnitudes | 0.3195 | 0.3202 | 0.3209 | 0.3196 | 0.3213 | 0.3199 | 0.002266 | 0.3213 | 0.3195 | | | |
| subject | 3 Ind. Judgements | 40 | 75 | 60 | 100 | 150 | 170 | 0.51854 | 170 | 40 | 1.1692 | 1618.06 | |
| | Test Magnitudes | 0.046 | 0.058 | 0.071 | 0.0931 | 0.1186 | 0.1535 | 0.444927 | 0.1535 | 0.046 | | | |
| | Ref Magnitudes | 0.3109 | 0.3119 | 0.3127 | 0.3102 | 0.3129 | 0.3108 | 0.003537 | 0.3129 | 0.3102 | | | |
| subject | 4 Ind. Judgements | 125 | 105 | 5 | 200 | 200 | 150 | 0.55614 | 200 | 5 | 0.83956 | 683.9119 | |
| | Test Magnitudes | 0.0466 | 0.0596 | 0.0734 | 0.0943 | 0.1202 | 0.1537 | 0.43979 | 0.1537 | 0.0466 | | | |
| | Ref Magnitudes | 0.3191 | 0.3208 | 0.3246 | 0.3214 | 0.3198 | 0.3227 | 0.006245 | 0.3246 | 0.3191 | | | |
| subject | 5 Ind. Judgements | 50 | 70 | 70 | 70 | 90 | 120 | 0.30656 | 120 | 50 | 0.59911 | 334.5201 | |
| | Test Magnitudes | 0.0468 | 0.0564 | 0.0729 | 0.0937 | 0.1202 | 0.1548 | 0.45164 | 0.1548 | 0.0468 | | | |
| | Ref Magnitudes | 0.3213 | 0.3047 | 0.3164 | 0.315 | 0.3147 | 0.3158 | 0.017275 | 0.3213 | 0.3047 | | | |
| subject | 6 Ind. Judgements | 70 | 20 | 40 | 90 | 90 | 120 | 0.51015 | 120 | 20 | 0.96757 | 657.7639 | |
| | Test Magnitudes | 0.0482 | 0.0613 | 0.075 | 0.0963 | 0.1234 | 0.1585 | 0.44113 | 0.1585 | 0.0482 | | | |
| | Ref Magnitudes | 0.3269 | 0.3278 | 0.3314 | 0.3278 | 0.3276 | 0.3278 | 0.004869 | 0.3314 | 0.3269 | | | |
| subject | 7 Ind. Judgements | 80 | 40 | 180 | 160 | 160 | 180 | 0.44159 | 180 | 40 | 0.96451 | 1306.658 | |
| | Test Magnitudes | 0.0461 | 0.0585 | 0.0722 | 0.0913 | 0.1177 | 0.1498 | 0.43612 | 0.1498 | 0.0461 | | | |
| | Ref Magnitudes | 0.3186 | 0.3192 | 0.3177 | 0.3198 | 0.3176 | 0.3194 | 0.002865 | 0.3198 | 0.3176 | | | |
| subject | 8 Ind. Judgements | 80 | 40 | 150 | 70 | 120 | 130 | 0.4238 | 150 | 40 | 0.55917 | 360.4232 | |
| | Test Magnitudes | 0.0457 | 0.0586 | 0.0716 | 0.0946 | 0.1196 | 0.1539 | 0.44842 | 0.1539 | 0.0457 | | | |
| | Ref Magnitudes | 0.3152 | 0.3216 | 0.3157 | 0.322 | 0.3149 | 0.3174 | 0.01013 | 0.322 | 0.3149 | | | |
| subject | 9 Ind. Judgements | 180 | 200 | 120 | 180 | 120 | 160 | 0.20917 | 200 | 120 | -0.20131 | 94.5029 | |
| | Test Magnitudes | 0.0452 | 0.0564 | 0.0705 | 0.0898 | 0.1145 | 0.1477 | 0.44053 | 0.1477 | 0.0452 | | | |
| | Ref Magnitudes | 0.3181 | 0.3183 | 0.3168 | 0.3166 | 0.3173 | 0.3175 | 0.002143 | 0.3183 | 0.3166 | | | |
| subject | 10 Ind. Judgements | 90 | 80 | 120 | 130 | 150 | 180 | 0.29826 | 180 | 80 | 0.68145 | 664.2517 | |
| | Test Magnitudes | 0.0465 | 0.0586 | 0.0721 | 0.0897 | 0.1132 | 0.1468 | 0.42408 | 0.1468 | 0.0465 | | | |
| | Ref Magnitudes | 0.3148 | 0.3139 | 0.3109 | 0.3218 | 0.3225 | 0.309 | 0.017657 | 0.3225 | 0.309 | | | |
| subject | 11 Ind. Judgements | 25 | 50 | 50 | 125 | 100 | 175 | 0.64523 | 175 | 25 | 1.5368 | 3291.058 | |
| | Test Magnitudes | 0.0459 | 0.0584 | 0.0721 | 0.095 | 0.117 | 0.1519 | 0.44 | 0.1519 | 0.0459 | | | |
| | Ref Magnitudes | 0.3207 | 0.3202 | 0.3159 | 0.3179 | 0.3191 | 0.3191 | 0.005427 | 0.3207 | 0.3159 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.83956 | 683.9119 |

Condition N

| Frequency 0.2 Hz | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|--------|-------------------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 1 | 2 | 3 | 4 | 5 | 6 | 0.87174 | 35 | 35 | 2 | 2.6553 154.8717 |
| | Test Magnitudes | 0.2011 | 0.2537 | 0.3181 | 0.4045 | 0.4834 | 0.6134 | 0.40453 | 0.6134 | 0.2011 | | |
| | Ref Magnitudes | 0.3232 | 0.3228 | 0.3233 | 0.3235 | 0.323 | 0.3219 | 0.00176 | 0.3235 | 0.3219 | | |
| subject | 2 Ind. Judgements | 2 | 10 | 40 | 50 | 60 | 80 | 0.7391 | 80 | 80 | 2 | 3.1287 592.9253 |
| | Test Magnitudes | 0.2046 | 0.2578 | 0.3226 | 0.4103 | 0.4913 | 0.6228 | 0.40434 | 0.6228 | 0.2046 | | |
| | Ref Magnitudes | 0.3277 | 0.3263 | 0.3262 | 0.3274 | 0.3257 | 0.3275 | 0.002553 | 0.3277 | 0.3257 | | |
| subject | 3 Ind. Judgements | 40 | 25 | 50 | 25 | 50 | 30 | 0.31883 | 50 | 25 | 25 | -0.044942 33.4796 |
| | Test Magnitudes | 0.1956 | 0.2435 | 0.307 | 0.4146 | 0.4673 | 0.6048 | 0.41097 | 0.6048 | 0.1956 | | |
| | Ref Magnitudes | 0.3125 | 0.3124 | 0.3119 | 0.3269 | 0.3125 | 0.3106 | 0.019506 | 0.3269 | 0.3106 | | |
| subject | 4 Ind. Judgements | 10 | 10 | 20 | 30 | 80 | 150 | 1.11 | 150 | 10 | 10 | 2.5606 459.1823 |
| | Test Magnitudes | 0.1947 | 0.2457 | 0.3121 | 0.3941 | 0.4713 | 0.6006 | 0.40757 | 0.6006 | 0.1947 | | |
| | Ref Magnitudes | 0.3176 | 0.3186 | 0.3178 | 0.3189 | 0.3185 | 0.3123 | 0.007851 | 0.3189 | 0.3123 | | |
| subject | 5 Ind. Judgements | 10 | 10 | 80 | 80 | 80 | 70 | 0.63766 | 80 | 10 | 10 | 2.0793 338.3298 |
| | Test Magnitudes | 0.2028 | 0.2522 | 0.3187 | 0.4054 | 0.4858 | 0.6164 | 0.40611 | 0.6164 | 0.2028 | | |
| | Ref Magnitudes | 0.3236 | 0.3201 | 0.322 | 0.3212 | 0.3215 | 0.322 | 0.00358 | 0.3236 | 0.3201 | | |
| subject | 6 Ind. Judgements | 10 | 10 | 20 | 20 | 30 | 30 | 0.44721 | 30 | 10 | 10 | 1.1306 57.2083 |
| | Test Magnitudes | 0.2058 | 0.2599 | 0.3285 | 0.4147 | 0.4959 | 0.6293 | 0.40436 | 0.6293 | 0.2058 | | |
| | Ref Magnitudes | 0.3315 | 0.3345 | 0.3364 | 0.3333 | 0.3335 | 0.3361 | 0.005538 | 0.3364 | 0.3315 | | |
| subject | 7 Ind. Judgements | 20 | 30 | 25 | 30 | 70 | 60 | 0.52584 | 70 | 20 | 10 | 1.047 107.9003 |
| | Test Magnitudes | 0.1955 | 0.2463 | 0.3081 | 0.3914 | 0.4695 | 0.5941 | 0.40385 | 0.5941 | 0.1955 | | |
| | Ref Magnitudes | 0.3159 | 0.3136 | 0.3138 | 0.3149 | 0.3148 | 0.3143 | 0.002673 | 0.3159 | 0.3136 | | |
| subject | 8 Ind. Judgements | 10 | 20 | 20 | 20 | 40 | 40 | 0.4899 | 40 | 10 | 10 | 1.1526 76.5003 |
| | Test Magnitudes | 0.1962 | 0.2478 | 0.3111 | 0.3954 | 0.4726 | 0.5983 | 0.40407 | 0.5983 | 0.1962 | | |
| | Ref Magnitudes | 0.3175 | 0.3178 | 0.3174 | 0.3142 | 0.3161 | 0.3173 | 0.004308 | 0.3178 | 0.3142 | | |
| subject | 9 Ind. Judgements | 1 | 10 | 10 | 20 | 50 | 70 | 1.0111 | 70 | 1 | 10 | 3.4422 543.2599 |
| | Test Magnitudes | 0.1948 | 0.2459 | 0.3129 | 0.3949 | 0.4716 | 0.5963 | 0.40427 | 0.5963 | 0.1948 | | |
| | Ref Magnitudes | 0.3209 | 0.321 | 0.3195 | 0.3199 | 0.3197 | 0.3203 | 0.001959 | 0.321 | 0.3195 | | |
| subject | 10 Ind. Judgements | 50 | 110 | 30 | 110 | 70 | 120 | 0.45433 | 120 | 30 | 10 | 0.57017 134.5302 |
| | Test Magnitudes | 0.1962 | 0.2462 | 0.3079 | 0.3919 | 0.4697 | 0.5948 | 0.40387 | 0.5948 | 0.1962 | | |
| | Ref Magnitudes | 0.3146 | 0.3166 | 0.3165 | 0.3162 | 0.3158 | 0.3158 | 0.002304 | 0.3166 | 0.3146 | | |
| subject | 11 Ind. Judgements | 5 | 15 | 10 | 25 | 25 | 25 | 0.50305 | 25 | 5 | 10 | 1.3444 64.8962 |
| | Test Magnitudes | 0.1938 | 0.2447 | 0.3071 | 0.3665 | 0.4671 | 0.5935 | 0.40909 | 0.5935 | 0.1938 | | |
| | Ref Magnitudes | 0.3174 | 0.318 | 0.3138 | 0.2938 | 0.314 | 0.3134 | 0.028877 | 0.318 | 0.2938 | | |
| +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | Median | 1.3444 134.5302 |

| Frequency 0.25 Hz | | | | | | | | | | | | |
|-------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|--------|------------------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 5 | 3 | 15 | 20 | 50 | 90 | 1.1048 | 90 | 3 | 10 | 2.8368 302.0094 |
| | Test Magnitudes | 0.201 | 0.2531 | 0.3167 | 0.4052 | 0.5082 | 0.6447 | 0.42939 | 0.6447 | 0.201 | | |
| | Ref Magnitudes | 0.3224 | 0.3234 | 0.322 | 0.3235 | 0.3217 | 0.3227 | 0.002264 | 0.3235 | 0.3217 | | |
| subject | 2 Ind. Judgements | 2 | 10 | 50 | 100 | 50 | 100 | 0.81043 | 100 | 2 | 10 | 3.0597 618.9634 |
| | Test Magnitudes | 0.2036 | 0.2567 | 0.3221 | 0.4107 | 0.5158 | 0.6554 | 0.43025 | 0.6554 | 0.2036 | | |
| | Ref Magnitudes | 0.3276 | 0.3263 | 0.3262 | 0.3263 | 0.327 | 0.3281 | 0.002427 | 0.3281 | 0.3262 | | |
| subject | 3 Ind. Judgements | 40 | 40 | 30 | 40 | 70 | 120 | 0.59757 | 120 | 30 | 10 | 0.94399 135.3675 |
| | Test Magnitudes | 0.2025 | 0.2424 | 0.306 | 0.3908 | 0.4925 | 0.6372 | 0.43377 | 0.6372 | 0.2025 | | |
| | Ref Magnitudes | 0.3243 | 0.3124 | 0.3117 | 0.3133 | 0.3123 | 0.3173 | 0.015498 | 0.3243 | 0.3117 | | |
| subject | 4 Ind. Judgements | 5 | 10 | 20 | 30 | 150 | 120 | 1.122 | 150 | 5 | 10 | 2.9685 645.8541 |
| | Test Magnitudes | 0.1943 | 0.245 | 0.3115 | 0.3955 | 0.4964 | 0.6276 | 0.43019 | 0.6276 | 0.1943 | | |
| | Ref Magnitudes | 0.3184 | 0.3165 | 0.3188 | 0.3178 | 0.3179 | 0.3181 | 0.002464 | 0.3188 | 0.3165 | | |
| subject | 5 Ind. Judgements | 20 | 70 | 50 | 70 | 80 | 110 | 0.45166 | 110 | 20 | 10 | 1.1192 186.2339 |
| | Test Magnitudes | 0.2002 | 0.2514 | 0.3175 | 0.4063 | 0.5103 | 0.6487 | 0.43337 | 0.6487 | 0.2002 | | |
| | Ref Magnitudes | 0.3185 | 0.322 | 0.3164 | 0.3158 | 0.3214 | 0.3195 | 0.007961 | 0.322 | 0.3158 | | |
| subject | 6 Ind. Judgements | 10 | 30 | 20 | 20 | 30 | 50 | 0.51235 | 50 | 10 | 10 | 0.98758 63.7074 |
| | Test Magnitudes | 0.2064 | 0.26 | 0.3258 | 0.4147 | 0.5207 | 0.662 | 0.42906 | 0.662 | 0.2064 | | |
| | Ref Magnitudes | 0.3352 | 0.334 | 0.3331 | 0.3301 | 0.3316 | 0.3335 | 0.005445 | 0.3352 | 0.3301 | | |
| subject | 7 Ind. Judgements | 40 | 40 | 30 | 50 | 60 | 100 | 0.46937 | 100 | 30 | 10 | 0.77586 111.8916 |
| | Test Magnitudes | 0.1946 | 0.2452 | 0.3075 | 0.3923 | 0.4928 | 0.6254 | 0.42984 | 0.6254 | 0.1946 | | |
| | Ref Magnitudes | 0.3124 | 0.3148 | 0.3153 | 0.315 | 0.3157 | 0.3139 | 0.003812 | 0.3157 | 0.3124 | | |
| subject | 8 Ind. Judgements | 10 | 20 | 30 | 40 | 50 | 40 | 0.46483 | 50 | 10 | 10 | 1.2117 99.7888 |
| | Test Magnitudes | 0.1956 | 0.2455 | 0.3097 | 0.3959 | 0.4969 | 0.6301 | 0.43119 | 0.6301 | 0.1956 | | |
| | Ref Magnitudes | 0.3185 | 0.3142 | 0.3159 | 0.3134 | 0.3158 | 0.316 | 0.005577 | 0.3185 | 0.3134 | | |
| subject | 9 Ind. Judgements | 10 | 10 | 10 | 30 | 30 | 100 | 1.1015 | 100 | 10 | 10 | 1.9356 161.3294 |
| | Test Magnitudes | 0.1945 | 0.2459 | 0.312 | 0.3953 | 0.4962 | 0.6302 | 0.43087 | 0.6302 | 0.1945 | | |
| | Ref Magnitudes | 0.3203 | 0.3202 | 0.3202 | 0.3203 | 0.321 | 0.3205 | 0.000955 | 0.321 | 0.3202 | | |
| subject | 10 Ind. Judgements | 30 | 50 | 50 | 60 | 100 | 130 | 0.50779 | 130 | 30 | 10 | 1.2108 233.9398 |
| | Test Magnitudes | 0.1951 | 0.2462 | 0.3062 | 0.3933 | 0.4937 | 0.627 | 0.42958 | 0.627 | 0.1951 | | |
| | Ref Magnitudes | 0.3161 | 0.3163 | 0.3166 | 0.3155 | 0.3164 | 0.316 | 0.001213 | 0.3166 | 0.3155 | | |
| subject | 11 Ind. Judgements | 15 | 5 | 20 | 30 | 100 | 75 | 0.85144 | 100 | 5 | 10 | 2.1924 292.2191 |
| | Test Magnitudes | 0.1938 | 0.2429 | 0.3098 | 0.3903 | 0.4917 | 0.6254 | 0.43103 | 0.6254 | 0.1938 | | |
| | Ref Magnitudes | 0.3176 | 0.3145 | 0.3178 | 0.3204 | 0.3137 | 0.3145 | 0.006882 | 0.3178 | 0.3124 | | |
| +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | Median | 1.2117 186.2339 |

| Frequency 0.315 Hz | | | | | | | | | | | | | |
|--------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|----------|
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 5 | 10 | 30 | 50 | 60 | 100 | 0.83438 | 100 | 5 | 2.5335 | 369.9828 | |
| | Test Magnitudes | 0.2001 | 0.2529 | 0.3177 | 0.406 | 0.5075 | 0.6504 | 0.43304 | 0.6504 | 0.2001 | | | |
| | Ref Magnitudes | 0.3235 | 0.3235 | 0.3229 | 0.3225 | 0.3196 | 0.3222 | 0.004507 | 0.3235 | 0.3196 | | | |
| subject | 2 Ind. Judgements | 5 | 33 | 66 | 180 | 200 | 175 | 0.77379 | 200 | 5 | 2.9247 | 1216.246 | |
| | Test Magnitudes | 0.2033 | 0.2565 | 0.3227 | 0.4123 | 0.5185 | 0.661 | 0.43398 | 0.661 | 0.2033 | | | |
| | Ref Magnitudes | 0.3267 | 0.327 | 0.327 | 0.3273 | 0.327 | 0.3272 | 0.000632 | 0.3273 | 0.3267 | | | |
| subject | 3 Ind. Judgements | 60 | 50 | 60 | 50 | 40 | 90 | 0.29527 | 90 | 40 | 0.14728 | 65.9422 | |
| | Test Magnitudes | 0.1943 | 0.2425 | 0.3121 | 0.3917 | 0.4945 | 0.63 | 0.43317 | 0.63 | 0.1943 | | | |
| | Ref Magnitudes | 0.3127 | 0.3126 | 0.317 | 0.3122 | 0.313 | 0.3123 | 0.005858 | 0.317 | 0.3122 | | | |
| subject | 4 Ind. Judgements | 5 | 30 | 30 | 50 | 200 | 125 | 1.0147 | 200 | 5 | 2.6851 | 701.1556 | |
| | Test Magnitudes | 0.1938 | 0.2458 | 0.3124 | 0.3969 | 0.4991 | 0.6347 | 0.43444 | 0.8347 | 0.1938 | | | |
| | Ref Magnitudes | 0.3168 | 0.3185 | 0.3181 | 0.3176 | 0.3157 | 0.317 | 0.003173 | 0.3185 | 0.3157 | | | |
| subject | 5 Ind. Judgements | 60 | 60 | 90 | 100 | 90 | 100 | 0.22343 | 100 | 60 | 0.4662 | 131.1299 | |
| | Test Magnitudes | 0.2005 | 0.2517 | 0.3167 | 0.4059 | 0.5128 | 0.6533 | 0.43659 | 0.6533 | 0.2005 | | | |
| | Ref Magnitudes | 0.3228 | 0.3233 | 0.3203 | 0.3202 | 0.3234 | 0.3212 | 0.004599 | 0.3234 | 0.3202 | | | |
| subject | 6 Ind. Judgements | 10 | 30 | 20 | 60 | 75 | 110 | 0.74758 | 110 | 10 | 1.9255 | 257.4501 | |
| | Test Magnitudes | 0.2055 | 0.2601 | 0.3271 | 0.4178 | 0.5244 | 0.6675 | 0.43267 | 0.6675 | 0.2055 | | | |
| | Ref Magnitudes | 0.3346 | 0.3346 | 0.3337 | 0.3332 | 0.3335 | 0.3311 | 0.003863 | 0.3346 | 0.3311 | | | |
| subject | 7 Ind. Judgements | 60 | 40 | 50 | 60 | 140 | 160 | 0.60334 | 160 | 40 | 1.072 | 227.9014 | |
| | Test Magnitudes | 0.1942 | 0.2448 | 0.3087 | 0.3943 | 0.4961 | 0.6318 | 0.43426 | 0.6318 | 0.1942 | | | |
| | Ref Magnitudes | 0.3152 | 0.3141 | 0.3155 | 0.3142 | 0.3148 | 0.3151 | 0.00179 | 0.3155 | 0.3141 | | | |
| subject | 8 Ind. Judgements | 20 | 40 | 30 | 70 | 100 | 70 | 0.54848 | 100 | 20 | 1.1859 | 164.9125 | |
| | Test Magnitudes | 0.1942 | 0.2452 | 0.3112 | 0.3988 | 0.4996 | 0.6362 | 0.43575 | 0.6362 | 0.1942 | | | |
| | Ref Magnitudes | 0.3169 | 0.3142 | 0.3167 | 0.3185 | 0.3147 | 0.3164 | 0.004962 | 0.3185 | 0.3142 | | | |
| subject | 9 Ind. Judgements | 10 | 50 | 50 | 50 | 100 | 120 | 0.62894 | 120 | 10 | 1.7451 | 307.3308 | |
| | Test Magnitudes | 0.1944 | 0.246 | 0.3131 | 0.3984 | 0.4997 | 0.6368 | 0.43476 | 0.6368 | 0.1944 | | | |
| | Ref Magnitudes | 0.3201 | 0.3199 | 0.3191 | 0.3194 | 0.32 | 0.3203 | 0.001426 | 0.3203 | 0.3191 | | | |
| subject | 10 Ind. Judgements | 50 | 30 | 80 | 90 | 80 | 100 | 0.36829 | 100 | 30 | 0.79039 | 152.3023 | |
| | Test Magnitudes | 0.1948 | 0.2465 | 0.3089 | 0.3951 | 0.4975 | 0.633 | 0.43314 | 0.633 | 0.1948 | | | |
| | Ref Magnitudes | 0.3162 | 0.3163 | 0.316 | 0.3162 | 0.3153 | 0.316 | 0.00115 | 0.3163 | 0.3153 | | | |
| subject | 11 Ind. Judgements | 20 | 15 | 10 | 75 | 50 | 100 | 0.81347 | 100 | 10 | 1.6234 | 181.2481 | |
| | Test Magnitudes | 0.1938 | 0.2448 | 0.3073 | 0.3685 | 0.4978 | 0.6336 | 0.44121 | 0.6336 | 0.1938 | | | |
| | Ref Magnitudes | 0.3179 | 0.3173 | 0.3143 | 0.2934 | 0.3176 | 0.3175 | 0.030968 | 0.3179 | 0.2934 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 1.6234 | 227.9014 |

| Frequency 0.4 Hz | | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|----------|
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 20 | 40 | 65 | 80 | 100 | 110 | 0.5017 | 110 | 20 | 1.3495 | 233.9074 | |
| | Test Magnitudes | 0.2001 | 0.254 | 0.3197 | 0.4091 | 0.5191 | 0.674 | 0.44744 | 0.674 | 0.2001 | | | |
| | Ref Magnitudes | 0.3223 | 0.3227 | 0.3229 | 0.3224 | 0.3229 | 0.3278 | 0.006557 | 0.3278 | 0.3223 | | | |
| subject | 2 Ind. Judgements | 70 | 33 | 150 | 100 | 100 | 200 | 0.54236 | 200 | 33 | 0.97219 | 248.6659 | |
| | Test Magnitudes | 0.2031 | 0.2569 | 0.3239 | 0.4148 | 0.5262 | 0.6725 | 0.44127 | 0.6725 | 0.2031 | | | |
| | Ref Magnitudes | 0.3294 | 0.3261 | 0.3263 | 0.3265 | 0.3269 | 0.3278 | 0.001894 | 0.3278 | 0.3261 | | | |
| subject | 3 Ind. Judgements | 40 | 70 | 70 | 120 | 80 | 100 | 0.3446 | 120 | 40 | 0.67035 | 151.3689 | |
| | Test Magnitudes | 0.1951 | 0.2442 | 0.3203 | 0.4117 | 0.5022 | 0.6417 | 0.43429 | 0.6417 | 0.1951 | | | |
| | Ref Magnitudes | 0.3132 | 0.3121 | 0.3222 | 0.3231 | 0.3125 | 0.312 | 0.016754 | 0.3231 | 0.312 | | | |
| subject | 4 Ind. Judgements | 33 | 50 | 120 | 50 | 50 | 130 | 0.57604 | 130 | 33 | 0.70604 | 131.7476 | |
| | Test Magnitudes | 0.1934 | 0.2464 | 0.3138 | 0.4014 | 0.5083 | 0.6463 | 0.442 | 0.6463 | 0.1934 | | | |
| | Ref Magnitudes | 0.3155 | 0.317 | 0.3168 | 0.318 | 0.3181 | 0.3176 | 0.003055 | 0.3181 | 0.3155 | | | |
| subject | 5 Ind. Judgements | 30 | 90 | 90 | 100 | 100 | 130 | 0.36515 | 130 | 30 | 0.91455 | 208.6835 | |
| | Test Magnitudes | 0.2002 | 0.253 | 0.3169 | 0.4096 | 0.5207 | 0.6642 | 0.44342 | 0.6642 | 0.2002 | | | |
| | Ref Magnitudes | 0.3221 | 0.3231 | 0.3189 | 0.3215 | 0.3229 | 0.3227 | 0.004868 | 0.3231 | 0.3189 | | | |
| subject | 6 Ind. Judgements | 10 | 40 | 60 | 90 | 80 | 180 | 0.75907 | 180 | 10 | 2.0258 | 414.6431 | |
| | Test Magnitudes | 0.2056 | 0.2609 | 0.328 | 0.4202 | 0.5317 | 0.6783 | 0.43908 | 0.6783 | 0.2056 | | | |
| | Ref Magnitudes | 0.333 | 0.3329 | 0.3314 | 0.3317 | 0.3314 | 0.3325 | 0.002227 | 0.333 | 0.3314 | | | |
| subject | 7 Ind. Judgements | 70 | 40 | 60 | 180 | 200 | 270 | 0.68118 | 270 | 40 | 1.5162 | 526.9327 | |
| | Test Magnitudes | 0.1946 | 0.2455 | 0.3104 | 0.3986 | 0.5052 | 0.6443 | 0.44163 | 0.6443 | 0.1946 | | | |
| | Ref Magnitudes | 0.3148 | 0.3133 | 0.3133 | 0.314 | 0.3144 | 0.3151 | 0.002405 | 0.3151 | 0.3133 | | | |
| subject | 8 Ind. Judgements | 40 | 40 | 30 | 110 | 60 | 70 | 0.50175 | 110 | 30 | 0.64229 | 103.3329 | |
| | Test Magnitudes | 0.1941 | 0.2477 | 0.3128 | 0.4021 | 0.5025 | 0.6441 | 0.43858 | 0.6441 | 0.1941 | | | |
| | Ref Magnitudes | 0.3158 | 0.3166 | 0.3156 | 0.318 | 0.3094 | 0.3116 | 0.010447 | 0.318 | 0.3094 | | | |
| subject | 9 Ind. Judgements | 10 | 20 | 100 | 50 | 75 | 110 | 0.6786 | 110 | 10 | 1.8208 | 293.4668 | |
| | Test Magnitudes | 0.1963 | 0.2492 | 0.3163 | 0.403 | 0.5093 | 0.6503 | 0.43942 | 0.6503 | 0.1963 | | | |
| | Ref Magnitudes | 0.3208 | 0.3207 | 0.3198 | 0.3202 | 0.3196 | 0.3206 | 0.00156 | 0.3208 | 0.3196 | | | |
| subject | 10 Ind. Judgements | 40 | 120 | 60 | 110 | 90 | 80 | 0.38133 | 120 | 40 | 0.3863 | 116.6646 | |
| | Test Magnitudes | 0.1959 | 0.2484 | 0.3127 | 0.4005 | 0.5062 | 0.6448 | 0.43812 | 0.6448 | 0.1959 | | | |
| | Ref Magnitudes | 0.3165 | 0.3165 | 0.3163 | 0.3163 | 0.3154 | 0.3155 | 0.001581 | 0.3165 | 0.3154 | | | |
| subject | 11 Ind. Judgements | 20 | 15 | 25 | 100 | 90 | 125 | 0.76858 | 125 | 15 | 1.9147 | 329.8519 | |
| | Test Magnitudes | 0.1954 | 0.2462 | 0.3143 | 0.4011 | 0.5032 | 0.6428 | 0.43734 | 0.6428 | 0.1954 | | | |
| | Ref Magnitudes | 0.314 | 0.3142 | 0.318 | 0.318 | 0.3137 | 0.3128 | 0.007249 | 0.318 | 0.3128 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.97219 | 233.9074 |

| Frequency 0.5 Hz | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 30 | 75 | 75 | 140 | 240 | 150 | 0.63051 | 240 | 30 | 1.493 | 439.5219 |
| | Test Magnitudes | 0.2018 | 0.2542 | 0.3222 | 0.4169 | 0.528 | 0.6426 | 0.4273 | 0.6426 | 0.2018 | | |
| | Ref Magnitudes | 0.3236 | 0.3218 | 0.3222 | 0.3226 | 0.3231 | 0.3224 | 0.002003 | 0.3236 | 0.3218 | | |
| subject | 2 Ind. Judgements | 80 | 100 | 110 | 150 | 220 | 400 | 0.67987 | 400 | 80 | 1.2966 | 547.658 |
| | Test Magnitudes | 0.2044 | 0.2592 | 0.3273 | 0.4204 | 0.5333 | 0.6522 | 0.42653 | 0.6522 | 0.2044 | | |
| | Ref Magnitudes | 0.3273 | 0.3273 | 0.3271 | 0.3248 | 0.326 | 0.3278 | 0.003405 | 0.3278 | 0.3248 | | |
| subject | 3 Ind. Judgements | 50 | 70 | 70 | 200 | 190 | 80 | 0.60576 | 200 | 50 | 0.82954 | 223.8588 |
| | Test Magnitudes | 0.197 | 0.2453 | 0.3132 | 0.4197 | 0.5206 | 0.6237 | 0.42751 | 0.6237 | 0.197 | | |
| | Ref Magnitudes | 0.3136 | 0.3118 | 0.3132 | 0.3244 | 0.3175 | 0.3112 | 0.015796 | 0.3244 | 0.3112 | | |
| subject | 4 Ind. Judgements | 70 | 90 | 90 | 110 | 120 | 133 | 0.2258 | 133 | 70 | 0.5159 | 170.319 |
| | Test Magnitudes | 0.1969 | 0.2465 | 0.3166 | 0.4058 | 0.5173 | 0.6279 | 0.42847 | 0.6279 | 0.1969 | | |
| | Ref Magnitudes | 0.3178 | 0.3154 | 0.3167 | 0.3151 | 0.3183 | 0.3162 | 0.004042 | 0.3183 | 0.3151 | | |
| subject | 5 Ind. Judgements | 90 | 90 | 130 | 110 | 110 | 200 | 0.33955 | 200 | 90 | 0.52668 | 199.2291 |
| | Test Magnitudes | 0.2023 | 0.2515 | 0.3233 | 0.4146 | 0.5277 | 0.6381 | 0.42577 | 0.6381 | 0.2023 | | |
| | Ref Magnitudes | 0.3233 | 0.3203 | 0.3232 | 0.3199 | 0.3218 | 0.3194 | 0.005287 | 0.3233 | 0.3194 | | |
| subject | 6 Ind. Judgements | 80 | 110 | 60 | 130 | 120 | 110 | 0.25962 | 130 | 60 | 0.3352 | 136.5199 |
| | Test Magnitudes | 0.2091 | 0.2655 | 0.3317 | 0.4308 | 0.5422 | 0.6596 | 0.422 | 0.6596 | 0.2091 | | |
| | Ref Magnitudes | 0.3337 | 0.3347 | 0.3319 | 0.3358 | 0.3331 | 0.3328 | 0.004163 | 0.3358 | 0.3319 | | |
| subject | 7 Ind. Judgements | 70 | 70 | 100 | 130 | 270 | 180 | 0.56615 | 270 | 70 | 1.1043 | 379.9053 |
| | Test Magnitudes | 0.1941 | 0.2496 | 0.3138 | 0.4053 | 0.5133 | 0.6233 | 0.42635 | 0.6233 | 0.1941 | | |
| | Ref Magnitudes | 0.3121 | 0.3151 | 0.3139 | 0.3141 | 0.3138 | 0.3109 | 0.00488 | 0.3151 | 0.3109 | | |
| subject | 8 Ind. Judgements | 30 | 100 | 70 | 120 | 120 | 110 | 0.38672 | 120 | 30 | 0.92859 | 216.9049 |
| | Test Magnitudes | 0.1977 | 0.2473 | 0.3176 | 0.41 | 0.5157 | 0.6254 | 0.42466 | 0.6254 | 0.1977 | | |
| | Ref Magnitudes | 0.3176 | 0.314 | 0.3175 | 0.3173 | 0.3153 | 0.3127 | 0.006561 | 0.3176 | 0.3127 | | |
| subject | 9 Ind. Judgements | 80 | 60 | 120 | 120 | 110 | 200 | 0.41793 | 200 | 60 | 0.77192 | 236.2853 |
| | Test Magnitudes | 0.1988 | 0.2511 | 0.3196 | 0.4111 | 0.5188 | 0.6329 | 0.42557 | 0.6329 | 0.1988 | | |
| | Ref Magnitudes | 0.3205 | 0.3201 | 0.3194 | 0.3202 | 0.3201 | 0.321 | 0.001646 | 0.321 | 0.3194 | | |
| subject | 10 Ind. Judgements | 80 | 80 | 95 | 100 | 120 | 220 | 0.45879 | 220 | 80 | 0.75839 | 236.3688 |
| | Test Magnitudes | 0.1977 | 0.25 | 0.3167 | 0.408 | 0.5157 | 0.6276 | 0.42485 | 0.6276 | 0.1977 | | |
| | Ref Magnitudes | 0.3164 | 0.316 | 0.3164 | 0.3166 | 0.3162 | 0.3161 | 0.000705 | 0.3166 | 0.316 | | |
| subject | 11 Ind. Judgements | 10 | 50 | 100 | 100 | 200 | 250 | 0.76602 | 250 | 10 | 2.4582 | 1006.679 |
| | Test Magnitudes | 0.1968 | 0.2472 | 0.3177 | 0.4051 | 0.516 | 0.628 | 0.42752 | 0.628 | 0.1968 | | |
| | Ref Magnitudes | 0.3174 | 0.3134 | 0.3178 | 0.3142 | 0.3177 | 0.3183 | 0.006639 | 0.3183 | 0.3134 | | |
| +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | Median | 0.82954 | 236.2853 |

| Frequency 0.63 Hz | | | | | | | | | | | | |
|-------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 60 | 60 | 110 | 100 | 220 | 290 | 0.67158 | 290 | 60 | 1.4261 | 682.5796 |
| | Test Magnitudes | 0.1616 | 0.2022 | 0.2571 | 0.3282 | 0.4241 | 0.5068 | 0.42449 | 0.5068 | 0.1616 | | |
| | Ref Magnitudes | 0.3227 | 0.3222 | 0.3226 | 0.3233 | 0.3234 | 0.3234 | 0.001563 | 0.3234 | 0.3222 | | |
| subject | 2 Ind. Judgements | 100 | 80 | 120 | 170 | 200 | 400 | 0.65817 | 400 | 80 | 1.2187 | 687.6304 |
| | Test Magnitudes | 0.1634 | 0.2034 | 0.2593 | 0.3306 | 0.4284 | 0.5111 | 0.42413 | 0.5111 | 0.1634 | | |
| | Ref Magnitudes | 0.3268 | 0.3257 | 0.3266 | 0.3264 | 0.3263 | 0.3278 | 0.00213 | 0.3278 | 0.3257 | | |
| subject | 3 Ind. Judgements | 75 | 60 | 120 | 100 | 175 | 130 | 0.40517 | 175 | 50 | 0.79235 | 270.5385 |
| | Test Magnitudes | 0.1576 | 0.1976 | 0.2562 | 0.3292 | 0.4258 | 0.4912 | 0.42204 | 0.4912 | 0.1576 | | |
| | Ref Magnitudes | 0.3131 | 0.3132 | 0.3228 | 0.3243 | 0.3237 | 0.3124 | 0.018496 | 0.3243 | 0.3124 | | |
| subject | 4 Ind. Judgements | 70 | 110 | 95 | 100 | 110 | 120 | 0.17296 | 120 | 70 | 0.33089 | 150.8521 |
| | Test Magnitudes | 0.159 | 0.197 | 0.2511 | 0.3215 | 0.4155 | 0.4953 | 0.42422 | 0.4953 | 0.159 | | |
| | Ref Magnitudes | 0.3182 | 0.3165 | 0.3168 | 0.3171 | 0.3185 | 0.3174 | 0.002484 | 0.3185 | 0.3165 | | |
| subject | 5 Ind. Judgements | 90 | 90 | 130 | 130 | 180 | 220 | 0.36701 | 220 | 90 | 0.80054 | 359.6032 |
| | Test Magnitudes | 0.1604 | 0.2012 | 0.2552 | 0.3244 | 0.4166 | 0.5065 | 0.42551 | 0.5065 | 0.1604 | | |
| | Ref Magnitudes | 0.3215 | 0.3218 | 0.323 | 0.3197 | 0.3171 | 0.3222 | 0.006705 | 0.323 | 0.3171 | | |
| subject | 6 Ind. Judgements | 80 | 90 | 140 | 120 | 160 | 170 | 0.28971 | 170 | 80 | 0.65682 | 270.3193 |
| | Test Magnitudes | 0.1656 | 0.2082 | 0.2656 | 0.3363 | 0.4349 | 0.5193 | 0.4228 | 0.5193 | 0.1656 | | |
| | Ref Magnitudes | 0.3319 | 0.3339 | 0.3334 | 0.332 | 0.3361 | 0.3342 | 0.00468 | 0.3361 | 0.3319 | | |
| subject | 7 Ind. Judgements | 80 | 90 | 250 | 170 | 280 | 220 | 0.45846 | 280 | 80 | 1.004 | 580.6231 |
| | Test Magnitudes | 0.158 | 0.1978 | 0.2505 | 0.319 | 0.4119 | 0.493 | 0.42248 | 0.493 | 0.158 | | |
| | Ref Magnitudes | 0.3148 | 0.3148 | 0.3135 | 0.3135 | 0.3127 | 0.3147 | 0.002834 | 0.3148 | 0.3127 | | |
| subject | 8 Ind. Judgements | 30 | 40 | 60 | 60 | 160 | 140 | 0.66807 | 160 | 30 | 1.4416 | 419.48 |
| | Test Magnitudes | 0.1548 | 0.1979 | 0.2517 | 0.3177 | 0.4158 | 0.4974 | 0.42956 | 0.4974 | 0.1548 | | |
| | Ref Magnitudes | 0.313 | 0.3161 | 0.3161 | 0.3133 | 0.3185 | 0.3176 | 0.007052 | 0.3185 | 0.313 | | |
| subject | 9 Ind. Judgements | 50 | 150 | 110 | 150 | 120 | 150 | 0.32219 | 150 | 50 | 0.62686 | 250.5208 |
| | Test Magnitudes | 0.1593 | 0.2 | 0.2544 | 0.325 | 0.4169 | 0.4973 | 0.42128 | 0.4973 | 0.1593 | | |
| | Ref Magnitudes | 0.3192 | 0.3199 | 0.3212 | 0.3205 | 0.3199 | 0.3192 | 0.002416 | 0.3212 | 0.3192 | | |
| subject | 10 Ind. Judgements | 60 | 80 | 130 | 150 | 160 | 220 | 0.43388 | 220 | 60 | 1.0703 | 469.4453 |
| | Test Magnitudes | 0.1589 | 0.1989 | 0.2521 | 0.3208 | 0.4139 | 0.4948 | 0.42158 | 0.4948 | 0.1589 | | |
| | Ref Magnitudes | 0.3162 | 0.3165 | 0.3161 | 0.3161 | 0.3161 | 0.3161 | 0.000507 | 0.3165 | 0.3161 | | |
| subject | 11 Ind. Judgements | 25 | 150 | 175 | 200 | 150 | 40 | 0.59121 | 200 | 25 | 0.33166 | 145.9296 |
| | Test Magnitudes | 0.1597 | 0.1989 | 0.2522 | 0.3183 | 0.4138 | 0.4947 | 0.42106 | 0.4947 | 0.1597 | | |
| | Ref Magnitudes | 0.3142 | 0.3174 | 0.3177 | 0.3138 | 0.3176 | 0.3182 | 0.006148 | 0.3182 | 0.3138 | | |
| +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | Median | 0.80054 | 359.6032 |

| Frequency 0.8 Hz | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|----------|----------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 70 | 75 | 200 | 205 | 320 | 330 | 0.56502 | 330 | 70 | 1.4681 | 1507.891 |
| | Test Magnitudes | 0.1211 | 0.1609 | 0.2031 | 0.2565 | 0.314 | 0.4024 | 0.42897 | 0.4024 | 0.1211 | | |
| | Ref Magnitudes | 0.3228 | 0.3232 | 0.3219 | 0.3222 | 0.3221 | 0.3231 | 0.001718 | 0.3232 | 0.3219 | | |
| subject | 2 Ind. Judgements | 120 | 150 | 200 | 300 | 300 | 250 | 0.34617 | 300 | 120 | 0.75419 | 637.6577 |
| | Test Magnitudes | 0.1216 | 0.162 | 0.2055 | 0.2599 | 0.3172 | 0.4038 | 0.42547 | 0.4038 | 0.1216 | | |
| | Ref Magnitudes | 0.3263 | 0.328 | 0.3266 | 0.3274 | 0.3273 | 0.3258 | 0.002478 | 0.328 | 0.3258 | | |
| subject | 3 Ind. Judgements | 90 | 75 | 80 | 130 | 140 | 180 | 0.35639 | 180 | 75 | 0.70082 | 318.7816 |
| | Test Magnitudes | 0.1184 | 0.1608 | 0.1971 | 0.2479 | 0.3048 | 0.3893 | 0.42038 | 0.3893 | 0.1184 | | |
| | Ref Magnitudes | 0.313 | 0.3233 | 0.3124 | 0.3142 | 0.3135 | 0.3119 | 0.013606 | 0.3233 | 0.3119 | | |
| subject | 4 Ind. Judgements | 120 | 80 | 80 | 120 | 120 | 150 | 0.24306 | 150 | 80 | 0.30941 | 174.0113 |
| | Test Magnitudes | 0.1173 | 0.1569 | 0.1997 | 0.2515 | 0.3056 | 0.3929 | 0.42705 | 0.3929 | 0.1173 | | |
| | Ref Magnitudes | 0.3155 | 0.3182 | 0.3185 | 0.318 | 0.3143 | 0.3168 | 0.005329 | 0.3185 | 0.3143 | | |
| subject | 5 Ind. Judgements | 100 | 130 | 120 | 190 | 330 | 400 | 0.58812 | 400 | 100 | 1.222 | 1157.748 |
| | Test Magnitudes | 0.1199 | 0.1589 | 0.2017 | 0.2548 | 0.3102 | 0.3967 | 0.42496 | 0.3967 | 0.1199 | | |
| | Ref Magnitudes | 0.3221 | 0.322 | 0.3206 | 0.3219 | 0.3215 | 0.3234 | 0.00283 | 0.3234 | 0.3206 | | |
| subject | 6 Ind. Judgements | 100 | 130 | 110 | 90 | 170 | 200 | 0.32404 | 200 | 90 | 0.46913 | 255.9041 |
| | Test Magnitudes | 0.1196 | 0.164 | 0.2065 | 0.2636 | 0.321 | 0.4096 | 0.43141 | 0.4096 | 0.1196 | | |
| | Ref Magnitudes | 0.3351 | 0.3314 | 0.3341 | 0.3311 | 0.3305 | 0.334 | 0.005782 | 0.3351 | 0.3305 | | |
| subject | 7 Ind. Judgements | 220 | 230 | 380 | 180 | 500 | 600 | 0.48605 | 800 | 180 | 0.77976 | 1046.348 |
| | Test Magnitudes | 0.1174 | 0.1548 | 0.1964 | 0.2501 | 0.3037 | 0.3882 | 0.42607 | 0.3882 | 0.1174 | | |
| | Ref Magnitudes | 0.3139 | 0.3125 | 0.3153 | 0.3153 | 0.3149 | 0.3143 | 0.003406 | 0.3153 | 0.3125 | | |
| subject | 8 Ind. Judgements | 110 | 60 | 110 | 90 | 130 | 120 | 0.24226 | 130 | 60 | 0.28647 | 154.6552 |
| | Test Magnitudes | 0.1182 | 0.1588 | 0.2012 | 0.254 | 0.3076 | 0.3917 | 0.42207 | 0.3917 | 0.1182 | | |
| | Ref Magnitudes | 0.3186 | 0.3178 | 0.3167 | 0.3177 | 0.3152 | 0.3138 | 0.005729 | 0.3186 | 0.3138 | | |
| subject | 9 Ind. Judgements | 120 | 120 | 150 | 150 | 200 | 130 | 0.20804 | 200 | 120 | 0.23439 | 203.0599 |
| | Test Magnitudes | 0.1203 | 0.1581 | 0.2019 | 0.2533 | 0.3087 | 0.3949 | 0.42319 | 0.3949 | 0.1203 | | |
| | Ref Magnitudes | 0.32 | 0.3193 | 0.3205 | 0.3186 | 0.3199 | 0.3196 | 0.002044 | 0.3205 | 0.3186 | | |
| subject | 10 Ind. Judgements | 110 | 140 | 160 | 200 | 200 | 250 | 0.2834 | 250 | 110 | 0.66334 | 468.1601 |
| | Test Magnitudes | 0.1183 | 0.156 | 0.1983 | 0.2489 | 0.3039 | 0.3892 | 0.42363 | 0.3892 | 0.1183 | | |
| | Ref Magnitudes | 0.3162 | 0.3163 | 0.3159 | 0.3141 | 0.3154 | 0.3145 | 0.002906 | 0.3163 | 0.3141 | | |
| subject | 11 Ind. Judgements | 125 | 80 | 175 | 350 | 300 | 300 | 0.49556 | 350 | 80 | 1.0905 | 1025.593 |
| | Test Magnitudes | 0.1179 | 0.1564 | 0.1977 | 0.2493 | 0.306 | 0.3892 | 0.42484 | 0.3892 | 0.1179 | | |
| | Ref Magnitudes | 0.3171 | 0.3128 | 0.3143 | 0.3176 | 0.3176 | 0.3138 | 0.006796 | 0.3176 | 0.3128 | | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.70082 | 468.1601 |
| Frequency 1 Hz | | | | | | | | | | | | |
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 95 | 175 | 280 | 270 | 400 | 420 | 0.46011 | 420 | 95 | 1.1705 | 1937.998 |
| | Test Magnitudes | 0.0932 | 0.1188 | 0.156 | 0.1955 | 0.2241 | 0.3221 | 0.44643 | 0.3221 | 0.0932 | | |
| | Ref Magnitudes | 0.3235 | 0.3223 | 0.3227 | 0.3231 | 0.3045 | 0.3225 | 0.023428 | 0.3235 | 0.3045 | | |
| subject | 2 Ind. Judgements | 100 | 200 | 200 | 250 | 400 | 400 | 0.46478 | 400 | 100 | 1.0749 | 1525.809 |
| | Test Magnitudes | 0.0945 | 0.1198 | 0.1591 | 0.1966 | 0.2417 | 0.3251 | 0.44768 | 0.3251 | 0.0945 | | |
| | Ref Magnitudes | 0.3279 | 0.327 | 0.327 | 0.3277 | 0.3275 | 0.3273 | 0.001126 | 0.3279 | 0.327 | | |
| subject | 3 Ind. Judgements | 80 | 200 | 150 | 140 | 270 | 290 | 0.42929 | 290 | 80 | 0.84504 | 780.9557 |
| | Test Magnitudes | 0.0897 | 0.1157 | 0.1528 | 0.1895 | 0.2359 | 0.3105 | 0.44714 | 0.3105 | 0.0897 | | |
| | Ref Magnitudes | 0.3118 | 0.3121 | 0.312 | 0.3114 | 0.3207 | 0.3118 | 0.011596 | 0.3207 | 0.3114 | | |
| subject | 4 Ind. Judgements | 110 | 125 | 130 | 150 | 150 | 180 | 0.17453 | 180 | 110 | 0.37114 | 269.194 |
| | Test Magnitudes | 0.091 | 0.1171 | 0.1541 | 0.1899 | 0.2346 | 0.3159 | 0.44881 | 0.3159 | 0.091 | | |
| | Ref Magnitudes | 0.3177 | 0.3163 | 0.3184 | 0.3171 | 0.316 | 0.3162 | 0.003018 | 0.3184 | 0.316 | | |
| subject | 5 Ind. Judgements | 120 | 130 | 120 | 160 | 280 | 450 | 0.6303 | 450 | 120 | 1.0702 | 1217.498 |
| | Test Magnitudes | 0.0916 | 0.1183 | 0.1569 | 0.1903 | 0.2379 | 0.3173 | 0.44672 | 0.3173 | 0.0916 | | |
| | Ref Magnitudes | 0.3229 | 0.3237 | 0.3213 | 0.3231 | 0.3216 | 0.3225 | 0.002845 | 0.3237 | 0.3213 | | |
| subject | 6 Ind. Judgements | 80 | 90 | 150 | 150 | 130 | 200 | 0.33091 | 200 | 80 | 0.68315 | 419.112 |
| | Test Magnitudes | 0.0941 | 0.1194 | 0.1602 | 0.198 | 0.2438 | 0.3231 | 0.44554 | 0.3231 | 0.0941 | | |
| | Ref Magnitudes | 0.3311 | 0.3349 | 0.3304 | 0.3312 | 0.3327 | 0.3343 | 0.005559 | 0.3349 | 0.3304 | | |
| subject | 7 Ind. Judgements | 160 | 330 | 320 | 400 | 280 | 700 | 0.49913 | 700 | 160 | 0.85402 | 1553.17 |
| | Test Magnitudes | 0.0885 | 0.1136 | 0.149 | 0.185 | 0.2291 | 0.3048 | 0.44675 | 0.3048 | 0.0885 | | |
| | Ref Magnitudes | 0.315 | 0.315 | 0.3151 | 0.3151 | 0.3153 | 0.316 | 0.001216 | 0.316 | 0.315 | | |
| subject | 8 Ind. Judgements | 140 | 130 | 180 | 200 | 170 | 140 | 0.1723 | 200 | 130 | 0.097404 | 188.4218 |
| | Test Magnitudes | 0.0872 | 0.113 | 0.1469 | 0.185 | 0.235 | 0.3168 | 0.46944 | 0.3168 | 0.0872 | | |
| | Ref Magnitudes | 0.3158 | 0.3153 | 0.317 | 0.3175 | 0.3157 | 0.3146 | 0.003417 | 0.3175 | 0.3146 | | |
| subject | 9 Ind. Judgements | 150 | 150 | 200 | 150 | 250 | 400 | 0.45378 | 400 | 150 | 0.73732 | 745.81 |
| | Test Magnitudes | 0.0918 | 0.1194 | 0.1554 | 0.1915 | 0.233 | 0.3156 | 0.44222 | 0.3156 | 0.0918 | | |
| | Ref Magnitudes | 0.32 | 0.3202 | 0.3201 | 0.3193 | 0.3199 | 0.3203 | 0.001112 | 0.3203 | 0.3193 | | |
| subject | 10 Ind. Judgements | 130 | 160 | 150 | 150 | 270 | 300 | 0.37394 | 300 | 130 | 0.67481 | 615.5461 |
| | Test Magnitudes | 0.0904 | 0.1157 | 0.1517 | 0.1878 | 0.2288 | 0.3078 | 0.44172 | 0.3078 | 0.0904 | | |
| | Ref Magnitudes | 0.316 | 0.3165 | 0.3159 | 0.3163 | 0.3162 | 0.316 | 0.000817 | 0.3166 | 0.3159 | | |
| subject | 11 Ind. Judgements | 200 | 200 | 200 | 300 | 250 | 400 | 0.34908 | 400 | 200 | 0.54293 | 659.877 |
| | Test Magnitudes | 0.0904 | 0.1162 | 0.1515 | 0.188 | 0.2305 | 0.3088 | 0.44272 | 0.3088 | 0.0904 | | |
| | Ref Magnitudes | 0.3144 | 0.3136 | 0.3182 | 0.317 | 0.3137 | 0.3179 | 0.006765 | 0.3182 | 0.3136 | | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.73732 | 745.81 |

| Frequency 1.25 Hz | | | | | | | | | | | | | |
|-------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|----------|
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 140 | 260 | 250 | 300 | 300 | 250 | 0.23461 | 300 | 140 | 0.39099 | 552.9548 | |
| | Test Magnitudes | 0.0665 | 0.0862 | 0.0995 | 0.1423 | 0.172 | 0.234 | 0.46859 | 0.234 | 0.0665 | | | |
| | Ref Magnitudes | 0.3225 | 0.3225 | 0.3048 | 0.3236 | 0.3046 | 0.3205 | 0.028857 | 0.3236 | 0.3046 | | | |
| subject | 2 Ind. Judgements | 120 | 130 | 200 | 250 | 200 | 450 | 0.53537 | 450 | 120 | 0.90917 | 1311.186 | |
| | Test Magnitudes | 0.0678 | 0.0898 | 0.11 | 0.1481 | 0.1885 | 0.2416 | 0.46374 | 0.2416 | 0.0678 | | | |
| | Ref Magnitudes | 0.3265 | 0.3268 | 0.3272 | 0.3267 | 0.3265 | 0.328 | 0.00176 | 0.328 | 0.3265 | | | |
| subject | 3 Ind. Judgements | 90 | 140 | 130 | 190 | 170 | 300 | 0.42581 | 300 | 90 | 0.79137 | 836.8141 | |
| | Test Magnitudes | 0.0649 | 0.0841 | 0.1054 | 0.1411 | 0.1778 | 0.2305 | 0.46453 | 0.2305 | 0.0649 | | | |
| | Ref Magnitudes | 0.3118 | 0.312 | 0.3172 | 0.3118 | 0.3121 | 0.3125 | 0.006783 | 0.3172 | 0.3118 | | | |
| subject | 4 Ind. Judgements | 150 | 150 | 150 | 180 | 180 | 250 | 0.21971 | 250 | 150 | 0.37422 | 381.8086 | |
| | Test Magnitudes | 0.0651 | 0.0848 | 0.1021 | 0.139 | 0.1784 | 0.2317 | 0.47043 | 0.2317 | 0.0651 | | | |
| | Ref Magnitudes | 0.3163 | 0.3185 | 0.3176 | 0.3171 | 0.3179 | 0.3175 | 0.002344 | 0.3185 | 0.3163 | | | |
| subject | 5 Ind. Judgements | 140 | 120 | 190 | 360 | 300 | 400 | 0.46909 | 400 | 120 | 0.97656 | 1756.027 | |
| | Test Magnitudes | 0.0657 | 0.0862 | 0.1051 | 0.1409 | 0.1789 | 0.2335 | 0.46528 | 0.2335 | 0.0657 | | | |
| | Ref Magnitudes | 0.3213 | 0.3237 | 0.3233 | 0.3227 | 0.3209 | 0.3202 | 0.004394 | 0.3237 | 0.3202 | | | |
| subject | 6 Ind. Judgements | 90 | 100 | 110 | 120 | 120 | 150 | 0.18032 | 150 | 90 | 0.36188 | 239.816 | |
| | Test Magnitudes | 0.0683 | 0.0879 | 0.1067 | 0.1459 | 0.1847 | 0.238 | 0.46304 | 0.238 | 0.0683 | | | |
| | Ref Magnitudes | 0.3328 | 0.3342 | 0.3336 | 0.3331 | 0.3347 | 0.3338 | 0.002093 | 0.3347 | 0.3328 | | | |
| subject | 7 Ind. Judgements | 160 | 300 | 200 | 300 | 380 | 360 | 0.30742 | 380 | 160 | 0.59543 | 953.7642 | |
| | Test Magnitudes | 0.0639 | 0.0843 | 0.1029 | 0.1392 | 0.1756 | 0.2278 | 0.46465 | 0.2278 | 0.0639 | | | |
| | Ref Magnitudes | 0.3133 | 0.3132 | 0.3146 | 0.3156 | 0.3141 | 0.3156 | 0.003394 | 0.3156 | 0.3132 | | | |
| subject | 8 Ind. Judgements | 80 | 120 | 120 | 50 | 150 | 190 | 0.41886 | 190 | 50 | 0.46513 | 291.045 | |
| | Test Magnitudes | 0.0648 | 0.0836 | 0.1017 | 0.1365 | 0.1795 | 0.2225 | 0.45951 | 0.2225 | 0.0648 | | | |
| | Ref Magnitudes | 0.318 | 0.3171 | 0.3162 | 0.309 | 0.3132 | 0.3185 | 0.011493 | 0.3185 | 0.309 | | | |
| subject | 9 Ind. Judgements | 150 | 200 | 250 | 200 | 200 | 500 | 0.50596 | 500 | 150 | 0.64204 | 881.2219 | |
| | Test Magnitudes | 0.0659 | 0.0859 | 0.1038 | 0.1429 | 0.1808 | 0.2377 | 0.47433 | 0.2377 | 0.0659 | | | |
| | Ref Magnitudes | 0.3204 | 0.32 | 0.32 | 0.3191 | 0.3206 | 0.3188 | 0.002241 | 0.3206 | 0.3188 | | | |
| subject | 10 Ind. Judgements | 80 | 90 | 150 | 180 | 180 | 200 | 0.34408 | 200 | 80 | 0.76354 | 688.7195 | |
| | Test Magnitudes | 0.0651 | 0.0844 | 0.1038 | 0.1408 | 0.1794 | 0.2305 | 0.46651 | 0.2305 | 0.0651 | | | |
| | Ref Magnitudes | 0.3166 | 0.3167 | 0.3142 | 0.3154 | 0.3166 | 0.3162 | 0.003112 | 0.3167 | 0.3142 | | | |
| subject | 11 Ind. Judgements | 175 | 225 | 150 | 175 | 250 | 350 | 0.33135 | 350 | 150 | 0.45754 | 558.0972 | |
| | Test Magnitudes | 0.0643 | 0.0843 | 0.0978 | 0.1406 | 0.1777 | 0.23 | 0.47503 | 0.23 | 0.0643 | | | |
| | Ref Magnitudes | 0.3176 | 0.3178 | 0.2937 | 0.3181 | 0.3178 | 0.3147 | 0.030887 | 0.3181 | 0.2937 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.59543 | 688.7195 |

| Frequency 1.6 Hz | | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|-----------|----------|---------|
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 140 | 200 | 250 | 230 | 370 | 300 | 0.32156 | 370 | 140 | 0.66809 | 1225.428 | |
| | Test Magnitudes | 0.049 | 0.0614 | 0.0725 | 0.0951 | 0.1211 | 0.1575 | 0.43943 | 0.1575 | 0.049 | | | |
| | Ref Magnitudes | 0.3277 | 0.3221 | 0.3229 | 0.3256 | 0.3227 | 0.3204 | 0.008129 | 0.3277 | 0.3204 | | | |
| subject | 2 Ind. Judgements | 20 | 150 | 150 | 300 | 300 | 200 | 0.56863 | 300 | 20 | 1.6966 | 8743.127 | |
| | Test Magnitudes | 0.0498 | 0.0617 | 0.077 | 0.097 | 0.1274 | 0.1595 | 0.43697 | 0.1595 | 0.0498 | | | |
| | Ref Magnitudes | 0.3277 | 0.3262 | 0.3285 | 0.3262 | 0.3285 | 0.3269 | 0.003237 | 0.3285 | 0.3262 | | | |
| subject | 3 Ind. Judgements | 80 | 140 | 80 | 140 | 300 | 180 | 0.5325 | 300 | 80 | 0.84752 | 1143.528 | |
| | Test Magnitudes | 0.046 | 0.0583 | 0.071 | 0.0918 | 0.1173 | 0.1502 | 0.43957 | 0.1502 | 0.046 | | | |
| | Ref Magnitudes | 0.3125 | 0.3126 | 0.3116 | 0.3123 | 0.3111 | 0.3128 | 0.002113 | 0.3128 | 0.3111 | | | |
| subject | 4 Ind. Judgements | 120 | 150 | 175 | 150 | 200 | 170 | 0.16961 | 200 | 120 | 0.28181 | 322.1123 | |
| | Test Magnitudes | 0.0446 | 0.0574 | 0.0701 | 0.0913 | 0.1172 | 0.1521 | 0.45359 | 0.1521 | 0.0446 | | | |
| | Ref Magnitudes | 0.318 | 0.3185 | 0.3171 | 0.3181 | 0.3185 | 0.3176 | 0.001707 | 0.3185 | 0.3171 | | | |
| subject | 5 Ind. Judgements | 110 | 220 | 250 | 160 | 150 | 400 | 0.48224 | 400 | 110 | 0.58162 | 831.031 | |
| | Test Magnitudes | 0.0474 | 0.0599 | 0.072 | 0.0938 | 0.1205 | 0.1522 | 0.43585 | 0.1522 | 0.0474 | | | |
| | Ref Magnitudes | 0.3232 | 0.3187 | 0.3204 | 0.3233 | 0.3223 | 0.3228 | 0.005572 | 0.3233 | 0.3187 | | | |
| subject | 6 Ind. Judgements | 90 | 120 | 110 | 110 | 130 | 120 | 0.12055 | 130 | 90 | 0.20804 | 187.3835 | |
| | Test Magnitudes | 0.0491 | 0.0623 | 0.0747 | 0.0954 | 0.1219 | 0.1573 | 0.43279 | 0.1573 | 0.0491 | | | |
| | Ref Magnitudes | 0.3315 | 0.3307 | 0.3343 | 0.3347 | 0.3343 | 0.3334 | 0.004993 | 0.3347 | 0.3307 | | | |
| subject | 7 Ind. Judgements | 170 | 230 | 350 | 230 | 240 | 180 | 0.27464 | 350 | 170 | -0.021926 | 214.6689 | |
| | Test Magnitudes | 0.0462 | 0.0585 | 0.0709 | 0.0912 | 0.1164 | 0.1503 | 0.43855 | 0.1503 | 0.0462 | | | |
| | Ref Magnitudes | 0.3144 | 0.3156 | 0.3153 | 0.3154 | 0.3147 | 0.3153 | 0.001467 | 0.3156 | 0.3144 | | | |
| subject | 8 Ind. Judgements | 50 | 50 | 70 | 110 | 110 | 120 | 0.37757 | 120 | 50 | 0.86128 | 693.3939 | |
| | Test Magnitudes | 0.046 | 0.0565 | 0.0697 | 0.09 | 0.1154 | 0.15 | 0.44599 | 0.15 | 0.046 | | | |
| | Ref Magnitudes | 0.3159 | 0.3185 | 0.3187 | 0.3168 | 0.3189 | 0.3163 | 0.004199 | 0.3189 | 0.3159 | | | |
| subject | 9 Ind. Judgements | 200 | 170 | 150 | 300 | 300 | 300 | 0.30076 | 300 | 150 | 0.52354 | 836.8833 | |
| | Test Magnitudes | 0.045 | 0.0582 | 0.0726 | 0.0946 | 0.1181 | 0.1528 | 0.44596 | 0.1528 | 0.045 | | | |
| | Ref Magnitudes | 0.3204 | 0.3206 | 0.3196 | 0.3185 | 0.32 | 0.3194 | 0.002388 | 0.3206 | 0.3185 | | | |
| subject | 10 Ind. Judgements | 110 | 150 | 150 | 180 | 100 | 220 | 0.29314 | 220 | 100 | 0.30518 | 312.619 | |
| | Test Magnitudes | 0.0457 | 0.059 | 0.0724 | 0.0943 | 0.1167 | 0.1527 | 0.44089 | 0.1527 | 0.0457 | | | |
| | Ref Magnitudes | 0.3165 | 0.3166 | 0.3167 | 0.3135 | 0.3169 | 0.3159 | 0.004045 | 0.3169 | 0.3135 | | | |
| subject | 11 Ind. Judgements | 175 | 150 | 125 | 250 | 175 | 400 | 0.47498 | 400 | 125 | 0.65159 | 1001.637 | |
| | Test Magnitudes | 0.0459 | 0.0578 | 0.0709 | 0.0922 | 0.1174 | 0.15 | 0.44066 | 0.15 | 0.0459 | | | |
| | Ref Magnitudes | 0.3144 | 0.3141 | 0.3141 | 0.3136 | 0.3179 | 0.3176 | 0.006122 | 0.3179 | 0.3136 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.58162 | 831.031 |

Condition O

| Frequency 0.2 Hz | | | | | | | | | | | | |
|-------------------|--------------------|--------|--------|--------|--------|--------|----------|----------|--------|-----------|----------|----------|
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 10 | 10 | 8 | 50 | 10 | 1.0303 | 50 | 8 | 1.0942 | 43.0824 | |
| | Test Magnitudes | 0.2202 | 0.2773 | 0.3505 | 0.4498 | 0.4659 | 0.30232 | 0.4659 | 0.2202 | | | |
| | Ref Magnitudes | 0.3507 | 0.346 | 0.3511 | 0.349 | 0.3491 | 0.005754 | 0.3511 | 0.346 | | | |
| subject | 2 Ind. Judgements | 50 | 75 | 80 | 300 | 300 | 0.79129 | 300 | 50 | 2.4746 | 2173.667 | |
| | Test Magnitudes | 0.2031 | 0.2552 | 0.3235 | 0.4127 | 0.4289 | 0.30106 | 0.4289 | 0.2031 | | | |
| | Ref Magnitudes | 0.3195 | 0.3197 | 0.319 | 0.3199 | 0.3193 | 0.001093 | 0.3199 | 0.319 | | | |
| subject | 3 Ind. Judgements | 40 | 80 | 120 | 150 | 130 | 0.42242 | 150 | 40 | 1.5927 | 606.5067 | |
| | Test Magnitudes | 0.2024 | 0.2543 | 0.3235 | 0.4099 | 0.4261 | 0.29933 | 0.4261 | 0.2024 | | | |
| | Ref Magnitudes | 0.3183 | 0.3171 | 0.3191 | 0.3172 | 0.317 | 0.002907 | 0.3191 | 0.317 | -0.014331 | 129.8901 | |
| subject | 4 Ind. Judgements | 150 | 110 | 130 | 170 | 110 | 0.1946 | 170 | 110 | | | |
| | Test Magnitudes | 0.2085 | 0.2617 | 0.3322 | 0.4243 | 0.4412 | 0.30211 | 0.4412 | 0.2085 | | | |
| | Ref Magnitudes | 0.3313 | 0.332 | 0.3317 | 0.3319 | 0.3311 | 0.001168 | 0.332 | 0.3311 | 0.85895 | 258.0712 | |
| subject | 5 Ind. Judgements | 70 | 80 | 80 | 130 | 130 | 0.30098 | 130 | 70 | | | |
| | Test Magnitudes | 0.2026 | 0.2541 | 0.3219 | 0.4099 | 0.4271 | 0.30019 | 0.4271 | 0.2026 | | | |
| | Ref Magnitudes | 0.3188 | 0.3195 | 0.3196 | 0.3199 | 0.3194 | 0.001264 | 0.3199 | 0.3188 | 1.0901 | 198.0066 | |
| subject | 6 Ind. Judgements | 30 | 50 | 60 | 25 | 175 | 0.85419 | 175 | 25 | | | |
| | Test Magnitudes | 0.2023 | 0.2549 | 0.3222 | 0.411 | 0.4274 | 0.30064 | 0.4274 | 0.2023 | | | |
| | Ref Magnitudes | 0.3189 | 0.3181 | 0.318 | 0.3177 | 0.3193 | 0.002107 | 0.3193 | 0.3177 | | | |
| subject | 7 Ind. Judgements | 30 | 30 | 60 | 60 | 110 | 0.56398 | 110 | 30 | 1.5524 | 299.6284 | |
| | Test Magnitudes | 0.2088 | 0.2622 | 0.332 | 0.4246 | 0.4413 | 0.30167 | 0.4413 | 0.2088 | | | |
| | Ref Magnitudes | 0.3324 | 0.3318 | 0.3321 | 0.3306 | 0.3322 | 0.002156 | 0.3324 | 0.3306 | | | |
| subject | 8 Ind. Judgements | 120 | 90 | 110 | 90 | 80 | 0.16767 | 120 | 80 | -0.39368 | 62.9133 | |
| | Test Magnitudes | 0.2194 | 0.2759 | 0.3398 | 0.4463 | 0.4502 | 0.29552 | 0.4502 | 0.2194 | | | |
| | Ref Magnitudes | 0.35 | 0.3512 | 0.3376 | 0.3496 | 0.3385 | 0.019471 | 0.3512 | 0.3376 | 1.583 | 1476.813 | |
| subject | 9 Ind. Judgements | 200 | 90 | 300 | 500 | 400 | 0.5413 | 500 | 90 | | | |
| | Test Magnitudes | 0.2136 | 0.2748 | 0.3401 | 0.434 | 0.4502 | 0.2962 | 0.4502 | 0.2136 | | | |
| | Ref Magnitudes | 0.3416 | 0.3474 | 0.3407 | 0.3408 | 0.3409 | 0.008426 | 0.3474 | 0.3407 | 1.6266 | 531.2224 | |
| subject | 10 Ind. Judgements | 40 | 60 | 140 | 180 | 100 | 0.55069 | 180 | 40 | | | |
| | Test Magnitudes | 0.2184 | 0.2746 | 0.3476 | 0.4439 | 0.4677 | 0.30494 | 0.4677 | 0.2184 | | | |
| | Ref Magnitudes | 0.3477 | 0.3479 | 0.3477 | 0.3487 | 0.3487 | 0.001487 | 0.3487 | 0.3477 | 0.96907 | 65.1146 | |
| subject | 11 Ind. Judgements | 25 | 10 | 15 | 25 | 50 | 0.61644 | 50 | 10 | | | |
| | Test Magnitudes | 0.2091 | 0.2613 | 0.3304 | 0.4231 | 0.4396 | 0.3005 | 0.4396 | 0.2091 | | | |
| | Ref Magnitudes | 0.3259 | 0.3296 | 0.328 | 0.3265 | 0.3253 | 0.005316 | 0.3296 | 0.3253 | 1.0942 | 258.0712 | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | +++ | +++ | Median | | | |
| Frequency 0.25 Hz | | | | | | | | | | | | |
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 7 | 12 | 20 | 120 | 25 | 350 | 1.5124 | 350 | 7 | 2.9031 | 530.0355 |
| | Test Magnitudes | 0.2208 | 0.2752 | 0.3452 | 0.439 | 0.5541 | 0.7027 | 0.42892 | 0.7027 | 0.2208 | | |
| | Ref Magnitudes | 0.3428 | 0.3454 | 0.3468 | 0.3472 | 0.3509 | 0.3468 | 0.00761 | 0.3509 | 0.3428 | | |
| subject | 2 Ind. Judgements | 100 | 50 | 75 | 400 | 400 | 450 | 0.76756 | 450 | 50 | 1.9056 | 1213.353 |
| | Test Magnitudes | 0.2029 | 0.2533 | 0.3183 | 0.4037 | 0.5097 | 0.6471 | 0.42912 | 0.6471 | 0.2029 | | |
| | Ref Magnitudes | 0.3206 | 0.3203 | 0.3204 | 0.3181 | 0.3196 | 0.3201 | 0.002884 | 0.3206 | 0.3181 | | |
| subject | 3 Ind. Judgements | 50 | 70 | 100 | 130 | 140 | 200 | 0.46308 | 200 | 50 | 1.1366 | 334.44 |
| | Test Magnitudes | 0.2025 | 0.2525 | 0.3138 | 0.402 | 0.5067 | 0.6461 | 0.43081 | 0.6461 | 0.2025 | | |
| | Ref Magnitudes | 0.3158 | 0.3163 | 0.3135 | 0.3167 | 0.3179 | 0.3151 | 0.00474 | 0.3179 | 0.3135 | 0.42977 | 218.9637 |
| subject | 4 Ind. Judgements | 110 | 130 | 110 | 200 | 150 | 180 | 0.2539 | 200 | 110 | | |
| | Test Magnitudes | 0.2082 | 0.2609 | 0.3272 | 0.415 | 0.5244 | 0.6645 | 0.42877 | 0.6645 | 0.2082 | | |
| | Ref Magnitudes | 0.3311 | 0.3309 | 0.3318 | 0.3314 | 0.3309 | 0.331 | 0.00107 | 0.3318 | 0.3309 | | |
| subject | 5 Ind. Judgements | 90 | 90 | 80 | 120 | 110 | 220 | 0.43884 | 220 | 80 | 0.67977 | 222.9883 |
| | Test Magnitudes | 0.2027 | 0.2522 | 0.3174 | 0.4021 | 0.5075 | 0.6454 | 0.42907 | 0.6454 | 0.2027 | | |
| | Ref Magnitudes | 0.3187 | 0.3191 | 0.3194 | 0.319 | 0.3199 | 0.3171 | 0.002999 | 0.3199 | 0.3171 | | |
| subject | 6 Ind. Judgements | 50 | 30 | 60 | 110 | 90 | 175 | 0.60808 | 175 | 30 | 1.2572 | 265.6651 |
| | Test Magnitudes | 0.2028 | 0.2531 | 0.3175 | 0.4025 | 0.5085 | 0.6451 | 0.42836 | 0.6451 | 0.2028 | | |
| | Ref Magnitudes | 0.3181 | 0.3185 | 0.3181 | 0.3177 | 0.319 | 0.3174 | 0.001786 | 0.319 | 0.3174 | | |
| subject | 7 Ind. Judgements | 75 | 60 | 35 | 80 | 90 | 370 | 1.0544 | 370 | 35 | 1.2472 | 298.6434 |
| | Test Magnitudes | 0.2086 | 0.2609 | 0.3272 | 0.4151 | 0.5245 | 0.6655 | 0.42907 | 0.6655 | 0.2086 | | |
| | Ref Magnitudes | 0.3328 | 0.332 | 0.3319 | 0.3321 | 0.3314 | 0.3332 | 0.001966 | 0.3332 | 0.3314 | | |
| subject | 8 Ind. Judgements | 60 | 80 | 110 | 120 | 140 | 80 | 0.30452 | 140 | 60 | 0.40197 | 138.4294 |
| | Test Magnitudes | 0.2199 | 0.2671 | 0.3442 | 0.4366 | 0.5519 | 0.6819 | 0.4228 | 0.6819 | 0.2199 | | |
| | Ref Magnitudes | 0.3497 | 0.3385 | 0.3501 | 0.3496 | 0.3477 | 0.3354 | 0.018811 | 0.3501 | 0.3354 | | |
| subject | 9 Ind. Judgements | 80 | 200 | 300 | 300 | 450 | 400 | 0.46552 | 450 | 80 | 1.2894 | 872.6087 |
| | Test Magnitudes | 0.2139 | 0.2726 | 0.335 | 0.4251 | 0.5496 | 0.6804 | 0.42758 | 0.6804 | 0.2139 | | |
| | Ref Magnitudes | 0.3412 | 0.3477 | 0.3401 | 0.3414 | 0.3469 | 0.3417 | 0.00949 | 0.3477 | 0.3401 | | |
| subject | 10 Ind. Judgements | 80 | 80 | 90 | 80 | 160 | 180 | 0.41005 | 180 | 80 | 0.74405 | 212.0143 |
| | Test Magnitudes | 0.219 | 0.2733 | 0.3427 | 0.4348 | 0.5493 | 0.6971 | 0.42871 | 0.6971 | 0.219 | | |
| | Ref Magnitudes | 0.3478 | 0.3478 | 0.3478 | 0.3486 | 0.3485 | 0.3482 | 0.001066 | 0.3486 | 0.3478 | | |
| subject | 11 Ind. Judgements | 20 | 15 | 25 | 75 | 25 | 200 | 1.1995 | 200 | 15 | 1.7603 | 216.6247 |
| | Test Magnitudes | 0.2091 | 0.2599 | 0.3289 | 0.4154 | 0.5217 | 0.6625 | 0.42707 | 0.6625 | 0.2091 | | |
| | Ref Magnitudes | 0.3274 | 0.3284 | 0.327 | 0.3268 | 0.3285 | 0.3277 | 0.002155 | 0.3285 | 0.3268 | | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | | |

| Frequency 0.315 Hz | | | | | | | | | | | | |
|--------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 40 | 30 | 70 | 150 | 270 | 90 | 0.8306 | 270 | 30 | 1.4212 | 314.4576 |
| | Test Magnitudes | 0.2195 | 0.2752 | 0.3461 | 0.4373 | 0.5464 | 0.6904 | 0.42144 | 0.6904 | 0.2195 | | |
| | Ref Magnitudes | 0.3455 | 0.3482 | 0.3497 | 0.3478 | 0.3481 | 0.3491 | 0.004146 | 0.3497 | 0.3455 | | |
| subject | 2 Ind. Judgements | 75 | 80 | 200 | 250 | 400 | 400 | 0.62038 | 400 | 75 | 1.672 | 1064.603 |
| | Test Magnitudes | 0.2019 | 0.2526 | 0.318 | 0.4029 | 0.5033 | 0.6344 | 0.42156 | 0.6344 | 0.2019 | | |
| | Ref Magnitudes | 0.3204 | 0.3197 | 0.3204 | 0.3202 | 0.3204 | 0.32 | 0.000893 | 0.3204 | 0.3197 | | |
| subject | 3 Ind. Judgements | 40 | 40 | 50 | 140 | 140 | 180 | 0.63155 | 180 | 40 | 1.5337 | 395.7932 |
| | Test Magnitudes | 0.2002 | 0.2519 | 0.3158 | 0.4003 | 0.5011 | 0.6309 | 0.42193 | 0.6309 | 0.2002 | | |
| | Ref Magnitudes | 0.3161 | 0.3165 | 0.3137 | 0.3162 | 0.3184 | 0.3168 | 0.004797 | 0.3184 | 0.3137 | 0.9794 | 339.5432 |
| subject | 4 Ind. Judgements | 80 | 90 | 110 | 120 | 180 | 250 | 0.46942 | 250 | 80 | | |
| | Test Magnitudes | 0.2077 | 0.26 | 0.3266 | 0.4138 | 0.5182 | 0.6521 | 0.42153 | 0.6521 | 0.2077 | | |
| | Ref Magnitudes | 0.3319 | 0.3309 | 0.3313 | 0.3297 | 0.3316 | 0.3322 | 0.002691 | 0.3322 | 0.3297 | | |
| subject | 5 Ind. Judgements | 80 | 90 | 110 | 80 | 250 | 360 | 0.72286 | 360 | 80 | 1.2751 | 498.4668 |
| | Test Magnitudes | 0.2009 | 0.2522 | 0.3169 | 0.4013 | 0.5013 | 0.6324 | 0.4216 | 0.6324 | 0.2009 | | |
| | Ref Magnitudes | 0.3198 | 0.3193 | 0.3186 | 0.319 | 0.3205 | 0.3202 | 0.00228 | 0.3205 | 0.3186 | 0.96539 | 273.77 |
| subject | 6 Ind. Judgements | 90 | 40 | 110 | 90 | 150 | 200 | 0.48862 | 200 | 40 | | |
| | Test Magnitudes | 0.201 | 0.2523 | 0.3171 | 0.4011 | 0.5022 | 0.6328 | 0.42182 | 0.6328 | 0.201 | | |
| | Ref Magnitudes | 0.3184 | 0.3167 | 0.3195 | 0.3175 | 0.3195 | 0.3183 | 0.003467 | 0.3195 | 0.3167 | | |
| subject | 7 Ind. Judgements | 25 | 40 | 100 | 65 | 190 | 140 | 0.67565 | 190 | 25 | 1.5987 | 368.5156 |
| | Test Magnitudes | 0.2078 | 0.2604 | 0.328 | 0.4155 | 0.5185 | 0.6528 | 0.42095 | 0.6528 | 0.2078 | | |
| | Ref Magnitudes | 0.3326 | 0.3327 | 0.3332 | 0.3327 | 0.333 | 0.3319 | 0.001336 | 0.3332 | 0.3319 | | |
| subject | 8 Ind. Judgements | 30 | 60 | 90 | 90 | 140 | 130 | 0.46081 | 140 | 30 | 1.237 | 260.9374 |
| | Test Magnitudes | 0.2186 | 0.2737 | 0.3441 | 0.4364 | 0.5297 | 0.6859 | 0.41842 | 0.6859 | 0.2186 | | |
| | Ref Magnitudes | 0.3488 | 0.3493 | 0.3494 | 0.3489 | 0.337 | 0.3476 | 0.014012 | 0.3494 | 0.337 | | |
| subject | 9 Ind. Judgements | 100 | 80 | 80 | 300 | 300 | 400 | 0.66735 | 400 | 80 | 1.5518 | 753.8158 |
| | Test Magnitudes | 0.2177 | 0.2664 | 0.3424 | 0.4343 | 0.5305 | 0.6693 | 0.41456 | 0.6693 | 0.2177 | | |
| | Ref Magnitudes | 0.3474 | 0.3407 | 0.347 | 0.3467 | 0.3402 | 0.341 | 0.010243 | 0.3474 | 0.3402 | | |
| subject | 10 Ind. Judgements | 50 | 50 | 110 | 80 | 150 | 260 | 0.685 | 260 | 50 | 1.3934 | 367.2206 |
| | Test Magnitudes | 0.2181 | 0.2724 | 0.3428 | 0.4379 | 0.5427 | 0.6836 | 0.42064 | 0.6836 | 0.2181 | | |
| | Ref Magnitudes | 0.349 | 0.3468 | 0.3481 | 0.35 | 0.3484 | 0.3484 | 0.003025 | 0.35 | 0.3468 | | |
| subject | 11 Ind. Judgements | 10 | 20 | 50 | 75 | 150 | 300 | 1.0875 | 300 | 10 | 2.9281 | 1066.073 |
| | Test Magnitudes | 0.2078 | 0.2598 | 0.3276 | 0.4135 | 0.5167 | 0.6516 | 0.42065 | 0.6516 | 0.2078 | | |
| | Ref Magnitudes | 0.3271 | 0.3275 | 0.3269 | 0.3275 | 0.3283 | 0.3274 | 0.001468 | 0.3283 | 0.3269 | | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 1.4212 | 368.5156 |
| Frequency 0.4 Hz | | | | | | | | | | | | |
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 35 | 25 | 110 | 70 | 90 | 230 | 0.7958 | 230 | 25 | 1.5739 | 314.5114 |
| | Test Magnitudes | 0.2201 | 0.2758 | 0.3472 | 0.4436 | 0.5548 | 0.699 | 0.42584 | 0.699 | 0.2201 | | |
| | Ref Magnitudes | 0.3449 | 0.3464 | 0.3463 | 0.3515 | 0.348 | 0.3503 | 0.007333 | 0.3515 | 0.3449 | | |
| subject | 2 Ind. Judgements | 100 | 100 | 150 | 120 | 350 | 450 | 0.7105 | 450 | 100 | 1.3571 | 701.0347 |
| | Test Magnitudes | 0.2016 | 0.2522 | 0.3183 | 0.4054 | 0.5094 | 0.6413 | 0.42697 | 0.6413 | 0.2016 | | |
| | Ref Magnitudes | 0.3202 | 0.3197 | 0.3199 | 0.3205 | 0.3203 | 0.3199 | 0.001027 | 0.3205 | 0.3197 | | |
| subject | 3 Ind. Judgements | 60 | 60 | 100 | 70 | 60 | 200 | 0.60313 | 200 | 60 | 0.67957 | 165.3746 |
| | Test Magnitudes | 0.1965 | 0.25 | 0.316 | 0.4038 | 0.5073 | 0.6373 | 0.43054 | 0.6373 | 0.1965 | | |
| | Ref Magnitudes | 0.3114 | 0.3157 | 0.3172 | 0.3174 | 0.3185 | 0.3176 | 0.008112 | 0.3185 | 0.3114 | | |
| subject | 4 Ind. Judgements | 100 | 130 | 110 | 75 | 200 | 200 | 0.38846 | 200 | 75 | 0.53693 | 217.2699 |
| | Test Magnitudes | 0.2086 | 0.2608 | 0.3278 | 0.4182 | 0.525 | 0.6596 | 0.42511 | 0.6596 | 0.2086 | | |
| | Ref Magnitudes | 0.332 | 0.3318 | 0.3315 | 0.3319 | 0.3314 | 0.3319 | 0.000732 | 0.332 | 0.3314 | | |
| subject | 5 Ind. Judgements | 70 | 90 | 90 | 120 | 150 | 290 | 0.5995 | 290 | 70 | 1.0971 | 369.956 |
| | Test Magnitudes | 0.2008 | 0.2517 | 0.3175 | 0.4043 | 0.5082 | 0.6373 | 0.42569 | 0.6373 | 0.2008 | | |
| | Ref Magnitudes | 0.3178 | 0.3197 | 0.319 | 0.3194 | 0.3185 | 0.3199 | 0.002482 | 0.3199 | 0.3178 | | |
| subject | 6 Ind. Judgements | 50 | 70 | 50 | 115 | 200 | 150 | 0.57352 | 200 | 50 | 1.1664 | 305.4176 |
| | Test Magnitudes | 0.2006 | 0.2508 | 0.3151 | 0.404 | 0.5075 | 0.6396 | 0.42866 | 0.6396 | 0.2006 | | |
| | Ref Magnitudes | 0.3184 | 0.317 | 0.3157 | 0.3171 | 0.3166 | 0.319 | 0.003803 | 0.319 | 0.3157 | | |
| subject | 7 Ind. Judgements | 70 | 80 | 100 | 120 | 280 | 150 | 0.5803 | 280 | 70 | 0.94955 | 305.6234 |
| | Test Magnitudes | 0.2077 | 0.2602 | 0.3285 | 0.4191 | 0.5203 | 0.6621 | 0.42635 | 0.6621 | 0.2077 | | |
| | Ref Magnitudes | 0.3317 | 0.3312 | 0.333 | 0.3328 | 0.328 | 0.3328 | 0.005717 | 0.333 | 0.328 | | |
| subject | 8 Ind. Judgements | 50 | 100 | 90 | 110 | 90 | 170 | 0.38558 | 170 | 50 | 0.73424 | 191.3057 |
| | Test Magnitudes | 0.219 | 0.2748 | 0.3352 | 0.4412 | 0.5522 | 0.6949 | 0.42926 | 0.6949 | 0.219 | | |
| | Ref Magnitudes | 0.3491 | 0.3505 | 0.3391 | 0.3486 | 0.3492 | 0.3485 | 0.012019 | 0.3505 | 0.3391 | | |
| subject | 9 Ind. Judgements | 80 | 110 | 100 | 120 | 110 | 300 | 0.59384 | 300 | 80 | 0.81399 | 267.7372 |
| | Test Magnitudes | 0.2139 | 0.2672 | 0.3434 | 0.438 | 0.5499 | 0.6899 | 0.43118 | 0.6899 | 0.2139 | | |
| | Ref Magnitudes | 0.3412 | 0.342 | 0.3479 | 0.3476 | 0.3472 | 0.3451 | 0.008525 | 0.3479 | 0.3412 | | |
| subject | 10 Ind. Judgements | 80 | 80 | 90 | 90 | 240 | 180 | 0.53233 | 240 | 80 | 0.90873 | 270.0876 |
| | Test Magnitudes | 0.2191 | 0.2731 | 0.3443 | 0.4386 | 0.55 | 0.6917 | 0.42477 | 0.6917 | 0.2191 | | |
| | Ref Magnitudes | 0.3482 | 0.3478 | 0.3483 | 0.3483 | 0.3486 | 0.3483 | 0.000743 | 0.3486 | 0.3478 | | |
| subject | 11 Ind. Judgements | 50 | 75 | 40 | 75 | 150 | 275 | 0.80469 | 275 | 40 | 1.3716 | 345.4626 |
| | Test Magnitudes | 0.2066 | 0.2583 | 0.3276 | 0.4184 | 0.5223 | 0.6602 | 0.42796 | 0.6602 | 0.2066 | | |
| | Ref Magnitudes | 0.3282 | 0.3281 | 0.3297 | 0.33 | 0.3234 | 0.3299 | 0.007639 | 0.33 | 0.3234 | | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.94955 | 305.4176 |

| Frequency 0.5 Hz | | | | | | | | | | | | |
|-------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 25 | 80 | 65 | 165 | 160 | 300 | 0.74513 | 300 | 25 | 1.8587 | 563.1535 |
| | Test Magnitudes | 0.2201 | 0.2758 | 0.3483 | 0.4485 | 0.5651 | 0.7157 | 0.43583 | 0.7157 | 0.2201 | | |
| | Ref Magnitudes | 0.3492 | 0.3485 | 0.3493 | 0.3487 | 0.348 | 0.3433 | 0.00653 | 0.3493 | 0.3433 | | |
| subject | 2 Ind. Judgements | 33 | 70 | 140 | 250 | 300 | 500 | 0.80225 | 500 | 33 | 2.2107 | 1424.942 |
| | Test Magnitudes | 0.2009 | 0.2519 | 0.3201 | 0.4106 | 0.5191 | 0.6615 | 0.44021 | 0.6615 | 0.2009 | | |
| | Ref Magnitudes | 0.3202 | 0.3192 | 0.321 | 0.3198 | 0.32 | 0.3204 | 0.001885 | 0.321 | 0.3192 | | |
| subject | 3 Ind. Judgements | 35 | 40 | 70 | 130 | 140 | 180 | 0.59864 | 180 | 35 | 1.5176 | 391.8896 |
| | Test Magnitudes | 0.2001 | 0.2498 | 0.3152 | 0.408 | 0.5112 | 0.6502 | 0.43621 | 0.6502 | 0.2001 | | |
| | Ref Magnitudes | 0.3178 | 0.3172 | 0.3145 | 0.3171 | 0.3125 | 0.3126 | 0.007621 | 0.3178 | 0.3125 | | |
| subject | 4 Ind. Judgements | 60 | 95 | 130 | 120 | 150 | 200 | 0.33066 | 200 | 60 | 0.70329 | 246.0276 |
| | Test Magnitudes | 0.2075 | 0.2624 | 0.3319 | 0.4249 | 0.5354 | 0.6823 | 0.43764 | 0.6823 | 0.2075 | | |
| | Ref Magnitudes | 0.3305 | 0.3322 | 0.3315 | 0.3309 | 0.3319 | 0.3316 | 0.001905 | 0.3322 | 0.3305 | | |
| subject | 5 Ind. Judgements | 60 | 100 | 110 | 140 | 300 | 400 | 0.72501 | 400 | 60 | 1.5647 | 732.4476 |
| | Test Magnitudes | 0.201 | 0.2522 | 0.3202 | 0.4102 | 0.5132 | 0.6578 | 0.4367 | 0.6578 | 0.201 | | |
| | Ref Magnitudes | 0.3187 | 0.3191 | 0.3188 | 0.3199 | 0.3189 | 0.3174 | 0.002541 | 0.3199 | 0.3174 | | |
| subject | 6 Ind. Judgements | 30 | 90 | 110 | 125 | 125 | 200 | 0.48783 | 200 | 30 | 1.2605 | 357.0567 |
| | Test Magnitudes | 0.1987 | 0.2519 | 0.3174 | 0.4089 | 0.5146 | 0.6594 | 0.44114 | 0.6594 | 0.1987 | | |
| | Ref Magnitudes | 0.3161 | 0.3199 | 0.3182 | 0.3185 | 0.3168 | 0.3194 | 0.004614 | 0.3199 | 0.3161 | | |
| subject | 7 Ind. Judgements | 90 | 130 | 160 | 150 | 250 | 420 | 0.6 | 420 | 90 | 1.1523 | 545.1019 |
| | Test Magnitudes | 0.2074 | 0.2631 | 0.3283 | 0.4197 | 0.5367 | 0.6834 | 0.4403 | 0.6834 | 0.2074 | | |
| | Ref Magnitudes | 0.3312 | 0.3331 | 0.336 | 0.3278 | 0.3323 | 0.3327 | 0.008063 | 0.336 | 0.3278 | | |
| subject | 8 Ind. Judgements | 70 | 90 | 70 | 120 | 130 | 120 | 0.26833 | 130 | 70 | 0.52051 | 158.0221 |
| | Test Magnitudes | 0.2205 | 0.2677 | 0.3391 | 0.4484 | 0.5477 | 0.7208 | 0.44376 | 0.7208 | 0.2205 | | |
| | Ref Magnitudes | 0.3487 | 0.3387 | 0.3397 | 0.3488 | 0.3374 | 0.3508 | 0.017514 | 0.3508 | 0.3374 | | |
| subject | 9 Ind. Judgements | 100 | 70 | 110 | 130 | 100 | 200 | 0.37572 | 200 | 70 | 0.56991 | 192.6407 |
| | Test Magnitudes | 0.2148 | 0.2694 | 0.3413 | 0.4459 | 0.5508 | 0.7004 | 0.43519 | 0.7004 | 0.2148 | | |
| | Ref Magnitudes | 0.3417 | 0.3402 | 0.341 | 0.3478 | 0.3413 | 0.3402 | 0.008443 | 0.3478 | 0.3402 | | |
| subject | 10 Ind. Judgements | 120 | 80 | 100 | 200 | 200 | 180 | 0.3625 | 200 | 80 | 0.66511 | 256.3666 |
| | Test Magnitudes | 0.2194 | 0.2754 | 0.3479 | 0.4454 | 0.5608 | 0.7141 | 0.43546 | 0.7141 | 0.2194 | | |
| | Ref Magnitudes | 0.3486 | 0.3478 | 0.3481 | 0.3487 | 0.3483 | 0.3482 | 0.000951 | 0.3487 | 0.3478 | | |
| subject | 11 Ind. Judgements | 50 | 120 | 100 | 150 | 250 | 400 | 0.71408 | 400 | 50 | 1.5373 | 662.4123 |
| | Test Magnitudes | 0.2067 | 0.2539 | 0.3277 | 0.4196 | 0.5327 | 0.6777 | 0.44243 | 0.6777 | 0.2067 | | |
| | Ref Magnitudes | 0.3287 | 0.3227 | 0.3279 | 0.3275 | 0.3269 | 0.3293 | 0.007178 | 0.3293 | 0.3227 | | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 1.2605 | 391.8896 |
| Frequency 0.63 Hz | | | | | | | | | | | | |
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 20 | 60 | 100 | 75 | 130 | 270 | 0.79774 | 270 | 20 | 1.8394 | 460.1279 |
| | Test Magnitudes | 0.2154 | 0.2757 | 0.3551 | 0.4601 | 0.5498 | 0.6896 | 0.41888 | 0.6896 | 0.2154 | | |
| | Ref Magnitudes | 0.3489 | 0.3491 | 0.3481 | 0.3485 | 0.3486 | 0.3478 | 0.001394 | 0.3491 | 0.3478 | | |
| subject | 2 Ind. Judgements | 75 | 70 | 150 | 233 | 350 | 300 | 0.59831 | 350 | 70 | 1.4893 | 749.9826 |
| | Test Magnitudes | 0.1966 | 0.2515 | 0.3256 | 0.4199 | 0.5047 | 0.6373 | 0.42358 | 0.6373 | 0.1966 | | |
| | Ref Magnitudes | 0.3188 | 0.3194 | 0.3207 | 0.3191 | 0.3208 | 0.3189 | 0.002822 | 0.3208 | 0.3188 | | |
| subject | 3 Ind. Judgements | 30 | 100 | 100 | 100 | 120 | 150 | 0.39497 | 150 | 30 | 1.0615 | 268.4809 |
| | Test Magnitudes | 0.1973 | 0.2513 | 0.323 | 0.4131 | 0.5028 | 0.6333 | 0.42205 | 0.6333 | 0.1973 | | |
| | Ref Magnitudes | 0.3178 | 0.3179 | 0.317 | 0.3143 | 0.3184 | 0.3179 | 0.004724 | 0.3184 | 0.3143 | | |
| subject | 4 Ind. Judgements | 150 | 130 | 120 | 180 | 200 | 150 | 0.19462 | 200 | 120 | 0.2058 | 186.8784 |
| | Test Magnitudes | 0.2047 | 0.2633 | 0.3389 | 0.4351 | 0.5211 | 0.6584 | 0.41926 | 0.6584 | 0.2047 | | |
| | Ref Magnitudes | 0.331 | 0.3317 | 0.3321 | 0.3317 | 0.332 | 0.3316 | 0.001166 | 0.3321 | 0.331 | | |
| subject | 5 Ind. Judgements | 80 | 110 | 110 | 120 | 170 | 250 | 0.43799 | 250 | 80 | 0.85925 | 316.0793 |
| | Test Magnitudes | 0.1963 | 0.251 | 0.3234 | 0.4165 | 0.5002 | 0.6251 | 0.41719 | 0.6251 | 0.1963 | | |
| | Ref Magnitudes | 0.3191 | 0.3197 | 0.3183 | 0.3192 | 0.3193 | 0.3193 | 0.001453 | 0.3197 | 0.3183 | | |
| subject | 6 Ind. Judgements | 75 | 75 | 125 | 130 | 130 | 160 | 0.29329 | 160 | 75 | 0.6747 | 222.5656 |
| | Test Magnitudes | 0.1956 | 0.2508 | 0.3238 | 0.4181 | 0.5009 | 0.6334 | 0.42264 | 0.6334 | 0.1956 | | |
| | Ref Magnitudes | 0.3176 | 0.3187 | 0.3185 | 0.3188 | 0.3188 | 0.3194 | 0.001848 | 0.3194 | 0.3176 | | |
| subject | 7 Ind. Judgements | 100 | 150 | 280 | 520 | 370 | 600 | 0.59128 | 600 | 100 | 1.5298 | 1262.062 |
| | Test Magnitudes | 0.2053 | 0.2845 | 0.335 | 0.4349 | 0.5255 | 0.658 | 0.42011 | 0.658 | 0.2053 | | |
| | Ref Magnitudes | 0.3326 | 0.3331 | 0.3305 | 0.3319 | 0.3328 | 0.3324 | 0.002807 | 0.3331 | 0.3305 | | |
| subject | 8 Ind. Judgements | 80 | 70 | 110 | 120 | 140 | 160 | 0.30395 | 160 | 70 | 0.69636 | 208.4948 |
| | Test Magnitudes | 0.217 | 0.278 | 0.3579 | 0.4434 | 0.5536 | 0.6932 | 0.41964 | 0.6932 | 0.217 | | |
| | Ref Magnitudes | 0.3489 | 0.3501 | 0.3505 | 0.3378 | 0.3502 | 0.3499 | 0.014309 | 0.3505 | 0.3378 | | |
| subject | 9 Ind. Judgements | 50 | 110 | 120 | 150 | 120 | 175 | 0.34957 | 175 | 50 | 0.83246 | 249.1871 |
| | Test Magnitudes | 0.2136 | 0.269 | 0.3476 | 0.4489 | 0.5394 | 0.6908 | 0.42846 | 0.6908 | 0.2136 | | |
| | Ref Magnitudes | 0.3474 | 0.3406 | 0.3401 | 0.3442 | 0.3409 | 0.3481 | 0.010379 | 0.3481 | 0.3401 | | |
| subject | 10 Ind. Judgements | 120 | 100 | 110 | 140 | 180 | 240 | 0.35779 | 240 | 100 | 0.66046 | 262.4384 |
| | Test Magnitudes | 0.2159 | 0.2752 | 0.3549 | 0.4581 | 0.5488 | 0.6838 | 0.41571 | 0.6838 | 0.2159 | | |
| | Ref Magnitudes | 0.3504 | 0.3483 | 0.3482 | 0.3482 | 0.3481 | 0.3484 | 0.002547 | 0.3504 | 0.3481 | | |
| subject | 11 Ind. Judgements | 50 | 50 | 125 | 50 | 250 | 350 | 0.87019 | 350 | 50 | 1.6231 | 536.9159 |
| | Test Magnitudes | 0.2025 | 0.2551 | 0.3301 | 0.4285 | 0.5128 | 0.6483 | 0.42231 | 0.6483 | 0.2025 | | |
| | Ref Magnitudes | 0.3276 | 0.3275 | 0.3271 | 0.3286 | 0.3281 | 0.33 | 0.003183 | 0.33 | 0.3271 | | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.85925 | 268.4809 |

| Frequency 0.8 Hz | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|------------|----------|--------|---------|---------|----------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 60 | 65 | 165 | 170 | 310 | 300 | 0.61033 | 310 | 60 | 1.6411 | 698.4593 |
| | Test Magnitudes | 0.2207 | 0.2728 | 0.3554 | 0.4354 | 0.5354 | 0.6757 | 0.40861 | 0.6757 | 0.2207 | | |
| | Ref Magnitudes | 0.3503 | 0.3423 | 0.3501 | 0.349 | 0.3477 | 0.3494 | 0.00863 | 0.3503 | 0.3423 | | |
| subject | 2 Ind. Judgements | 20 | 75 | 133 | 200 | 130 | 200 | 0.55807 | 200 | 20 | 1.6955 | 573.9282 |
| | Test Magnitudes | 0.2029 | 0.248 | 0.3271 | 0.4029 | 0.4999 | 0.636 | 0.42047 | 0.636 | 0.2029 | | |
| | Ref Magnitudes | 0.3199 | 0.3201 | 0.319 | 0.3193 | 0.3171 | 0.3201 | 0.00387 | 0.3201 | 0.3171 | | |
| subject | 3 Ind. Judgements | 60 | 140 | 120 | 100 | 140 | 160 | 0.29814 | 160 | 60 | 0.57712 | 208.4034 |
| | Test Magnitudes | 0.2022 | 0.2445 | 0.3232 | 0.4033 | 0.5 | 0.6156 | 0.41222 | 0.6156 | 0.2022 | | |
| | Ref Magnitudes | 0.3171 | 0.3142 | 0.3157 | 0.3181 | 0.3176 | 0.3109 | 0.008568 | 0.3181 | 0.3109 | 0.63194 | 269.0665 |
| subject | 4 Ind. Judgements | 70 | 150 | 200 | 130 | 160 | 200 | 0.32144 | 200 | 70 | | |
| | Test Magnitudes | 0.2136 | 0.2564 | 0.337 | 0.4134 | 0.5185 | 0.6471 | 0.41258 | 0.6471 | 0.2136 | | |
| | Ref Magnitudes | 0.3317 | 0.3314 | 0.331 | 0.3299 | 0.3318 | 0.3318 | 0.002224 | 0.3318 | 0.3299 | | |
| subject | 5 Ind. Judgements | 80 | 120 | 130 | 110 | 140 | 320 | 0.57194 | 320 | 80 | 0.92578 | 356.3843 |
| | Test Magnitudes | 0.2023 | 0.2468 | 0.3217 | 0.3938 | 0.4878 | 0.6107 | 0.40678 | 0.6107 | 0.2023 | | |
| | Ref Magnitudes | 0.3197 | 0.3204 | 0.3207 | 0.3196 | 0.3204 | 0.3183 | 0.002731 | 0.3207 | 0.3183 | | |
| subject | 6 Ind. Judgements | 80 | 70 | 75 | 115 | 120 | 175 | 0.37726 | 175 | 70 | 0.73376 | 213.87 |
| | Test Magnitudes | 0.2002 | 0.2459 | 0.3256 | 0.4027 | 0.5004 | 0.6303 | 0.42104 | 0.6303 | 0.2002 | | |
| | Ref Magnitudes | 0.3168 | 0.3173 | 0.3188 | 0.3199 | 0.3182 | 0.3184 | 0.003458 | 0.3199 | 0.3168 | | |
| subject | 7 Ind. Judgements | 240 | 330 | 400 | 490 | 470 | 580 | 0.29058 | 580 | 240 | 0.71748 | 821.7703 |
| | Test Magnitudes | 0.2128 | 0.2595 | 0.331 | 0.4123 | 0.5185 | 0.65 | 0.41536 | 0.65 | 0.2128 | | |
| | Ref Magnitudes | 0.3329 | 0.3321 | 0.3313 | 0.3332 | 0.3327 | 0.3326 | 0.002037 | 0.3332 | 0.3313 | | |
| subject | 8 Ind. Judgements | 80 | 150 | 110 | 130 | 150 | 190 | 0.28011 | 190 | 80 | 0.52751 | 214.9922 |
| | Test Magnitudes | 0.2204 | 0.2604 | 0.3543 | 0.4439 | 0.5508 | 0.675 | 0.41806 | 0.675 | 0.2204 | | |
| | Ref Magnitudes | 0.3494 | 0.3504 | 0.3472 | 0.3504 | 0.3488 | 0.3506 | 0.003756 | 0.3506 | 0.3472 | | |
| subject | 9 Ind. Judgements | 90 | 120 | 110 | 170 | 175 | 175 | 0.27011 | 175 | 90 | 0.60677 | 240.521 |
| | Test Magnitudes | 0.2196 | 0.272 | 0.358 | 0.4341 | 0.5368 | 0.6882 | 0.41654 | 0.6882 | 0.2196 | | |
| | Ref Magnitudes | 0.3409 | 0.3469 | 0.3473 | 0.3448 | 0.3412 | 0.3475 | 0.008809 | 0.3475 | 0.3409 | | |
| subject | 10 Ind. Judgements | 120 | 160 | 120 | 180 | 200 | 150 | 0.20706 | 200 | 120 | 0.268 | 195.8449 |
| | Test Magnitudes | 0.2237 | 0.2728 | 0.3562 | 0.4358 | 0.5463 | 0.6856 | 0.41372 | 0.6856 | 0.2237 | | |
| | Ref Magnitudes | 0.3474 | 0.3501 | 0.3485 | 0.3474 | 0.3485 | 0.3483 | 0.002846 | 0.3501 | 0.3474 | | |
| subject | 11 Ind. Judgements | 50 | 25 | 100 | 200 | 125 | 50 | 0.70418 | 200 | 25 | 0.69877 | 147.8331 |
| | Test Magnitudes | 0.2092 | 0.2566 | 0.3348 | 0.4056 | 0.5153 | 0.6513 | 0.41944 | 0.6513 | 0.2092 | | |
| | Ref Magnitudes | 0.3279 | 0.3273 | 0.3255 | 0.3294 | 0.3292 | 0.3292 | 0.004632 | 0.3294 | 0.3255 | | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | 6 +++ | +++ | Median | 0.69877 | 240.521 | |

| Frequency 1 Hz | | | | | | | | | | | | |
|----------------|--------------------|--------|--------|--------|--------|--------|------------|----------|--------|--------|----------|----------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 140 | 100 | 140 | 320 | 400 | 370 | 0.54257 | 400 | 100 | 1.2772 | 752.6725 |
| | Test Magnitudes | 0.2209 | 0.2535 | 0.348 | 0.4056 | 0.5134 | 0.652 | 0.40829 | 0.652 | 0.2209 | | |
| | Ref Magnitudes | 0.3521 | 0.348 | 0.3468 | 0.3511 | 0.3502 | 0.3458 | 0.007197 | 0.3521 | 0.3458 | | |
| subject | 2 Ind. Judgements | 70 | 133 | 200 | 175 | 200 | 300 | 0.42776 | 300 | 70 | 1.0312 | 481.5096 |
| | Test Magnitudes | 0.2045 | 0.2365 | 0.3225 | 0.3938 | 0.4963 | 0.6258 | 0.42253 | 0.6258 | 0.2045 | | |
| | Ref Magnitudes | 0.3188 | 0.3199 | 0.3198 | 0.319 | 0.3193 | 0.3192 | 0.001367 | 0.3199 | 0.3188 | | |
| subject | 3 Ind. Judgements | 75 | 40 | 50 | 90 | 140 | 170 | 0.544 | 170 | 40 | 1.088 | 260.0212 |
| | Test Magnitudes | 0.2041 | 0.238 | 0.321 | 0.3828 | 0.4908 | 0.6185 | 0.41839 | 0.6185 | 0.2041 | | |
| | Ref Magnitudes | 0.3159 | 0.3184 | 0.3183 | 0.3114 | 0.3155 | 0.3167 | 0.008123 | 0.3184 | 0.3114 | | |
| subject | 4 Ind. Judgements | 120 | 120 | 110 | 160 | 150 | 150 | 0.1536 | 160 | 110 | 0.27307 | 175.7372 |
| | Test Magnitudes | 0.2167 | 0.2512 | 0.3363 | 0.4068 | 0.5097 | 0.6444 | 0.41127 | 0.6444 | 0.2167 | | |
| | Ref Magnitudes | 0.3319 | 0.3322 | 0.3305 | 0.3316 | 0.3313 | 0.3318 | 0.001797 | 0.3322 | 0.3305 | | |
| subject | 5 Ind. Judgements | 80 | 110 | 110 | 120 | 140 | 240 | 0.41803 | 240 | 80 | 0.78116 | 286.5886 |
| | Test Magnitudes | 0.2003 | 0.2368 | 0.3178 | 0.3923 | 0.4883 | 0.6087 | 0.41528 | 0.6087 | 0.2003 | | |
| | Ref Magnitudes | 0.3198 | 0.3202 | 0.3197 | 0.3196 | 0.3179 | 0.3201 | 0.002631 | 0.3202 | 0.3179 | | |
| subject | 6 Ind. Judgements | 25 | 85 | 140 | 150 | 85 | 150 | 0.47189 | 150 | 25 | 1.0804 | 283.0275 |
| | Test Magnitudes | 0.2045 | 0.2365 | 0.3198 | 0.382 | 0.4973 | 0.6251 | 0.42515 | 0.6251 | 0.2045 | | |
| | Ref Magnitudes | 0.3201 | 0.3181 | 0.3185 | 0.315 | 0.3173 | 0.3189 | 0.005441 | 0.3201 | 0.315 | | |
| subject | 7 Ind. Judgements | 170 | 220 | 340 | 360 | 370 | 550 | 0.39725 | 550 | 170 | 0.93961 | 815.1436 |
| | Test Magnitudes | 0.2105 | 0.2447 | 0.3254 | 0.4041 | 0.5067 | 0.6393 | 0.42059 | 0.6393 | 0.2105 | | |
| | Ref Magnitudes | 0.327 | 0.3319 | 0.3329 | 0.332 | 0.3304 | 0.3321 | 0.006475 | 0.3329 | 0.327 | | |
| subject | 8 Ind. Judgements | 100 | 60 | 70 | 80 | 70 | 160 | 0.40976 | 160 | 60 | 0.37085 | 121.652 |
| | Test Magnitudes | 0.2153 | 0.2623 | 0.3422 | 0.4199 | 0.5425 | 0.6834 | 0.43083 | 0.6834 | 0.2153 | | |
| | Ref Magnitudes | 0.3382 | 0.3497 | 0.3391 | 0.338 | 0.349 | 0.3487 | 0.017108 | 0.3497 | 0.338 | | |
| subject | 9 Ind. Judgements | 40 | 100 | 150 | 110 | 200 | 150 | 0.43745 | 200 | 40 | 1.0401 | 310.1555 |
| | Test Magnitudes | 0.2203 | 0.257 | 0.342 | 0.4213 | 0.5188 | 0.6653 | 0.41548 | 0.6653 | 0.2203 | | |
| | Ref Magnitudes | 0.3405 | 0.3411 | 0.3406 | 0.3419 | 0.3405 | 0.3413 | 0.001643 | 0.3419 | 0.3405 | | |
| subject | 10 Ind. Judgements | 80 | 150 | 120 | 120 | 220 | 180 | 0.34275 | 220 | 80 | 0.84657 | 257.0155 |
| | Test Magnitudes | 0.2224 | 0.2631 | 0.344 | 0.428 | 0.5359 | 0.6656 | 0.4121 | 0.6656 | 0.2224 | | |
| | Ref Magnitudes | 0.349 | 0.3473 | 0.3484 | 0.3483 | 0.3484 | 0.348 | 0.001611 | 0.349 | 0.3473 | | |
| subject | 11 Ind. Judgements | 25 | 25 | 90 | 30 | 75 | 200 | 0.9119 | 200 | 25 | 1.6116 | 275.9222 |
| | Test Magnitudes | 0.211 | 0.2484 | 0.3319 | 0.4079 | 0.5098 | 0.6454 | 0.41927 | 0.6454 | 0.211 | | |
| | Ref Magnitudes | 0.3263 | 0.3268 | 0.3272 | 0.3259 | 0.3278 | 0.3264 | 0.0021 | 0.3278 | 0.3259 | | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | 6 +++ | +++ | Median | 1.0312 | 283.0275 | |

| Frequency 1.25 Hz | | | | | | | | | | | | |
|-------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|---------|----------|----------|
| | Ind. Data-> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 100 | 180 | 150 | 280 | 240 | 215 | 0.33314 | 280 | 100 | 0.66832 | 361.5422 |
| | Test Magnitudes | 0.2165 | 0.2619 | 0.3214 | 0.3946 | 0.5036 | 0.6471 | 0.41293 | 0.6471 | 0.2165 | | |
| | Ref Magnitudes | 0.3479 | 0.3472 | 0.348 | 0.3472 | 0.3474 | 0.3455 | 0.002595 | 0.348 | 0.3455 | | |
| subject | 2 Ind. Judgements | 120 | 200 | 300 | 250 | 300 | 450 | 0.41243 | 450 | 120 | 1.0294 | 744.6331 |
| | Test Magnitudes | 0.2047 | 0.2519 | 0.3095 | 0.3857 | 0.4744 | 0.5888 | 0.39057 | 0.5888 | 0.2047 | | |
| | Ref Magnitudes | 0.3188 | 0.3198 | 0.3197 | 0.3203 | 0.3201 | 0.3192 | 0.001756 | 0.3203 | 0.3188 | | |
| subject | 3 Ind. Judgements | 120 | 65 | 110 | 130 | 80 | 190 | 0.37869 | 190 | 65 | 0.41813 | 170.8658 |
| | Test Magnitudes | 0.2021 | 0.2488 | 0.3069 | 0.377 | 0.4712 | 0.5914 | 0.39773 | 0.5914 | 0.2021 | | |
| | Ref Magnitudes | 0.317 | 0.3162 | 0.3155 | 0.3179 | 0.3161 | 0.3173 | 0.002801 | 0.3179 | 0.3155 | | |
| subject | 4 Ind. Judgements | 115 | 115 | 125 | 160 | 200 | 200 | 0.26454 | 200 | 115 | 0.62944 | 280.6469 |
| | Test Magnitudes | 0.2171 | 0.263 | 0.3235 | 0.401 | 0.4847 | 0.6317 | 0.39695 | 0.6317 | 0.2171 | | |
| | Ref Magnitudes | 0.3315 | 0.3306 | 0.3318 | 0.3318 | 0.3313 | 0.3317 | 0.001386 | 0.3318 | 0.3306 | | |
| subject | 5 Ind. Judgements | 110 | 120 | 120 | 160 | 160 | 250 | 0.36505 | 250 | 110 | 0.66355 | 285.3735 |
| | Test Magnitudes | 0.2038 | 0.2453 | 0.3015 | 0.3827 | 0.4713 | 0.5962 | 0.40326 | 0.5962 | 0.2038 | | |
| | Ref Magnitudes | 0.3187 | 0.3185 | 0.319 | 0.3188 | 0.3197 | 0.32 | 0.001874 | 0.32 | 0.3185 | | |
| subject | 6 Ind. Judgements | 120 | 110 | 115 | 115 | 150 | 200 | 0.25873 | 200 | 110 | 0.45819 | 214.5881 |
| | Test Magnitudes | 0.2007 | 0.2491 | 0.3066 | 0.3872 | 0.4732 | 0.6006 | 0.40393 | 0.6006 | 0.2007 | | |
| | Ref Magnitudes | 0.3182 | 0.3194 | 0.3193 | 0.3192 | 0.3188 | 0.3199 | 0.001813 | 0.3199 | 0.3182 | | |
| subject | 7 Ind. Judgements | 170 | 170 | 280 | 290 | 330 | 460 | 0.38383 | 460 | 170 | 0.933 | 692.4832 |
| | Test Magnitudes | 0.211 | 0.2641 | 0.317 | 0.389 | 0.4921 | 0.617 | 0.39558 | 0.617 | 0.211 | | |
| | Ref Magnitudes | 0.333 | 0.3291 | 0.3329 | 0.3318 | 0.3333 | 0.3324 | 0.004679 | 0.3333 | 0.3291 | | |
| subject | 8 Ind. Judgements | 20 | 90 | 90 | 110 | 120 | 120 | 0.4106 | 120 | 20 | 1.2889 | 286.4429 |
| | Test Magnitudes | 0.2163 | 0.2728 | 0.3249 | 0.402 | 0.5116 | 0.658 | 0.41259 | 0.658 | 0.2163 | | |
| | Ref Magnitudes | 0.3374 | 0.35 | 0.3382 | 0.3386 | 0.3487 | 0.3488 | 0.017779 | 0.35 | 0.3374 | | |
| subject | 9 Ind. Judgements | 140 | 120 | 150 | 110 | 250 | 175 | 0.32234 | 250 | 110 | 0.40454 | 227.4173 |
| | Test Magnitudes | 0.2168 | 0.2651 | 0.3289 | 0.4106 | 0.505 | 0.6216 | 0.39024 | 0.6216 | 0.2168 | | |
| | Ref Magnitudes | 0.3411 | 0.3479 | 0.3474 | 0.341 | 0.3479 | 0.3417 | 0.010318 | 0.3479 | 0.341 | | |
| subject | 10 Ind. Judgements | 140 | 200 | 170 | 150 | 160 | 180 | 0.12961 | 200 | 140 | 0.064268 | 176.3174 |
| | Test Magnitudes | 0.2225 | 0.2712 | 0.3382 | 0.4083 | 0.5077 | 0.6475 | 0.39578 | 0.6475 | 0.2225 | | |
| | Ref Magnitudes | 0.348 | 0.3492 | 0.3502 | 0.3483 | 0.3476 | 0.3479 | 0.002821 | 0.3502 | 0.3476 | | |
| subject | 11 Ind. Judgements | 25 | 125 | 50 | 175 | 150 | 300 | 0.71582 | 300 | 25 | 1.9239 | 766.0299 |
| | Test Magnitudes | 0.2117 | 0.2567 | 0.3119 | 0.3906 | 0.4885 | 0.6017 | 0.39205 | 0.6017 | 0.2117 | | |
| | Ref Magnitudes | 0.3281 | 0.3274 | 0.3276 | 0.3287 | 0.3267 | 0.3264 | 0.002616 | 0.3287 | 0.3264 | | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | 6 +++ | +++ | Median | 0.66355 | 285.3735 | |

| Frequency 1.6 Hz | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|---------|---------|----------|
| | Ind. Data-> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 150 | 120 | 170 | 300 | 200 | 330 | 0.40023 | 330 | 120 | 0.72873 | 445.583 |
| | Test Magnitudes | 0.1853 | 0.2235 | 0.2975 | 0.3659 | 0.4796 | 0.5862 | 0.432 | 0.5862 | 0.1853 | | |
| | Ref Magnitudes | 0.3491 | 0.3485 | 0.3478 | 0.3498 | 0.3481 | 0.3494 | 0.002231 | 0.3498 | 0.3478 | | |
| subject | 2 Ind. Judgements | 50 | 120 | 100 | 180 | 400 | 400 | 0.74014 | 400 | 50 | 1.8311 | 1282.491 |
| | Test Magnitudes | 0.1776 | 0.2322 | 0.2994 | 0.3657 | 0.4356 | 0.564 | 0.40784 | 0.564 | 0.1776 | | |
| | Ref Magnitudes | 0.3201 | 0.319 | 0.3174 | 0.3176 | 0.3193 | 0.3189 | 0.003245 | 0.3201 | 0.3174 | | |
| subject | 3 Ind. Judgements | 120 | 45 | 140 | 100 | 130 | 200 | 0.41444 | 200 | 45 | 0.69317 | 244.977 |
| | Test Magnitudes | 0.1834 | 0.2307 | 0.2934 | 0.3622 | 0.4473 | 0.5646 | 0.40927 | 0.5646 | 0.1834 | | |
| | Ref Magnitudes | 0.3168 | 0.3174 | 0.3143 | 0.3148 | 0.3183 | 0.3121 | 0.007301 | 0.3183 | 0.3121 | | |
| subject | 4 Ind. Judgements | 85 | 130 | 160 | 150 | 200 | 175 | 0.26415 | 200 | 85 | 0.62355 | 288.856 |
| | Test Magnitudes | 0.1907 | 0.236 | 0.3051 | 0.3755 | 0.4371 | 0.5836 | 0.40481 | 0.5836 | 0.1907 | | |
| | Ref Magnitudes | 0.3317 | 0.332 | 0.3317 | 0.3303 | 0.3318 | 0.3302 | 0.002441 | 0.332 | 0.3302 | | |
| subject | 5 Ind. Judgements | 80 | 120 | 110 | 140 | 180 | 180 | 0.29537 | 180 | 80 | 0.68705 | 283.7202 |
| | Test Magnitudes | 0.1791 | 0.2272 | 0.2943 | 0.3648 | 0.4376 | 0.5672 | 0.41458 | 0.5672 | 0.1791 | | |
| | Ref Magnitudes | 0.3198 | 0.3192 | 0.319 | 0.3191 | 0.3193 | 0.3195 | 0.000917 | 0.3198 | 0.319 | | |
| subject | 6 Ind. Judgements | 115 | 85 | 135 | 135 | 140 | 175 | 0.22727 | 175 | 85 | 0.44687 | 215.6848 |
| | Test Magnitudes | 0.1722 | 0.2189 | 0.282 | 0.3525 | 0.4323 | 0.5502 | 0.42017 | 0.5502 | 0.1722 | | |
| | Ref Magnitudes | 0.3187 | 0.3179 | 0.3158 | 0.3154 | 0.3187 | 0.3191 | 0.005046 | 0.3191 | 0.3154 | | |
| subject | 7 Ind. Judgements | 170 | 280 | 260 | 280 | 380 | 550 | 0.40936 | 550 | 170 | 0.86621 | 799.3043 |
| | Test Magnitudes | 0.18 | 0.2301 | 0.2951 | 0.3655 | 0.4436 | 0.5646 | 0.41075 | 0.5646 | 0.18 | | |
| | Ref Magnitudes | 0.3333 | 0.3322 | 0.3325 | 0.3323 | 0.3269 | 0.3331 | 0.007236 | 0.3333 | 0.3269 | | |
| subject | 8 Ind. Judgements | 20 | 20 | 110 | 120 | 150 | 180 | 0.66633 | 180 | 20 | 2.4398 | 1122.58 |
| | Test Magnitudes | 0.1991 | 0.2482 | 0.2895 | 0.3602 | 0.4167 | 0.5478 | 0.36867 | 0.5478 | 0.1991 | | |
| | Ref Magnitudes | 0.3512 | 0.3498 | 0.3504 | 0.3391 | 0.3387 | 0.3498 | 0.017058 | 0.3512 | 0.3387 | | |
| subject | 9 Ind. Judgements | 120 | 175 | 130 | 200 | 200 | 200 | 0.2162 | 200 | 120 | 0.4148 | 267.2279 |
| | Test Magnitudes | 0.1798 | 0.233 | 0.288 | 0.356 | 0.4438 | 0.5939 | 0.4341 | 0.5939 | 0.1798 | | |
| | Ref Magnitudes | 0.3406 | 0.3475 | 0.3413 | 0.3404 | 0.3423 | 0.3404 | 0.008045 | 0.3475 | 0.3404 | | |
| subject | 10 Ind. Judgements | 170 | 160 | 210 | 150 | 160 | 250 | 0.21172 | 250 | 150 | 0.22358 | 229.6359 |
| | Test Magnitudes | 0.1988 | 0.2405 | 0.3134 | 0.3796 | 0.4575 | 0.5768 | 0.39031 | 0.5768 | 0.1988 | | |
| | Ref Magnitudes | 0.3476 | 0.3487 | 0.3468 | 0.349 | 0.3487 | 0.3472 | 0.00264 | 0.349 | 0.3468 | | |
| subject | 11 Ind. Judgements | 25 | 50 | 125 | 200 | 300 | 400 | 0.79824 | 400 | 25 | 2.6003 | 2510.22 |
| | Test Magnitudes | 0.1853 | 0.23 | 0.2826 | 0.3423 | 0.4315 | 0.5506 | 0.40246 | 0.5506 | 0.1853 | | |
| | Ref Magnitudes | 0.3291 | 0.3273 | 0.3301 | 0.3288 | 0.3272 | 0.3277 | 0.003518 | 0.3301 | 0.3272 | | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | 6 +++ | +++ | Median | 0.69317 | 288.856 | |

Condition P

| Frequency 0.2 Hz | | | | | | | | | | | | | |
|-------------------|--------------------|--------|--------|--------|--------|--------|----------|----------|--------|--------|-----------|----------|----------|
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | Coef.Var | Max | Min | Ind. n | Ind. k | | |
| subject | 1 Ind. Judgements | 15 | 55 | 30 | 30 | 70 | 0.55199 | | 70 | 15 | 1.0953 | 124.213 | |
| | Test Magnitudes | 0.2042 | 0.2567 | 0.3248 | 0.4157 | 0.4312 | 0.30144 | 0.4312 | 0.2042 | | | | |
| | Ref Magnitudes | 0.3234 | 0.3226 | 0.323 | 0.3146 | 0.3228 | 0.011659 | 0.3234 | 0.3146 | | | | |
| subject | 2 Ind. Judgements | 20 | 50 | 100 | 120 | 300 | 0.92524 | | 300 | 20 | 3.0329 | 2830.991 | |
| | Test Magnitudes | 0.2019 | 0.2538 | 0.3213 | 0.4109 | 0.4264 | 0.30139 | 0.4264 | 0.2019 | | | | |
| | Ref Magnitudes | 0.3206 | 0.3195 | 0.3205 | 0.32 | 0.3201 | 0.001372 | 0.3206 | 0.3195 | | | | |
| subject | 3 Ind. Judgements | 25 | 30 | 70 | 75 | 160 | 0.75212 | | 160 | 25 | 2.2001 | 708.5863 | |
| | Test Magnitudes | 0.2077 | 0.2607 | 0.3304 | 0.4232 | 0.439 | 0.30216 | 0.439 | 0.2077 | | | | |
| | Ref Magnitudes | 0.3259 | 0.3258 | 0.3246 | 0.3205 | 0.3237 | 0.006813 | 0.3259 | 0.3205 | | | | |
| subject | 4 Ind. Judgements | 10 | 50 | 50 | 100 | 300 | 1.1294 | | 300 | 10 | 3.5963 | 3945.74 | |
| | Test Magnitudes | 0.2028 | 0.255 | 0.3226 | 0.4115 | 0.428 | 0.30055 | 0.428 | 0.2028 | | | | |
| | Ref Magnitudes | 0.3185 | 0.3177 | 0.318 | 0.3179 | 0.3163 | 0.0026 | 0.3185 | 0.3163 | | | | |
| subject | 5 Ind. Judgements | 90 | 90 | 110 | 90 | 120 | 0.14142 | | 120 | 90 | 0.24243 | 131.5644 | |
| | Test Magnitudes | 0.2034 | 0.2557 | 0.3233 | 0.4131 | 0.4288 | 0.30054 | 0.4288 | 0.2034 | | | | |
| | Ref Magnitudes | 0.3201 | 0.3201 | 0.3205 | 0.317 | 0.3203 | 0.004577 | 0.3205 | 0.317 | | | | |
| subject | 6 Ind. Judgements | 20 | 50 | 50 | 20 | 40 | 0.42127 | | 50 | 20 | 0.16428 | 39.9479 | |
| | Test Magnitudes | 0.2087 | 0.2621 | 0.3323 | 0.4246 | 0.4412 | 0.30174 | 0.4412 | 0.2087 | | | | |
| | Ref Magnitudes | 0.33 | 0.3314 | 0.3304 | 0.3316 | 0.3328 | 0.003318 | 0.3328 | 0.33 | | | | |
| subject | 7 Ind. Judgements | 30 | 80 | 40 | 90 | 110 | 0.48445 | | 110 | 30 | 1.306 | 275.3323 | |
| | Test Magnitudes | 0.2086 | 0.2623 | 0.3326 | 0.4254 | 0.4411 | 0.30198 | 0.4411 | 0.2086 | | | | |
| | Ref Magnitudes | 0.3309 | 0.3298 | 0.3309 | 0.3296 | 0.3293 | 0.002277 | 0.3309 | 0.3293 | | | | |
| subject | 8 Ind. Judgements | 50 | 20 | 90 | 90 | 40 | 0.53698 | | 90 | 20 | 0.73011 | 110.7671 | |
| | Test Magnitudes | 0.2205 | 0.2775 | 0.352 | 0.4492 | 0.4679 | 0.30248 | 0.4679 | 0.2205 | | | | |
| | Ref Magnitudes | 0.3517 | 0.3534 | 0.3525 | 0.3537 | 0.3521 | 0.002409 | 0.3537 | 0.3517 | | | | |
| subject | 9 Ind. Judgements | 70 | 70 | 90 | 130 | 150 | 0.35619 | | 150 | 70 | 1.0481 | 302.8606 | |
| | Test Magnitudes | 0.22 | 0.2758 | 0.3493 | 0.446 | 0.4635 | 0.30057 | 0.4635 | 0.22 | | | | |
| | Ref Magnitudes | 0.3423 | 0.3466 | 0.3463 | 0.3471 | 0.3454 | 0.005539 | 0.3471 | 0.3423 | | | | |
| subject | 10 Ind. Judgements | 90 | 80 | 80 | 60 | 120 | 0.25475 | | 120 | 60 | -0.007319 | 83.1581 | |
| | Test Magnitudes | 0.2074 | 0.2604 | 0.3281 | 0.4192 | 0.4345 | 0.29835 | 0.4345 | 0.2074 | | | | |
| | Ref Magnitudes | 0.3278 | 0.3245 | 0.3278 | 0.3272 | 0.329 | 0.00512 | 0.329 | 0.3245 | | | | |
| subject | 11 Ind. Judgements | 50 | 15 | 25 | 25 | 25 | 0.46566 | | 50 | 15 | -0.47707 | 15.0724 | |
| | Test Magnitudes | 0.2112 | 0.262 | 0.331 | 0.4227 | 0.4385 | 0.29667 | 0.4385 | 0.2112 | | | | |
| | Ref Magnitudes | 0.3299 | 0.3306 | 0.3288 | 0.329 | 0.3289 | 0.002377 | 0.3306 | 0.3288 | | | | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | +++ | +++ | Median | 1.0481 | 131.5644 | | |
| Frequency 0.25 Hz | | | | | | | | | | | | | |
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 10 | 40 | 25 | 55 | 70 | 100 | 0.64807 | | 100 | 10 | 1.7197 | 227.1674 |
| | Test Magnitudes | 0.2043 | 0.2552 | 0.3198 | 0.4056 | 0.5127 | 0.6497 | 0.42821 | 0.6497 | 0.2043 | | | |
| | Ref Magnitudes | 0.3233 | 0.3231 | 0.3191 | 0.3215 | 0.3226 | 0.3172 | 0.007685 | 0.3233 | 0.3172 | | | |
| subject | 2 Ind. Judgements | 33 | 66 | 175 | 200 | 300 | 450 | 0.75584 | | 450 | 33 | 2.1739 | 1369.451 |
| | Test Magnitudes | 0.2023 | 0.2523 | 0.3168 | 0.4026 | 0.5081 | 0.6447 | 0.42917 | 0.6447 | 0.2023 | | | |
| | Ref Magnitudes | 0.3203 | 0.3199 | 0.3196 | 0.3197 | 0.3204 | 0.3207 | 0.001355 | 0.3207 | 0.3196 | | | |
| subject | 3 Ind. Judgements | 40 | 50 | 70 | 75 | 100 | 100 | 0.34275 | | 100 | 40 | 0.82652 | 156.9662 |
| | Test Magnitudes | 0.2078 | 0.2589 | 0.325 | 0.412 | 0.5206 | 0.6611 | 0.42878 | 0.6611 | 0.2078 | | | |
| | Ref Magnitudes | 0.3233 | 0.3248 | 0.3268 | 0.3265 | 0.3265 | 0.3253 | 0.004134 | 0.3268 | 0.3233 | | | |
| subject | 4 Ind. Judgements | 75 | 50 | 75 | 75 | 150 | 250 | 0.67036 | | 250 | 50 | 1.1538 | 313.3968 |
| | Test Magnitudes | 0.2026 | 0.2532 | 0.3168 | 0.4025 | 0.5094 | 0.6458 | 0.42915 | 0.6458 | 0.2026 | | | |
| | Ref Magnitudes | 0.3176 | 0.3155 | 0.3155 | 0.3187 | 0.317 | 0.3171 | 0.003916 | 0.3187 | 0.3155 | | | |
| subject | 5 Ind. Judgements | 60 | 100 | 90 | 110 | 180 | 140 | 0.36876 | | 180 | 60 | 0.76194 | 232.0442 |
| | Test Magnitudes | 0.2041 | 0.2539 | 0.3246 | 0.4042 | 0.5095 | 0.648 | 0.42582 | 0.648 | 0.2041 | | | |
| | Ref Magnitudes | 0.3161 | 0.3209 | 0.3217 | 0.3185 | 0.3198 | 0.3313 | 0.016312 | 0.3313 | 0.3161 | | | |
| subject | 6 Ind. Judgements | 20 | 90 | 30 | 20 | 80 | 80 | 0.62375 | | 90 | 20 | 0.7597 | 92.7866 |
| | Test Magnitudes | 0.209 | 0.2609 | 0.327 | 0.4151 | 0.5252 | 0.6659 | 0.42922 | 0.6659 | 0.209 | | | |
| | Ref Magnitudes | 0.3303 | 0.3318 | 0.331 | 0.3306 | 0.3312 | 0.3317 | 0.001792 | 0.3318 | 0.3303 | | | |
| subject | 7 Ind. Judgements | 70 | 70 | 80 | 50 | 120 | 140 | 0.38833 | | 140 | 50 | 0.5713 | 146.6151 |
| | Test Magnitudes | 0.209 | 0.2605 | 0.3268 | 0.4148 | 0.5242 | 0.6648 | 0.42873 | 0.6648 | 0.209 | | | |
| | Ref Magnitudes | 0.3306 | 0.3278 | 0.3311 | 0.3307 | 0.328 | 0.3313 | 0.004802 | 0.3313 | 0.3278 | | | |
| subject | 8 Ind. Judgements | 40 | 40 | 40 | 50 | 150 | 160 | 0.72887 | | 160 | 40 | 1.3749 | 236.1501 |
| | Test Magnitudes | 0.2213 | 0.276 | 0.3465 | 0.4397 | 0.5547 | 0.7046 | 0.42872 | 0.7046 | 0.2213 | | | |
| | Ref Magnitudes | 0.3549 | 0.3547 | 0.3539 | 0.353 | 0.3549 | 0.353 | 0.002556 | 0.3549 | 0.353 | | | |
| subject | 9 Ind. Judgements | 110 | 120 | 100 | 160 | 140 | 175 | 0.21911 | | 175 | 100 | 0.40263 | 192.2826 |
| | Test Magnitudes | 0.2197 | 0.2739 | 0.3438 | 0.4364 | 0.5516 | 0.699 | 0.42874 | 0.699 | 0.2197 | | | |
| | Ref Magnitudes | 0.3461 | 0.3463 | 0.3468 | 0.3455 | 0.3461 | 0.3482 | 0.002689 | 0.3482 | 0.3455 | | | |
| subject | 10 Ind. Judgements | 40 | 70 | 90 | 120 | 130 | 100 | 0.36126 | | 130 | 40 | 0.82464 | 195.4437 |
| | Test Magnitudes | 0.2077 | 0.2587 | 0.325 | 0.4122 | 0.5188 | 0.6596 | 0.42712 | 0.6596 | 0.2077 | | | |
| | Ref Magnitudes | 0.328 | 0.33 | 0.3251 | 0.3262 | 0.329 | 0.3277 | 0.004681 | 0.33 | 0.3262 | | | |
| subject | 11 Ind. Judgements | 50 | 50 | 50 | 100 | 75 | 115 | 0.38969 | | 115 | 50 | 0.73558 | 142.0071 |
| | Test Magnitudes | 0.2092 | 0.2665 | 0.3271 | 0.4151 | 0.535 | 0.6841 | 0.43833 | 0.6841 | 0.2092 | | | |
| | Ref Magnitudes | 0.3301 | 0.3349 | 0.3286 | 0.3297 | 0.3354 | 0.3344 | 0.00913 | 0.3354 | 0.3286 | | | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.82484 | 195.4437 | |

| Frequency 0.315 Hz | | | | | | | | | | | | |
|--------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 20 | 30 | 40 | 50 | 110 | 140 | 0.7458 | 140 | 20 | 1.721 | 299.9358 |
| | Test Magnitudes | 0.2029 | 0.2534 | 0.318 | 0.4053 | 0.506 | 0.6373 | 0.4223 | 0.6373 | 0.2029 | | |
| | Ref Magnitudes | 0.3206 | 0.3165 | 0.3141 | 0.3209 | 0.3227 | 0.321 | 0.00946 | 0.3227 | 0.3141 | | |
| subject | 2 Ind. Judgements | 50 | 75 | 90 | 250 | 300 | 350 | 0.69757 | 350 | 50 | 1.8585 | 977.7543 |
| | Test Magnitudes | 0.2014 | 0.2523 | 0.3174 | 0.4011 | 0.5012 | 0.6339 | 0.42188 | 0.6339 | 0.2014 | | |
| | Ref Magnitudes | 0.3191 | 0.3197 | 0.3167 | 0.319 | 0.319 | 0.3208 | 0.002404 | 0.3208 | 0.3187 | | |
| subject | 3 Ind. Judgements | 90 | 90 | 65 | 100 | 140 | 130 | 0.28814 | 140 | 65 | 0.49217 | 160.02 |
| | Test Magnitudes | 0.2057 | 0.2576 | 0.3241 | 0.4107 | 0.5128 | 0.6472 | 0.42186 | 0.6472 | 0.2057 | | |
| | Ref Magnitudes | 0.3268 | 0.3235 | 0.3281 | 0.3247 | 0.3242 | 0.3254 | 0.003769 | 0.3268 | 0.3235 | | |
| subject | 4 Ind. Judgements | 50 | 75 | 125 | 150 | 175 | 200 | 0.44838 | 200 | 50 | 1.2005 | 400.8618 |
| | Test Magnitudes | 0.2011 | 0.2517 | 0.317 | 0.4023 | 0.502 | 0.633 | 0.42208 | 0.633 | 0.2011 | | |
| | Ref Magnitudes | 0.3187 | 0.318 | 0.3181 | 0.3182 | 0.3181 | 0.3187 | 0.000993 | 0.3187 | 0.318 | | |
| subject | 5 Ind. Judgements | 70 | 80 | 120 | 130 | 140 | 260 | 0.51015 | 260 | 70 | 1.0358 | 351.853 |
| | Test Magnitudes | 0.2018 | 0.2527 | 0.318 | 0.4035 | 0.5034 | 0.6344 | 0.42152 | 0.6344 | 0.2018 | | |
| | Ref Magnitudes | 0.3192 | 0.3205 | 0.3176 | 0.3199 | 0.3184 | 0.319 | 0.003245 | 0.3205 | 0.3176 | | |
| subject | 6 Ind. Judgements | 50 | 30 | 40 | 120 | 90 | 120 | 0.53831 | 120 | 30 | 1.1001 | 196.1549 |
| | Test Magnitudes | 0.208 | 0.2595 | 0.3264 | 0.4164 | 0.5185 | 0.6539 | 0.42249 | 0.6539 | 0.208 | | |
| | Ref Magnitudes | 0.333 | 0.3309 | 0.3314 | 0.3311 | 0.3327 | 0.3326 | 0.002766 | 0.333 | 0.3309 | | |
| subject | 7 Ind. Judgements | 100 | 60 | 80 | 130 | 120 | 320 | 0.69763 | 320 | 60 | 1.0475 | 330.6455 |
| | Test Magnitudes | 0.2075 | 0.259 | 0.326 | 0.4133 | 0.5174 | 0.6515 | 0.42206 | 0.6515 | 0.2075 | | |
| | Ref Magnitudes | 0.3311 | 0.3235 | 0.3264 | 0.3288 | 0.3301 | 0.3301 | 0.008744 | 0.3311 | 0.3235 | | |
| subject | 8 Ind. Judgements | 30 | 30 | 80 | 110 | 70 | 150 | 0.59559 | 150 | 30 | 1.3618 | 238.1633 |
| | Test Magnitudes | 0.2204 | 0.2758 | 0.3465 | 0.4399 | 0.5495 | 0.6912 | 0.42102 | 0.6912 | 0.2204 | | |
| | Ref Magnitudes | 0.3536 | 0.3545 | 0.3549 | 0.3545 | 0.3531 | 0.3508 | 0.004269 | 0.3549 | 0.3508 | | |
| subject | 9 Ind. Judgements | 100 | 100 | 110 | 90 | 150 | 160 | 0.24734 | 160 | 90 | 0.41724 | 171.8034 |
| | Test Magnitudes | 0.2181 | 0.2731 | 0.3436 | 0.4357 | 0.5428 | 0.6857 | 0.42141 | 0.6857 | 0.2181 | | |
| | Ref Magnitudes | 0.344 | 0.3481 | 0.3479 | 0.3462 | 0.3447 | 0.3478 | 0.005127 | 0.3481 | 0.344 | | |
| subject | 10 Ind. Judgements | 70 | 95 | 90 | 140 | 110 | 150 | 0.28147 | 150 | 70 | 0.58498 | 190.2204 |
| | Test Magnitudes | 0.2062 | 0.2581 | 0.3255 | 0.4114 | 0.5145 | 0.6485 | 0.42166 | 0.6485 | 0.2062 | | |
| | Ref Magnitudes | 0.3293 | 0.3278 | 0.3296 | 0.3296 | 0.328 | 0.3292 | 0.002451 | 0.3296 | 0.3278 | | |
| subject | 11 Ind. Judgements | 50 | 25 | 90 | 120 | 125 | 100 | 0.46764 | 125 | 25 | 1.0767 | 215.8393 |
| | Test Magnitudes | 0.2073 | 0.263 | 0.3358 | 0.4179 | 0.5278 | 0.6519 | 0.41788 | 0.6519 | 0.2073 | | |
| | Ref Magnitudes | 0.3288 | 0.3334 | 0.332 | 0.3293 | 0.3339 | 0.3302 | 0.00649 | 0.3339 | 0.3288 | | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 1.0767 | 238.1633 |

| Frequency 0.4 Hz | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 30 | 50 | 70 | 100 | 110 | 200 | 0.64523 | 200 | 30 | 1.4957 | 360.0009 |
| | Test Magnitudes | 0.2027 | 0.2531 | 0.319 | 0.4065 | 0.5141 | 0.644 | 0.42771 | 0.644 | 0.2027 | | |
| | Ref Magnitudes | 0.3236 | 0.3217 | 0.3208 | 0.3212 | 0.3236 | 0.3202 | 0.00448 | 0.3236 | 0.3202 | | |
| subject | 2 Ind. Judgements | 33 | 50 | 75 | 250 | 200 | 400 | 0.85171 | 400 | 33 | 2.193 | 1103.936 |
| | Test Magnitudes | 0.2099 | 0.252 | 0.3173 | 0.4045 | 0.51 | 0.6392 | 0.42699 | 0.6392 | 0.2099 | | |
| | Ref Magnitudes | 0.3201 | 0.3208 | 0.3193 | 0.3192 | 0.3204 | 0.3194 | 0.002071 | 0.3208 | 0.3192 | | |
| subject | 3 Ind. Judgements | 45 | 100 | 100 | 120 | 35 | 120 | 0.43122 | 120 | 35 | 0.22534 | 98.0231 |
| | Test Magnitudes | 0.2055 | 0.256 | 0.3202 | 0.4121 | 0.5199 | 0.6516 | 0.42833 | 0.6516 | 0.2055 | | |
| | Ref Magnitudes | 0.3266 | 0.323 | 0.3179 | 0.3231 | 0.3253 | 0.3224 | 0.009247 | 0.3266 | 0.3179 | | |
| subject | 4 Ind. Judgements | 75 | 75 | 50 | 150 | 150 | 300 | 0.68807 | 300 | 50 | 1.2382 | 398.8605 |
| | Test Magnitudes | 0.1988 | 0.2509 | 0.3167 | 0.4039 | 0.5067 | 0.6365 | 0.42731 | 0.6365 | 0.1988 | | |
| | Ref Magnitudes | 0.3159 | 0.3184 | 0.3188 | 0.3182 | 0.3171 | 0.3146 | 0.005172 | 0.3188 | 0.3146 | | |
| subject | 5 Ind. Judgements | 90 | 100 | 120 | 150 | 130 | 250 | 0.41404 | 250 | 90 | 0.75003 | 284.5031 |
| | Test Magnitudes | 0.2011 | 0.2518 | 0.3181 | 0.4052 | 0.5092 | 0.6422 | 0.4282 | 0.6422 | 0.2011 | | |
| | Ref Magnitudes | 0.3206 | 0.3192 | 0.3198 | 0.3181 | 0.3178 | 0.3195 | 0.003308 | 0.3206 | 0.3178 | | |
| subject | 6 Ind. Judgements | 90 | 30 | 90 | 110 | 150 | 200 | 0.52038 | 200 | 30 | 1.1224 | 293.5107 |
| | Test Magnitudes | 0.2091 | 0.2594 | 0.3287 | 0.419 | 0.526 | 0.6614 | 0.42636 | 0.6614 | 0.2091 | | |
| | Ref Magnitudes | 0.3332 | 0.3296 | 0.3328 | 0.3323 | 0.3318 | 0.3328 | 0.003942 | 0.3332 | 0.3296 | | |
| subject | 7 Ind. Judgements | 70 | 80 | 130 | 170 | 130 | 280 | 0.53255 | 280 | 70 | 1.0679 | 372.3 |
| | Test Magnitudes | 0.2078 | 0.2593 | 0.3269 | 0.4182 | 0.5212 | 0.661 | 0.42705 | 0.661 | 0.2078 | | |
| | Ref Magnitudes | 0.3307 | 0.33 | 0.3299 | 0.3306 | 0.3268 | 0.33 | 0.004382 | 0.3307 | 0.3268 | | |
| subject | 8 Ind. Judgements | 80 | 60 | 40 | 100 | 120 | 70 | 0.36482 | 120 | 40 | 0.29514 | 97.2073 |
| | Test Magnitudes | 0.2213 | 0.2764 | 0.3482 | 0.4436 | 0.5564 | 0.6989 | 0.42453 | 0.6989 | 0.2213 | | |
| | Ref Magnitudes | 0.3527 | 0.3529 | 0.3533 | 0.353 | 0.3529 | 0.3517 | 0.001561 | 0.3533 | 0.3517 | | |
| subject | 9 Ind. Judgements | 100 | 100 | 100 | 120 | 120 | 160 | 0.20041 | 160 | 100 | 0.3793 | 164.5621 |
| | Test Magnitudes | 0.218 | 0.2727 | 0.3435 | 0.439 | 0.5505 | 0.6924 | 0.4265 | 0.6924 | 0.218 | | |
| | Ref Magnitudes | 0.3476 | 0.3458 | 0.3474 | 0.3475 | 0.3467 | 0.3462 | 0.001596 | 0.3476 | 0.3462 | | |
| subject | 10 Ind. Judgements | 70 | 70 | 90 | 90 | 110 | 240 | 0.57875 | 240 | 70 | 0.91898 | 253.2072 |
| | Test Magnitudes | 0.2058 | 0.2574 | 0.3245 | 0.4136 | 0.5229 | 0.6573 | 0.42926 | 0.6573 | 0.2058 | | |
| | Ref Magnitudes | 0.3283 | 0.3278 | 0.3273 | 0.3235 | 0.3287 | 0.3287 | 0.006553 | 0.3297 | 0.3235 | | |
| subject | 11 Ind. Judgements | 25 | 50 | 75 | 100 | 125 | 150 | 0.53452 | 150 | 25 | 1.471 | 320.7573 |
| | Test Magnitudes | 0.2066 | 0.2642 | 0.3281 | 0.4181 | 0.5353 | 0.6594 | 0.42646 | 0.6594 | 0.2066 | | |
| | Ref Magnitudes | 0.3304 | 0.3358 | 0.331 | 0.3295 | 0.3353 | 0.3286 | 0.009179 | 0.3358 | 0.3286 | | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 1.0679 | 293.5107 |

| Frequency 0.5 Hz | | | | | | | | | | | | | |
|-------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|--|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 80 | 100 | 90 | 150 | 160 | 300 | 0.55837 | 300 | 80 | 1.0213 | 369.4242 | |
| | Test Magnitudes | 0.201 | 0.253 | 0.3209 | 0.4134 | 0.5174 | 0.665 | 0.44057 | 0.665 | 0.201 | | | |
| | Ref Magnitudes | 0.3214 | 0.3209 | 0.3205 | 0.3217 | 0.3181 | 0.3209 | 0.004016 | 0.3217 | 0.3181 | | | |
| subject | 2 Ind. Judgements | 100 | 100 | 150 | 175 | 350 | 400 | 0.61244 | 400 | 100 | 1.2972 | 678.3803 | |
| | Test Magnitudes | 0.2009 | 0.2531 | 0.3205 | 0.4113 | 0.5173 | 0.662 | 0.43921 | 0.662 | 0.2009 | | | |
| | Ref Magnitudes | 0.3192 | 0.3205 | 0.3201 | 0.3201 | 0.3191 | 0.32 | 0.001743 | 0.3205 | 0.3191 | | | |
| subject | 3 Ind. Judgements | 40 | 30 | 80 | 100 | 155 | 120 | 0.54541 | 155 | 30 | 1.2655 | 264.5324 | |
| | Test Magnitudes | 0.2037 | 0.2574 | 0.3256 | 0.4183 | 0.5276 | 0.6756 | 0.44144 | 0.6756 | 0.2037 | | | |
| | Ref Magnitudes | 0.3246 | 0.3264 | 0.3256 | 0.3254 | 0.3244 | 0.3265 | 0.002695 | 0.3265 | 0.3244 | | | |
| subject | 4 Ind. Judgements | 50 | 100 | 125 | 100 | 200 | 200 | 0.46478 | 200 | 50 | 1.046 | 340.0555 | |
| | Test Magnitudes | 0.2002 | 0.2493 | 0.3162 | 0.4043 | 0.512 | 0.6567 | 0.44062 | 0.6567 | 0.2002 | | | |
| | Ref Magnitudes | 0.3188 | 0.3158 | 0.3164 | 0.3126 | 0.3142 | 0.3157 | 0.00663 | 0.3188 | 0.3126 | | | |
| subject | 5 Ind. Judgements | 70 | 90 | 110 | 120 | 140 | 260 | 0.51156 | 260 | 70 | 0.95363 | 315.7272 | |
| | Test Magnitudes | 0.2015 | 0.2528 | 0.3199 | 0.412 | 0.5197 | 0.6609 | 0.43886 | 0.6609 | 0.2015 | | | |
| | Ref Magnitudes | 0.3201 | 0.3197 | 0.3205 | 0.3201 | 0.3198 | 0.3188 | 0.001809 | 0.3205 | 0.3188 | | | |
| subject | 6 Ind. Judgements | 100 | 110 | 90 | 120 | 140 | 160 | 0.21731 | 160 | 90 | 0.40601 | 175.0694 | |
| | Test Magnitudes | 0.2088 | 0.2627 | 0.3307 | 0.4258 | 0.5372 | 0.6836 | 0.43794 | 0.6836 | 0.2088 | | | |
| | Ref Magnitudes | 0.3323 | 0.3325 | 0.3309 | 0.3325 | 0.3327 | 0.3334 | 0.002469 | 0.3334 | 0.3309 | | | |
| subject | 7 Ind. Judgements | 70 | 100 | 250 | 140 | 380 | 500 | 0.71151 | 500 | 70 | 1.5752 | 894.932 | |
| | Test Magnitudes | 0.2076 | 0.2605 | 0.3262 | 0.4238 | 0.5325 | 0.6815 | 0.44009 | 0.6815 | 0.2076 | | | |
| | Ref Magnitudes | 0.3302 | 0.3301 | 0.3261 | 0.3302 | 0.3289 | 0.3304 | 0.005057 | 0.3304 | 0.3261 | | | |
| subject | 8 Ind. Judgements | 20 | 110 | 40 | 70 | 120 | 190 | 0.57395 | 190 | 20 | 1.4364 | 269.1988 | |
| | Test Magnitudes | 0.2219 | 0.2769 | 0.3539 | 0.4536 | 0.5699 | 0.7249 | 0.43713 | 0.7249 | 0.2219 | | | |
| | Ref Magnitudes | 0.3538 | 0.35 | 0.3544 | 0.3543 | 0.3532 | 0.3544 | 0.004829 | 0.3544 | 0.35 | | | |
| subject | 9 Ind. Judgements | 80 | 50 | 100 | 110 | 120 | 175 | 0.39687 | 175 | 50 | 0.79844 | 208.101 | |
| | Test Magnitudes | 0.2186 | 0.2732 | 0.3435 | 0.4467 | 0.5606 | 0.7154 | 0.4394 | 0.7154 | 0.2186 | | | |
| | Ref Magnitudes | 0.348 | 0.3462 | 0.3433 | 0.3478 | 0.3459 | 0.3459 | 0.0049 | 0.348 | 0.3433 | | | |
| subject | 10 Ind. Judgements | 60 | 80 | 120 | 110 | 170 | 230 | 0.48642 | 230 | 60 | 1.0631 | 332.3571 | |
| | Test Magnitudes | 0.2068 | 0.2589 | 0.3286 | 0.4198 | 0.5319 | 0.6799 | 0.44016 | 0.6799 | 0.2068 | | | |
| | Ref Magnitudes | 0.3291 | 0.3281 | 0.3286 | 0.3262 | 0.3279 | 0.3285 | 0.003064 | 0.3291 | 0.3262 | | | |
| subject | 11 Ind. Judgements | 75 | 80 | 100 | 125 | 150 | 250 | 0.50148 | 250 | 75 | 0.96047 | 305.0263 | |
| | Test Magnitudes | 0.2066 | 0.2587 | 0.3292 | 0.4229 | 0.544 | 0.6835 | 0.44402 | 0.6835 | 0.2066 | | | |
| | Ref Magnitudes | 0.3296 | 0.3288 | 0.3284 | 0.3296 | 0.334 | 0.3303 | 0.006225 | 0.3341 | 0.3284 | | | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 1.046 | 315.7272 | |
| Frequency 0.63 Hz | | | | | | | | | | | | | |
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 130 | 150 | 130 | 200 | 280 | 190 | 0.31817 | 280 | 130 | 0.52174 | 294.1742 | |
| | Test Magnitudes | 0.1992 | 0.253 | 0.3292 | 0.4271 | 0.5097 | 0.6251 | 0.41262 | 0.6251 | 0.1992 | | | |
| | Ref Magnitudes | 0.3237 | 0.3215 | 0.3225 | 0.3234 | 0.3218 | 0.3138 | 0.01148 | 0.3237 | 0.3138 | | | |
| subject | 2 Ind. Judgements | 133 | 80 | 150 | 200 | 275 | 333 | 0.48372 | 333 | 80 | 1.0473 | 508.6167 | |
| | Test Magnitudes | 0.1991 | 0.2553 | 0.3272 | 0.4204 | 0.5057 | 0.637 | 0.41868 | 0.637 | 0.1991 | | | |
| | Ref Magnitudes | 0.3195 | 0.3205 | 0.3198 | 0.32 | 0.3201 | 0.3201 | 0.001046 | 0.3205 | 0.3195 | | | |
| subject | 3 Ind. Judgements | 40 | 70 | 130 | 50 | 140 | 140 | 0.4926 | 140 | 40 | 0.88572 | 204.1367 | |
| | Test Magnitudes | 0.2007 | 0.2595 | 0.333 | 0.4302 | 0.5112 | 0.6512 | 0.42126 | 0.6512 | 0.2007 | | | |
| | Ref Magnitudes | 0.3256 | 0.3266 | 0.3263 | 0.3264 | 0.324 | 0.3254 | 0.00296 | 0.3266 | 0.324 | | | |
| subject | 4 Ind. Judgements | 100 | 125 | 100 | 200 | 200 | 300 | 0.45734 | 300 | 100 | 0.9089 | 400.0406 | |
| | Test Magnitudes | 0.1947 | 0.2476 | 0.3237 | 0.4189 | 0.5012 | 0.6366 | 0.42725 | 0.6366 | 0.1947 | | | |
| | Ref Magnitudes | 0.3172 | 0.3157 | 0.3179 | 0.318 | 0.3169 | 0.3169 | 0.003461 | 0.3169 | 0.3157 | | | |
| subject | 5 Ind. Judgements | 100 | 100 | 130 | 120 | 200 | 190 | 0.31623 | 200 | 100 | 0.62724 | 255.7401 | |
| | Test Magnitudes | 0.1982 | 0.2584 | 0.3235 | 0.4165 | 0.503 | 0.6376 | 0.42399 | 0.6376 | 0.1982 | | | |
| | Ref Magnitudes | 0.3203 | 0.3185 | 0.3181 | 0.3168 | 0.319 | 0.3197 | 0.003882 | 0.3203 | 0.3168 | | | |
| subject | 6 Ind. Judgements | 60 | 125 | 90 | 120 | 180 | 110 | 0.35082 | 180 | 60 | 0.54243 | 185.0641 | |
| | Test Magnitudes | 0.2022 | 0.2628 | 0.3353 | 0.4329 | 0.5189 | 0.6591 | 0.42298 | 0.6591 | 0.2022 | | | |
| | Ref Magnitudes | 0.3328 | 0.332 | 0.3312 | 0.3325 | 0.3321 | 0.3307 | 0.002391 | 0.3328 | 0.3307 | | | |
| subject | 7 Ind. Judgements | 140 | 110 | 200 | 450 | 480 | 460 | 0.56643 | 480 | 110 | 1.3371 | 982.892 | |
| | Test Magnitudes | 0.1974 | 0.2616 | 0.3329 | 0.4296 | 0.5228 | 0.6588 | 0.429 | 0.6588 | 0.1974 | | | |
| | Ref Magnitudes | 0.3259 | 0.3304 | 0.3277 | 0.328 | 0.3301 | 0.331 | 0.00598 | 0.331 | 0.3259 | | | |
| subject | 8 Ind. Judgements | 60 | 70 | 90 | 70 | 140 | 80 | 0.33894 | 140 | 60 | 0.39424 | 117.0661 | |
| | Test Magnitudes | 0.2208 | 0.2804 | 0.3621 | 0.4694 | 0.5609 | 0.7043 | 0.41908 | 0.7043 | 0.2208 | | | |
| | Ref Magnitudes | 0.3539 | 0.3542 | 0.354 | 0.3541 | 0.3541 | 0.3538 | 0.000416 | 0.3542 | 0.3538 | | | |
| subject | 9 Ind. Judgements | 50 | 100 | 110 | 110 | 110 | 175 | 0.36459 | 175 | 50 | 0.79819 | 217.7036 | |
| | Test Magnitudes | 0.2116 | 0.2759 | 0.3455 | 0.457 | 0.551 | 0.6877 | 0.42435 | 0.6877 | 0.2116 | | | |
| | Ref Magnitudes | 0.3443 | 0.3482 | 0.3403 | 0.3472 | 0.3485 | 0.3442 | 0.009093 | 0.3485 | 0.3403 | | | |
| subject | 10 Ind. Judgements | 130 | 120 | 100 | 200 | 170 | 240 | 0.33307 | 240 | 100 | 0.58777 | 273.1198 | |
| | Test Magnitudes | 0.2049 | 0.2613 | 0.3372 | 0.4333 | 0.5194 | 0.6554 | 0.41903 | 0.6554 | 0.2049 | | | |
| | Ref Magnitudes | 0.3284 | 0.3277 | 0.3298 | 0.3288 | 0.327 | 0.3279 | 0.002958 | 0.3298 | 0.327 | | | |
| subject | 11 Ind. Judgements | 100 | 100 | 125 | 150 | 150 | 250 | 0.38205 | 250 | 100 | 0.72192 | 281.8697 | |
| | Test Magnitudes | 0.2032 | 0.2603 | 0.3399 | 0.434 | 0.5199 | 0.6679 | 0.42716 | 0.6679 | 0.2032 | | | |
| | Ref Magnitudes | 0.3313 | 0.3294 | 0.3358 | 0.3301 | 0.329 | 0.3356 | 0.009254 | 0.3358 | 0.329 | | | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.72192 | 273.1198 | |

| Frequency 0.8 Hz | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 100 | 110 | 230 | 150 | 160 | 180 | 0.30738 | 230 | 100 | 0.47702 | 244.1196 |
| | Test Magnitudes | 0.2005 | 0.2469 | 0.3273 | 0.4045 | 0.4826 | 0.6337 | 0.41848 | 0.6337 | 0.2005 | | |
| | Ref Magnitudes | 0.3201 | 0.3208 | 0.3204 | 0.3209 | 0.3117 | 0.3186 | 0.011145 | 0.3209 | 0.3117 | | |
| subject | 2 Ind. Judgements | 150 | 75 | 166 | 200 | 150 | 300 | 0.42797 | 300 | 75 | 0.72985 | 337.197 |
| | Test Magnitudes | 0.2033 | 0.2532 | 0.3293 | 0.4047 | 0.5042 | 0.6317 | 0.41411 | 0.6317 | 0.2033 | | |
| | Ref Magnitudes | 0.3199 | 0.3208 | 0.32 | 0.3192 | 0.3191 | 0.3194 | 0.001995 | 0.3208 | 0.3191 | | |
| subject | 3 Ind. Judgements | 70 | 120 | 90 | 80 | 140 | 100 | 0.26077 | 140 | 70 | 0.23382 | 123.1377 |
| | Test Magnitudes | 0.2081 | 0.2444 | 0.3343 | 0.4136 | 0.5126 | 0.6525 | 0.42711 | 0.6525 | 0.2081 | | |
| | Ref Magnitudes | 0.3267 | 0.3189 | 0.3253 | 0.3257 | 0.3249 | 0.3267 | 0.009036 | 0.3267 | 0.3189 | | |
| subject | 4 Ind. Judgements | 150 | 125 | 150 | 300 | 300 | 300 | 0.39488 | 300 | 125 | 0.83366 | 488.0825 |
| | Test Magnitudes | 0.1975 | 0.2486 | 0.327 | 0.3979 | 0.4992 | 0.6263 | 0.41889 | 0.6263 | 0.1975 | | |
| | Ref Magnitudes | 0.3161 | 0.3184 | 0.3182 | 0.3162 | 0.3182 | 0.3154 | 0.004186 | 0.3184 | 0.3154 | | |
| subject | 5 Ind. Judgements | 110 | 120 | 140 | 120 | 160 | 200 | 0.23798 | 200 | 110 | 0.47345 | 226.2392 |
| | Test Magnitudes | 0.2037 | 0.2486 | 0.3259 | 0.3985 | 0.4952 | 0.6166 | 0.40725 | 0.6166 | 0.2037 | | |
| | Ref Magnitudes | 0.3202 | 0.3204 | 0.3202 | 0.318 | 0.3179 | 0.3174 | 0.004345 | 0.3204 | 0.3174 | | |
| subject | 6 Ind. Judgements | 110 | 85 | 140 | 100 | 130 | 175 | 0.26106 | 175 | 85 | 0.41881 | 182.0914 |
| | Test Magnitudes | 0.2111 | 0.2564 | 0.334 | 0.4154 | 0.515 | 0.6534 | 0.41834 | 0.6534 | 0.2111 | | |
| | Ref Magnitudes | 0.3327 | 0.3327 | 0.3315 | 0.3313 | 0.3319 | 0.3305 | 0.002577 | 0.3327 | 0.3305 | | |
| subject | 7 Ind. Judgements | 170 | 180 | 300 | 400 | 450 | 580 | 0.46358 | 580 | 170 | 1.1337 | 991.4718 |
| | Test Magnitudes | 0.2031 | 0.2537 | 0.3269 | 0.4088 | 0.5122 | 0.6455 | 0.42419 | 0.6455 | 0.2031 | | |
| | Ref Magnitudes | 0.3253 | 0.3264 | 0.326 | 0.3288 | 0.3298 | 0.3309 | 0.00696 | 0.3309 | 0.3253 | | |
| subject | 8 Ind. Judgements | 30 | 130 | 60 | 120 | 160 | 170 | 0.49834 | 170 | 30 | 1.2321 | 294.1617 |
| | Test Magnitudes | 0.2298 | 0.2793 | 0.3678 | 0.4511 | 0.5599 | 0.7041 | 0.4129 | 0.7041 | 0.2298 | | |
| | Ref Magnitudes | 0.3545 | 0.3533 | 0.3549 | 0.3545 | 0.3536 | 0.3531 | 0.002102 | 0.3549 | 0.3531 | | |
| subject | 9 Ind. Judgements | 50 | 90 | 120 | 110 | 130 | 110 | 0.28109 | 130 | 50 | 0.62102 | 174.2438 |
| | Test Magnitudes | 0.2239 | 0.2678 | 0.3591 | 0.4425 | 0.5488 | 0.6879 | 0.41644 | 0.6879 | 0.2239 | | |
| | Ref Magnitudes | 0.3467 | 0.3446 | 0.3478 | 0.3475 | 0.3469 | 0.3442 | 0.004381 | 0.3478 | 0.3442 | | |
| subject | 10 Ind. Judgements | 90 | 100 | 120 | 130 | 180 | 230 | 0.37728 | 230 | 90 | 0.82439 | 304.4353 |
| | Test Magnitudes | 0.2109 | 0.258 | 0.3383 | 0.4134 | 0.5167 | 0.6511 | 0.41516 | 0.6511 | 0.2109 | | |
| | Ref Magnitudes | 0.3278 | 0.3279 | 0.328 | 0.3271 | 0.3273 | 0.3268 | 0.001489 | 0.328 | 0.3268 | | |
| subject | 11 Ind. Judgements | 150 | 125 | 150 | 200 | 175 | 350 | 0.426 | 350 | 125 | 0.69783 | 362.1536 |
| | Test Magnitudes | 0.209 | 0.2556 | 0.337 | 0.4194 | 0.5124 | 0.6455 | 0.41368 | 0.6455 | 0.209 | | |
| | Ref Magnitudes | 0.3296 | 0.3301 | 0.3304 | 0.336 | 0.3293 | 0.3296 | 0.007743 | 0.336 | 0.3293 | | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.69783 | 294.1617 |

| Frequency 1 Hz | | | | | | | | | | | | |
|----------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 100 | 210 | 310 | 360 | 450 | 520 | 0.47458 | 520 | 100 | 1.3341 | 1194.949 |
| | Test Magnitudes | 0.1968 | 0.2373 | 0.311 | 0.3817 | 0.4775 | 0.6096 | 0.42018 | 0.6096 | 0.1968 | | |
| | Ref Magnitudes | 0.321 | 0.3235 | 0.3215 | 0.321 | 0.3213 | 0.3233 | 0.003593 | 0.3235 | 0.321 | | |
| subject | 2 Ind. Judgements | 65 | 120 | 200 | 175 | 300 | 300 | 0.48879 | 300 | 65 | 1.2939 | 661.4721 |
| | Test Magnitudes | 0.2046 | 0.2404 | 0.3233 | 0.3969 | 0.4937 | 0.6169 | 0.41125 | 0.6169 | 0.2046 | | |
| | Ref Magnitudes | 0.3198 | 0.3194 | 0.3197 | 0.3198 | 0.3203 | 0.3199 | 0.00092 | 0.3203 | 0.3194 | | |
| subject | 3 Ind. Judgements | 80 | 50 | 115 | 160 | 180 | 200 | 0.45116 | 200 | 50 | 1.1258 | 372.7006 |
| | Test Magnitudes | 0.2077 | 0.2468 | 0.3313 | 0.3942 | 0.5023 | 0.6369 | 0.41828 | 0.6369 | 0.2077 | | |
| | Ref Magnitudes | 0.3235 | 0.327 | 0.3265 | 0.3224 | 0.3237 | 0.3252 | 0.005596 | 0.327 | 0.3224 | | |
| subject | 4 Ind. Judgements | 150 | 150 | 150 | 350 | 300 | 400 | 0.45607 | 400 | 150 | 0.97866 | 639.403 |
| | Test Magnitudes | 0.2031 | 0.238 | 0.3215 | 0.3853 | 0.4915 | 0.616 | 0.41714 | 0.616 | 0.2031 | | |
| | Ref Magnitudes | 0.3185 | 0.3177 | 0.3185 | 0.3154 | 0.3176 | 0.3171 | 0.003623 | 0.3185 | 0.3154 | | |
| subject | 5 Ind. Judgements | 110 | 110 | 120 | 160 | 160 | 200 | 0.25219 | 200 | 110 | 0.54916 | 251.5487 |
| | Test Magnitudes | 0.1971 | 0.2293 | 0.3183 | 0.3916 | 0.4718 | 0.6093 | 0.41989 | 0.6093 | 0.1971 | | |
| | Ref Magnitudes | 0.3169 | 0.3165 | 0.32 | 0.3203 | 0.3171 | 0.3193 | 0.005352 | 0.3203 | 0.3165 | | |
| subject | 6 Ind. Judgements | 120 | 70 | 140 | 120 | 175 | 150 | 0.27527 | 175 | 70 | 0.49659 | 205.8534 |
| | Test Magnitudes | 0.2121 | 0.2494 | 0.3285 | 0.4054 | 0.5043 | 0.64 | 0.41509 | 0.64 | 0.2121 | | |
| | Ref Magnitudes | 0.3319 | 0.3305 | 0.3297 | 0.331 | 0.3312 | 0.3328 | 0.00326 | 0.3328 | 0.3297 | | |
| subject | 7 Ind. Judgements | 160 | 120 | 240 | 460 | 460 | 500 | 0.52401 | 500 | 120 | 1.3492 | 1119.823 |
| | Test Magnitudes | 0.2102 | 0.2441 | 0.3303 | 0.4011 | 0.4949 | 0.6305 | 0.41214 | 0.6305 | 0.2102 | | |
| | Ref Magnitudes | 0.3308 | 0.3314 | 0.3307 | 0.3302 | 0.3304 | 0.3286 | 0.002877 | 0.3314 | 0.3286 | | |
| subject | 8 Ind. Judgements | 40 | 50 | 190 | 80 | 180 | 200 | 0.60386 | 200 | 40 | 1.4572 | 413.1835 |
| | Test Magnitudes | 0.2288 | 0.2617 | 0.3462 | 0.4353 | 0.5225 | 0.6554 | 0.39853 | 0.6554 | 0.2288 | | |
| | Ref Magnitudes | 0.3545 | 0.3538 | 0.3531 | 0.3533 | 0.3544 | 0.3521 | 0.002547 | 0.3545 | 0.3521 | | |
| subject | 9 Ind. Judgements | 80 | 110 | 110 | 120 | 130 | 175 | 0.25963 | 175 | 80 | 0.56944 | 202.8583 |
| | Test Magnitudes | 0.2256 | 0.2636 | 0.3517 | 0.4223 | 0.5336 | 0.6777 | 0.41418 | 0.6777 | 0.2256 | | |
| | Ref Magnitudes | 0.3475 | 0.3472 | 0.3461 | 0.3464 | 0.3486 | 0.3467 | 0.002599 | 0.3486 | 0.3461 | | |
| subject | 10 Ind. Judgements | 130 | 140 | 160 | 140 | 250 | 220 | 0.28653 | 250 | 130 | 0.53628 | 292.0411 |
| | Test Magnitudes | 0.2095 | 0.2444 | 0.3257 | 0.4058 | 0.486 | 0.6224 | 0.40697 | 0.6224 | 0.2095 | | |
| | Ref Magnitudes | 0.3287 | 0.3254 | 0.3288 | 0.326 | 0.3283 | 0.3282 | 0.00371 | 0.3288 | 0.326 | | |
| subject | 11 Ind. Judgements | 15 | 150 | 125 | 200 | 180 | 225 | 0.50052 | 225 | 15 | 1.7888 | 706.7382 |
| | Test Magnitudes | 0.2133 | 0.2487 | 0.3283 | 0.4008 | 0.5082 | 0.6331 | 0.41187 | 0.6331 | 0.2133 | | |
| | Ref Magnitudes | 0.33 | 0.3292 | 0.328 | 0.3282 | 0.3287 | 0.3292 | 0.002246 | 0.33 | 0.328 | | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 1.1258 | 413.1835 |

| Frequency 1.25 Hz | | | | | | | | | | | | |
|-------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 110 | 290 | 290 | 350 | 500 | 420 | 0.40827 | 500 | 110 | 1.0908 | 1011.964 |
| | Test Magnitudes | 0.1988 | 0.2295 | 0.2883 | 0.3635 | 0.4268 | 0.5727 | 0.40143 | 0.5727 | 0.1988 | | |
| | Ref Magnitudes | 0.3206 | 0.3211 | 0.3233 | 0.3205 | 0.322 | 0.3238 | 0.004365 | 0.3238 | 0.3205 | | |
| subject | 2 Ind. Judgements | 120 | 200 | 200 | 200 | 266 | 200 | 0.23429 | 266 | 120 | 0.44889 | 314.2091 |
| | Test Magnitudes | 0.2045 | 0.2488 | 0.2885 | 0.3712 | 0.4575 | 0.579 | 0.39324 | 0.579 | 0.2045 | | |
| | Ref Magnitudes | 0.3208 | 0.3194 | 0.3196 | 0.3195 | 0.3203 | 0.3198 | 0.001701 | 0.3208 | 0.3194 | | |
| subject | 3 Ind. Judgements | 30 | 40 | 160 | 180 | 120 | 220 | 0.61501 | 220 | 30 | 1.7432 | 596.4397 |
| | Test Magnitudes | 0.21 | 0.2569 | 0.3141 | 0.3944 | 0.4899 | 0.6202 | 0.40393 | 0.6202 | 0.21 | | |
| | Ref Magnitudes | 0.3268 | 0.3263 | 0.3231 | 0.3246 | 0.3253 | 0.3261 | 0.004168 | 0.3268 | 0.3231 | | |
| subject | 4 Ind. Judgements | 200 | 200 | 200 | 200 | 300 | 300 | 0.22131 | 300 | 200 | 0.41197 | 355.4284 |
| | Test Magnitudes | 0.1976 | 0.2438 | 0.3079 | 0.3873 | 0.4758 | 0.6042 | 0.41202 | 0.6042 | 0.1976 | | |
| | Ref Magnitudes | 0.318 | 0.3164 | 0.3186 | 0.3176 | 0.3164 | 0.3184 | 0.003044 | 0.3186 | 0.3164 | | |
| subject | 5 Ind. Judgements | 110 | 120 | 120 | 120 | 190 | 180 | 0.25153 | 190 | 110 | 0.51325 | 238.5597 |
| | Test Magnitudes | 0.2018 | 0.2443 | 0.296 | 0.3758 | 0.4583 | 0.5882 | 0.40075 | 0.5882 | 0.2018 | | |
| | Ref Magnitudes | 0.3184 | 0.3201 | 0.3138 | 0.3192 | 0.3164 | 0.32 | 0.00773 | 0.3201 | 0.3138 | | |
| subject | 6 Ind. Judgements | 50 | 130 | 140 | 120 | 150 | 120 | 0.29957 | 150 | 50 | 0.60023 | 209.139 |
| | Test Magnitudes | 0.2084 | 0.2558 | 0.3131 | 0.3878 | 0.4858 | 0.6142 | 0.40245 | 0.6142 | 0.2084 | | |
| | Ref Magnitudes | 0.3315 | 0.3327 | 0.3308 | 0.3303 | 0.3318 | 0.3318 | 0.002541 | 0.3327 | 0.3303 | | |
| subject | 7 Ind. Judgements | 210 | 280 | 200 | 160 | 380 | 440 | 0.39776 | 440 | 160 | 0.58706 | 467.4951 |
| | Test Magnitudes | 0.2107 | 0.2515 | 0.3173 | 0.4004 | 0.4963 | 0.6223 | 0.40726 | 0.6223 | 0.2107 | | |
| | Ref Magnitudes | 0.328 | 0.3255 | 0.3313 | 0.3291 | 0.329 | 0.3307 | 0.005291 | 0.3313 | 0.3255 | | |
| subject | 8 Ind. Judgements | 50 | 90 | 150 | 120 | 200 | 200 | 0.44629 | 200 | 50 | 1.3077 | 481.943 |
| | Test Magnitudes | 0.2166 | 0.2614 | 0.3154 | 0.3725 | 0.4593 | 0.5912 | 0.37357 | 0.5912 | 0.2166 | | |
| | Ref Magnitudes | 0.3535 | 0.3541 | 0.3537 | 0.3532 | 0.3537 | 0.3534 | 0.000876 | 0.3541 | 0.3532 | | |
| subject | 9 Ind. Judgements | 60 | 90 | 110 | 110 | 130 | 250 | 0.5252 | 250 | 60 | 1.1493 | 352.2952 |
| | Test Magnitudes | 0.2234 | 0.2745 | 0.3352 | 0.4156 | 0.5036 | 0.6247 | 0.37865 | 0.6247 | 0.2234 | | |
| | Ref Magnitudes | 0.3482 | 0.3471 | 0.3433 | 0.348 | 0.3476 | 0.3435 | 0.006543 | 0.3482 | 0.3433 | | |
| subject | 10 Ind. Judgements | 140 | 110 | 160 | 170 | 190 | 170 | 0.17903 | 190 | 110 | 0.36209 | 226.2812 |
| | Test Magnitudes | 0.2034 | 0.2556 | 0.3158 | 0.3974 | 0.4636 | 0.5847 | 0.38096 | 0.5847 | 0.2034 | | |
| | Ref Magnitudes | 0.3281 | 0.3278 | 0.3282 | 0.3279 | 0.3285 | 0.3281 | 0.000747 | 0.3285 | 0.3278 | | |
| subject | 11 Ind. Judgements | 125 | 150 | 150 | 175 | 175 | 175 | 0.12892 | 175 | 125 | 0.30955 | 216.2449 |
| | Test Magnitudes | 0.2129 | 0.2592 | 0.3152 | 0.3943 | 0.4972 | 0.6042 | 0.39144 | 0.6042 | 0.2129 | | |
| | Ref Magnitudes | 0.3284 | 0.3285 | 0.3283 | 0.3287 | 0.33 | 0.3307 | 0.003045 | 0.3307 | 0.3283 | | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.58706 | 352.2952 |

| Frequency 1.6 Hz | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|----------|----------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 150 | 230 | 250 | 300 | 290 | 370 | 0.28011 | 370 | 150 | 0.64557 | 551.4141 |
| | Test Magnitudes | 0.1603 | 0.2155 | 0.2809 | 0.3401 | 0.4233 | 0.5603 | 0.44147 | 0.5603 | 0.1603 | | |
| | Ref Magnitudes | 0.3235 | 0.3213 | 0.3209 | 0.3234 | 0.3148 | 0.3231 | 0.010307 | 0.3235 | 0.3148 | | |
| subject | 2 Ind. Judgements | 75 | 75 | 200 | 250 | 300 | 350 | 0.55078 | 350 | 75 | 1.4917 | 1024.699 |
| | Test Magnitudes | 0.1689 | 0.2229 | 0.2759 | 0.3414 | 0.4317 | 0.5443 | 0.42043 | 0.5443 | 0.1689 | | |
| | Ref Magnitudes | 0.3196 | 0.32 | 0.3196 | 0.32 | 0.3194 | 0.3207 | 0.001459 | 0.3207 | 0.3194 | | |
| subject | 3 Ind. Judgements | 40 | 110 | 150 | 110 | 150 | 170 | 0.38346 | 170 | 40 | 1.0685 | 361.7308 |
| | Test Magnitudes | 0.1847 | 0.2398 | 0.3111 | 0.3725 | 0.4496 | 0.5645 | 0.39447 | 0.5645 | 0.1847 | | |
| | Ref Magnitudes | 0.3273 | 0.3235 | 0.3231 | 0.3267 | 0.3245 | 0.3263 | 0.00544 | 0.3273 | 0.3231 | | |
| subject | 4 Ind. Judgements | 135 | 200 | 200 | 300 | 400 | 300 | 0.37296 | 400 | 135 | 0.8409 | 625.7628 |
| | Test Magnitudes | 0.1846 | 0.2338 | 0.2831 | 0.3677 | 0.435 | 0.56 | 0.40435 | 0.56 | 0.1846 | | |
| | Ref Magnitudes | 0.3185 | 0.3172 | 0.3181 | 0.319 | 0.3166 | 0.3181 | 0.002752 | 0.319 | 0.3166 | | |
| subject | 5 Ind. Judgements | 90 | 130 | 150 | 170 | 140 | 180 | 0.23035 | 180 | 90 | 0.4937 | 239.6044 |
| | Test Magnitudes | 0.1821 | 0.2261 | 0.2927 | 0.3532 | 0.4482 | 0.5704 | 0.41935 | 0.5704 | 0.1821 | | |
| | Ref Magnitudes | 0.3199 | 0.3195 | 0.3195 | 0.321 | 0.3139 | 0.3191 | 0.007826 | 0.321 | 0.3139 | | |
| subject | 6 Ind. Judgements | 120 | 80 | 110 | 130 | 120 | 160 | 0.21731 | 160 | 80 | 0.34886 | 175.0917 |
| | Test Magnitudes | 0.1768 | 0.2237 | 0.2915 | 0.3647 | 0.4453 | 0.5627 | 0.41851 | 0.5627 | 0.1768 | | |
| | Ref Magnitudes | 0.33 | 0.3325 | 0.3328 | 0.3306 | 0.3332 | 0.3331 | 0.00415 | 0.3332 | 0.33 | | |
| subject | 7 Ind. Judgements | 150 | 150 | 300 | 270 | 340 | 400 | 0.37816 | 400 | 150 | 0.95308 | 723.162 |
| | Test Magnitudes | 0.1872 | 0.2442 | 0.302 | 0.3573 | 0.4468 | 0.575 | 0.40172 | 0.575 | 0.1872 | | |
| | Ref Magnitudes | 0.331 | 0.3269 | 0.3305 | 0.3315 | 0.3303 | 0.3268 | 0.006357 | 0.3315 | 0.3268 | | |
| subject | 8 Ind. Judgements | 50 | 90 | 160 | 120 | 180 | 200 | 0.42866 | 200 | 50 | 1.0384 | 408.4899 |
| | Test Magnitudes | 0.1698 | 0.2199 | 0.2692 | 0.3609 | 0.4308 | 0.5614 | 0.43415 | 0.5614 | 0.1698 | | |
| | Ref Magnitudes | 0.3525 | 0.3529 | 0.3536 | 0.3532 | 0.3534 | 0.3549 | 0.002329 | 0.3549 | 0.3525 | | |
| subject | 9 Ind. Judgements | 130 | 120 | 130 | 110 | 120 | 150 | 0.10786 | 150 | 110 | 0.068038 | 135.5324 |
| | Test Magnitudes | 0.1992 | 0.2382 | 0.3067 | 0.3989 | 0.4768 | 0.6123 | 0.41899 | 0.6123 | 0.1992 | | |
| | Ref Magnitudes | 0.3422 | 0.3464 | 0.3464 | 0.3471 | 0.3468 | 0.347 | 0.005424 | 0.3471 | 0.3422 | | |
| subject | 10 Ind. Judgements | 160 | 150 | 180 | 150 | 170 | 230 | 0.17372 | 230 | 150 | 0.24312 | 226.2897 |
| | Test Magnitudes | 0.1721 | 0.2238 | 0.2986 | 0.3626 | 0.4456 | 0.5649 | 0.42157 | 0.5649 | 0.1721 | | |
| | Ref Magnitudes | 0.3298 | 0.3262 | 0.3207 | 0.3279 | 0.3287 | 0.3294 | 0.010371 | 0.3298 | 0.3207 | | |
| subject | 11 Ind. Judgements | 150 | 150 | 150 | 150 | 250 | 300 | 0.34674 | 300 | 150 | 0.62864 | 376.0016 |
| | Test Magnitudes | 0.1828 | 0.2223 | 0.2945 | 0.3549 | 0.4337 | 0.5719 | 0.41872 | 0.5719 | 0.1828 | | |
| | Ref Magnitudes | 0.3298 | 0.3304 | 0.3306 | 0.3302 | 0.3298 | 0.3351 | 0.006169 | 0.3351 | 0.3298 | | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.64557 | 376.0016 |

Condition Q

| Frequency 0.2 Hz | | | | | | | | | | | | | |
|-------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|----------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 20 | 60 | 80 | 50 | 30 | 40 | 0.46291 | 80 | 20 | 0.11973 | 47.9156 | |
| | Test Magnitudes | 0.201 | 0.2521 | 0.3184 | 0.3999 | 0.4966 | 0.6327 | 0.42047 | 0.6327 | 0.201 | | | |
| | Ref Magnitudes | 0.319 | 0.3171 | 0.3171 | 0.3167 | 0.3171 | 0.3194 | 0.003631 | 0.3194 | 0.3167 | | | |
| subject | 2 Ind. Judgements | 5 | 5 | 30 | 10 | 50 | 110 | 1.1641 | 110 | 5 | 2.6574 | 283.7978 | |
| | Test Magnitudes | 0.2016 | 0.255 | 0.3212 | 0.4018 | 0.5036 | 0.6358 | 0.42014 | 0.6358 | 0.2016 | | | |
| | Ref Magnitudes | 0.3213 | 0.3224 | 0.3183 | 0.3229 | 0.3246 | 0.3211 | 0.006577 | 0.3246 | 0.3183 | | | |
| subject | 3 Ind. Judgements | 5 | 20 | 70 | 80 | 150 | 180 | 0.81726 | 180 | 5 | 2.9368 | 1037.741 | |
| | Test Magnitudes | 0.1968 | 0.2499 | 0.3167 | 0.3955 | 0.4952 | 0.629 | 0.42376 | 0.629 | 0.1968 | | | |
| | Ref Magnitudes | 0.3146 | 0.3192 | 0.3182 | 0.3142 | 0.3159 | 0.3137 | 0.007158 | 0.3192 | 0.3137 | | | |
| subject | 4 Ind. Judgements | 30 | 30 | 40 | 60 | 100 | 140 | 0.66858 | 140 | 30 | 1.4447 | 245.2114 | |
| | Test Magnitudes | 0.2017 | 0.2523 | 0.3193 | 0.4088 | 0.5009 | 0.6433 | 0.42568 | 0.6433 | 0.2017 | | | |
| | Ref Magnitudes | 0.3131 | 0.3117 | 0.3116 | 0.3126 | 0.3116 | 0.3156 | 0.004954 | 0.3156 | 0.3116 | | | |
| subject | 5 Ind. Judgements | 33 | 50 | 180 | 150 | 150 | 250 | 0.60253 | 250 | 33 | 1.6695 | 603.6046 | |
| | Test Magnitudes | 0.2015 | 0.2549 | 0.3229 | 0.4038 | 0.5003 | 0.6346 | 0.418 | 0.6346 | 0.2015 | | | |
| | Ref Magnitudes | 0.32 | 0.3205 | 0.3215 | 0.3134 | 0.3202 | 0.3208 | 0.009349 | 0.3215 | 0.3134 | | | |
| subject | 6 Ind. Judgements | 20 | 90 | 60 | 130 | 130 | 160 | 0.5281 | 160 | 20 | 1.5327 | 393.3783 | |
| | Test Magnitudes | 0.2025 | 0.2543 | 0.3181 | 0.4019 | 0.5005 | 0.6382 | 0.42197 | 0.6382 | 0.2025 | | | |
| | Ref Magnitudes | 0.3166 | 0.319 | 0.3171 | 0.3185 | 0.3162 | 0.3226 | 0.007401 | 0.3226 | 0.3162 | | | |
| subject | 7 Ind. Judgements | 15 | 30 | 35 | 35 | 30 | 110 | 0.79705 | 110 | 15 | 1.2241 | 124.0304 | |
| | Test Magnitudes | 0.203 | 0.2483 | 0.311 | 0.4022 | 0.5027 | 0.634 | 0.42592 | 0.634 | 0.203 | | | |
| | Ref Magnitudes | 0.3147 | 0.3124 | 0.3141 | 0.3148 | 0.3143 | 0.3111 | 0.004746 | 0.3146 | 0.3111 | | | |
| subject | 8 Ind. Judgements | 60 | 110 | 115 | 80 | 80 | 140 | 0.30034 | 140 | 60 | 0.357 | 135.9068 | |
| | Test Magnitudes | 0.198 | 0.2489 | 0.3144 | 0.398 | 0.5007 | 0.6338 | 0.42804 | 0.6338 | 0.198 | | | |
| | Ref Magnitudes | 0.3174 | 0.3164 | 0.3176 | 0.3171 | 0.317 | 0.3171 | 0.001293 | 0.3176 | 0.3164 | | | |
| subject | 9 Ind. Judgements | 80 | 40 | 90 | 110 | 130 | 110 | 0.33655 | 130 | 40 | 0.64907 | 172.0482 | |
| | Test Magnitudes | 0.197 | 0.2502 | 0.3146 | 0.3972 | 0.5009 | 0.6347 | 0.42865 | 0.6347 | 0.197 | | | |
| | Ref Magnitudes | 0.3147 | 0.3161 | 0.3145 | 0.3155 | 0.3147 | 0.3155 | 0.001993 | 0.3161 | 0.3145 | | | |
| subject | 10 Ind. Judgements | 10 | 10 | 30 | 50 | 60 | 80 | 0.70711 | 80 | 10 | 1.9903 | 235.715 | |
| | Test Magnitudes | 0.1968 | 0.2506 | 0.3158 | 0.4003 | 0.5017 | 0.6355 | 0.4283 | 0.6355 | 0.1968 | | | |
| | Ref Magnitudes | 0.3121 | 0.3176 | 0.3174 | 0.316 | 0.3162 | 0.3176 | 0.006684 | 0.3176 | 0.3121 | | | |
| subject | 11 Ind. Judgements | 15 | 5 | 15 | 15 | 10 | 20 | 0.3873 | 20 | 5 | 0.43685 | 19.2931 | |
| | Test Magnitudes | 0.1971 | 0.2483 | 0.3166 | 0.3982 | 0.4994 | 0.6319 | 0.42678 | 0.6319 | 0.1971 | | | |
| | Ref Magnitudes | 0.3145 | 0.3147 | 0.317 | 0.3148 | 0.3157 | 0.3154 | 0.002939 | 0.317 | 0.3145 | | | |
| subject | 12 Ind. Judgements | 50 | 30 | 105 | 125 | 135 | 130 | 0.46831 | 135 | 30 | 1.1669 | 282.0933 | |
| | Test Magnitudes | 0.1977 | 0.2473 | 0.3155 | 0.3982 | 0.5004 | 0.6323 | 0.42781 | 0.6323 | 0.1977 | | | |
| | Ref Magnitudes | 0.3157 | 0.3149 | 0.3169 | 0.3159 | 0.3155 | 0.3145 | 0.002649 | 0.3169 | 0.3145 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 1.3344 | 240.4632 |
| Frequency 0.25 Hz | | | | | | | | | | | | | |
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 30 | 25 | 30 | 40 | 70 | 130 | 0.74858 | 130 | 25 | 1.3608 | 184.2809 | |
| | Test Magnitudes | 0.2022 | 0.2522 | 0.3168 | 0.3959 | 0.4952 | 0.6243 | 0.41512 | 0.6243 | 0.2022 | | | |
| | Ref Magnitudes | 0.3219 | 0.3202 | 0.3236 | 0.3187 | 0.3201 | 0.3174 | 0.006906 | 0.3236 | 0.3174 | | | |
| subject | 2 Ind. Judgements | 5 | 25 | 25 | 50 | 75 | 150 | 0.95346 | 150 | 5 | 2.6155 | 513.1062 | |
| | Test Magnitudes | 0.2027 | 0.2511 | 0.319 | 0.4026 | 0.5025 | 0.6323 | 0.42006 | 0.6323 | 0.2027 | | | |
| | Ref Magnitudes | 0.3226 | 0.3211 | 0.3204 | 0.3231 | 0.3247 | 0.32 | 0.005585 | 0.3247 | 0.32 | | | |
| subject | 3 Ind. Judgements | 10 | 90 | 40 | 50 | 140 | 80 | 0.66367 | 140 | 10 | 1.4866 | 247.156 | |
| | Test Magnitudes | 0.1982 | 0.2488 | 0.3152 | 0.3922 | 0.493 | 0.6244 | 0.42109 | 0.6244 | 0.1982 | | | |
| | Ref Magnitudes | 0.3202 | 0.3147 | 0.3188 | 0.3165 | 0.3132 | 0.3097 | 0.012156 | 0.3202 | 0.3097 | | | |
| subject | 4 Ind. Judgements | 30 | 30 | 70 | 50 | 75 | 120 | 0.54435 | 120 | 30 | 1.1827 | 188.4016 | |
| | Test Magnitudes | 0.2012 | 0.2542 | 0.3156 | 0.3981 | 0.4923 | 0.6251 | 0.41482 | 0.6251 | 0.2012 | | | |
| | Ref Magnitudes | 0.3155 | 0.3155 | 0.3054 | 0.3135 | 0.3128 | 0.3155 | 0.012519 | 0.3155 | 0.3054 | | | |
| subject | 5 Ind. Judgements | 75 | 175 | 200 | 200 | 80 | 200 | 0.39244 | 200 | 75 | 0.3306 | 200.5604 | |
| | Test Magnitudes | 0.2033 | 0.255 | 0.317 | 0.3998 | 0.4958 | 0.6273 | 0.41398 | 0.6273 | 0.2033 | | | |
| | Ref Magnitudes | 0.3209 | 0.3215 | 0.3196 | 0.3203 | 0.3192 | 0.3213 | 0.002905 | 0.3215 | 0.3192 | | | |
| subject | 6 Ind. Judgements | 20 | 30 | 30 | 170 | 160 | 200 | 0.81921 | 200 | 20 | 2.2898 | 724.2657 | |
| | Test Magnitudes | 0.2013 | 0.2521 | 0.3168 | 0.4004 | 0.4982 | 0.6309 | 0.41998 | 0.6309 | 0.2013 | | | |
| | Ref Magnitudes | 0.32 | 0.3222 | 0.3173 | 0.3195 | 0.3188 | 0.3192 | 0.005039 | 0.3222 | 0.3173 | | | |
| subject | 7 Ind. Judgements | 40 | 70 | 30 | 85 | 90 | 115 | 0.44709 | 115 | 30 | 0.85981 | 158.3803 | |
| | Test Magnitudes | 0.1934 | 0.2509 | 0.3143 | 0.4006 | 0.5048 | 0.6331 | 0.43048 | 0.6331 | 0.1934 | | | |
| | Ref Magnitudes | 0.3122 | 0.3131 | 0.3124 | 0.3117 | 0.3114 | 0.3123 | 0.001894 | 0.3131 | 0.3114 | | | |
| subject | 8 Ind. Judgements | 75 | 50 | 110 | 110 | 150 | 90 | 0.37501 | 150 | 50 | 0.49046 | 159.8509 | |
| | Test Magnitudes | 0.1971 | 0.2438 | 0.3156 | 0.401 | 0.5007 | 0.6366 | 0.43274 | 0.6366 | 0.1971 | | | |
| | Ref Magnitudes | 0.3169 | 0.3168 | 0.3166 | 0.3173 | 0.317 | 0.3175 | 0.001045 | 0.3175 | 0.3166 | | | |
| subject | 9 Ind. Judgements | 20 | 50 | 120 | 80 | 80 | 110 | 0.48571 | 120 | 20 | 1.1618 | 221.878 | |
| | Test Magnitudes | 0.1975 | 0.2441 | 0.3173 | 0.4 | 0.5001 | 0.6352 | 0.43073 | 0.6352 | 0.1975 | | | |
| | Ref Magnitudes | 0.3158 | 0.316 | 0.3187 | 0.3145 | 0.3155 | 0.3146 | 0.004834 | 0.3187 | 0.3145 | | | |
| subject | 10 Ind. Judgements | 20 | 35 | 40 | 110 | 40 | 120 | 0.70209 | 120 | 20 | 1.2465 | 180.0502 | |
| | Test Magnitudes | 0.1985 | 0.2444 | 0.3163 | 0.4016 | 0.5085 | 0.6402 | 0.43461 | 0.6402 | 0.1985 | | | |
| | Ref Magnitudes | 0.3165 | 0.3173 | 0.3165 | 0.3175 | 0.3166 | 0.3174 | 0.001515 | 0.3175 | 0.3165 | | | |
| subject | 11 Ind. Judgements | 15 | 10 | 5 | 20 | 25 | 40 | 0.64781 | 40 | 5 | 1.1031 | 49.7446 | |
| | Test Magnitudes | 0.1973 | 0.2424 | 0.3135 | 0.3999 | 0.4989 | 0.6316 | 0.43104 | 0.6316 | 0.1973 | | | |
| | Ref Magnitudes | 0.3154 | 0.315 | 0.3152 | 0.3152 | 0.3148 | 0.3124 | 0.003588 | 0.3154 | 0.3124 | | | |
| subject | 12 Ind. Judgements | 25 | 105 | 90 | 75 | 180 | 135 | 0.52017 | 180 | 25 | 1.1618 | 292.5246 | |
| | Test Magnitudes | 0.1962 | 0.2412 | 0.314 | 0.3996 | 0.4996 | 0.6386 | 0.43693 | 0.6386 | 0.1962 | | | |
| | Ref Magnitudes | 0.3138 | 0.3128 | 0.3146 | 0.3147 | 0.3154 | 0.3171 | 0.004642 | 0.3171 | 0.3128 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 1.1722 | 194.481 |

| Frequency 0.315 Hz | | | | | | | | | | | | | |
|--------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|-----------|----------|----------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 40 | 30 | 40 | 80 | 70 | 130 | 0.57358 | 130 | 30 | 1.1452 | 189.1139 | |
| | Test Magnitudes | 0.1988 | 0.2502 | 0.3132 | 0.3962 | 0.4947 | 0.6214 | 0.41848 | 0.6214 | 0.1988 | | | |
| | Ref Magnitudes | 0.3176 | 0.3202 | 0.3164 | 0.3196 | 0.3171 | 0.3173 | 0.004751 | 0.3202 | 0.3164 | | | |
| subject | 2 Ind. Judgements | 10 | 50 | 5 | 25 | 25 | 125 | 1.1124 | 125 | 5 | 1.5189 | 115.4502 | |
| | Test Magnitudes | 0.202 | 0.2518 | 0.317 | 0.4016 | 0.501 | 0.6314 | 0.42024 | 0.6314 | 0.202 | | | |
| | Ref Magnitudes | 0.3221 | 0.3204 | 0.3232 | 0.3229 | 0.324 | 0.3238 | 0.004118 | 0.324 | 0.3204 | | | |
| subject | 3 Ind. Judgements | 10 | 20 | 20 | 110 | 70 | 150 | 0.90244 | 150 | 10 | 2.3646 | 486.9919 | |
| | Test Magnitudes | 0.1965 | 0.2497 | 0.3128 | 0.3926 | 0.4955 | 0.6205 | 0.42083 | 0.6205 | 0.1965 | | | |
| | Ref Magnitudes | 0.3155 | 0.3184 | 0.3197 | 0.3143 | 0.3156 | 0.3141 | 0.007201 | 0.3197 | 0.3141 | | | |
| subject | 4 Ind. Judgements | 60 | 60 | 70 | 70 | 50 | 130 | 0.39207 | 130 | 50 | 0.42137 | 108.4659 | |
| | Test Magnitudes | 0.1981 | 0.2504 | 0.312 | 0.3935 | 0.4893 | 0.6181 | 0.4166 | 0.6181 | 0.1981 | | | |
| | Ref Magnitudes | 0.3131 | 0.315 | 0.3138 | 0.3113 | 0.3149 | 0.313 | 0.004408 | 0.315 | 0.3113 | | | |
| subject | 5 Ind. Judgements | 140 | 70 | 133 | 133 | 200 | 200 | 0.33529 | 200 | 70 | 0.61835 | 262.3091 | |
| | Test Magnitudes | 0.2007 | 0.2511 | 0.3161 | 0.399 | 0.4951 | 0.6285 | 0.41943 | 0.6285 | 0.2007 | | | |
| | Ref Magnitudes | 0.3205 | 0.3148 | 0.32 | 0.3211 | 0.3172 | 0.32 | 0.007618 | 0.3211 | 0.3148 | | | |
| subject | 6 Ind. Judgements | 60 | 80 | 20 | 70 | 150 | 120 | 0.55078 | 150 | 20 | 0.83907 | 167.9034 | |
| | Test Magnitudes | 0.2015 | 0.2515 | 0.3133 | 0.3983 | 0.498 | 0.6297 | 0.42109 | 0.6297 | 0.2015 | | | |
| | Ref Magnitudes | 0.3223 | 0.3209 | 0.3145 | 0.3201 | 0.3205 | 0.318 | 0.008669 | 0.3223 | 0.3145 | | | |
| subject | 7 Ind. Judgements | 20 | 25 | 25 | 115 | 95 | 145 | 0.76862 | 145 | 20 | 1.935 | 385.5138 | |
| | Test Magnitudes | 0.2024 | 0.249 | 0.3161 | 0.3997 | 0.502 | 0.628 | 0.42036 | 0.628 | 0.2024 | | | |
| | Ref Magnitudes | 0.314 | 0.3143 | 0.3138 | 0.3108 | 0.3135 | 0.3125 | 0.004172 | 0.3143 | 0.3108 | | | |
| subject | 8 Ind. Judgements | 60 | 115 | 130 | 110 | 130 | 155 | 0.2733 | 155 | 60 | 0.6045 | 209.6381 | |
| | Test Magnitudes | 0.2002 | 0.2498 | 0.3144 | 0.3998 | 0.5012 | 0.6376 | 0.42799 | 0.6376 | 0.2002 | | | |
| | Ref Magnitudes | 0.3171 | 0.3173 | 0.3177 | 0.3175 | 0.3172 | 0.3167 | 0.001139 | 0.3177 | 0.3167 | | | |
| subject | 9 Ind. Judgements | 110 | 120 | 125 | 90 | 130 | 110 | 0.12516 | 130 | 90 | -0.014315 | 111.7006 | |
| | Test Magnitudes | 0.2006 | 0.2476 | 0.312 | 0.3994 | 0.5009 | 0.6354 | 0.42865 | 0.6354 | 0.2006 | | | |
| | Ref Magnitudes | 0.3188 | 0.3125 | 0.3147 | 0.3159 | 0.3146 | 0.3157 | 0.006565 | 0.3188 | 0.3125 | | | |
| subject | 10 Ind. Judgements | 40 | 15 | 40 | 90 | 50 | 140 | 0.72222 | 140 | 15 | 1.3144 | 193.1113 | |
| | Test Magnitudes | 0.1959 | 0.2509 | 0.3146 | 0.4012 | 0.5073 | 0.6364 | 0.42772 | 0.6364 | 0.1959 | | | |
| | Ref Magnitudes | 0.3157 | 0.3177 | 0.317 | 0.3162 | 0.3171 | 0.3161 | 0.002377 | 0.3177 | 0.3157 | | | |
| subject | 11 Ind. Judgements | 20 | 30 | 20 | 50 | 33 | 80 | 0.59181 | 80 | 20 | 1.0023 | 96.8919 | |
| | Test Magnitudes | 0.1988 | 0.2482 | 0.3129 | 0.3964 | 0.4999 | 0.6346 | 0.42902 | 0.6346 | 0.1988 | | | |
| | Ref Magnitudes | 0.315 | 0.315 | 0.3147 | 0.3123 | 0.3157 | 0.3148 | 0.003726 | 0.3157 | 0.3123 | | | |
| subject | 12 Ind. Judgements | 30 | 50 | 75 | 110 | 100 | 180 | 0.58298 | 180 | 30 | 1.4084 | 335.7665 | |
| | Test Magnitudes | 0.2 | 0.2494 | 0.313 | 0.399 | 0.4994 | 0.6353 | 0.4273 | 0.6353 | 0.2 | | | |
| | Ref Magnitudes | 0.3155 | 0.3161 | 0.315 | 0.3152 | 0.3153 | 0.3154 | 0.001193 | 0.3161 | 0.315 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 1.0737 | 191.1126 |

| Frequency 0.4 Hz | | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|----------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 200 | 60 | 140 | 220 | 120 | 300 | 0.48772 | 300 | 60 | 1.1645 | 426.756 | |
| | Test Magnitudes | 0.5937 | 0.24 | 0.3056 | 0.3891 | 0.4975 | 0.6203 | 0.35139 | 0.6203 | 0.24 | | | |
| | Ref Magnitudes | 0.3171 | 0.3135 | 0.3174 | 0.3204 | 0.3194 | 0.3152 | 0.008077 | 0.3204 | 0.3135 | | | |
| subject | 2 Ind. Judgements | 75 | 50 | 50 | 90 | 150 | 110 | 0.43929 | 150 | 50 | 0.84177 | 167.4544 | |
| | Test Magnitudes | 0.6013 | 0.2443 | 0.3066 | 0.3924 | 0.497 | 0.6321 | 0.35388 | 0.6321 | 0.2443 | | | |
| | Ref Magnitudes | 0.3214 | 0.3201 | 0.3191 | 0.3204 | 0.3209 | 0.3223 | 0.003444 | 0.3223 | 0.3191 | | | |
| subject | 3 Ind. Judgements | 110 | 60 | 70 | 120 | 150 | 140 | 0.33748 | 150 | 60 | 0.85939 | 219.2618 | |
| | Test Magnitudes | 0.5878 | 0.2395 | 0.3046 | 0.3852 | 0.4856 | 0.6196 | 0.351 | 0.6196 | 0.2395 | | | |
| | Ref Magnitudes | 0.3098 | 0.3161 | 0.315 | 0.3148 | 0.3117 | 0.3097 | 0.008988 | 0.3161 | 0.3097 | | | |
| subject | 4 Ind. Judgements | 120 | 40 | 110 | 120 | 120 | 130 | 0.31187 | 130 | 40 | 0.92262 | 225.2176 | |
| | Test Magnitudes | 0.5881 | 0.2403 | 0.3036 | 0.3872 | 0.4862 | 0.6226 | 0.35172 | 0.6226 | 0.2403 | | | |
| | Ref Magnitudes | 0.3144 | 0.3145 | 0.3147 | 0.3157 | 0.3137 | 0.3148 | 0.002066 | 0.3157 | 0.3137 | | | |
| subject | 5 Ind. Judgements | 275 | 50 | 150 | 185 | 110 | 240 | 0.4937 | 275 | 50 | 1.3129 | 461.1352 | |
| | Test Magnitudes | 0.5966 | 0.2417 | 0.3078 | 0.3905 | 0.4927 | 0.6295 | 0.35308 | 0.6295 | 0.2417 | | | |
| | Ref Magnitudes | 0.3152 | 0.3199 | 0.3211 | 0.319 | 0.3188 | 0.3197 | 0.006298 | 0.3211 | 0.3152 | | | |
| subject | 6 Ind. Judgements | 200 | 90 | 110 | 90 | 150 | 160 | 0.33091 | 200 | 90 | 0.7554 | 245.2755 | |
| | Test Magnitudes | 0.5948 | 0.2425 | 0.3113 | 0.3914 | 0.4974 | 0.6294 | 0.34992 | 0.6294 | 0.2425 | | | |
| | Ref Magnitudes | 0.3183 | 0.3197 | 0.322 | 0.3144 | 0.3205 | 0.3213 | 0.008618 | 0.322 | 0.3144 | | | |
| subject | 7 Ind. Judgements | 30 | 85 | 90 | 115 | 115 | 140 | 0.39517 | 140 | 30 | 1.0756 | 265.5988 | |
| | Test Magnitudes | 0.1967 | 0.246 | 0.3176 | 0.3966 | 0.5029 | 0.6332 | 0.42982 | 0.6332 | 0.1967 | | | |
| | Ref Magnitudes | 0.3131 | 0.3118 | 0.3123 | 0.3125 | 0.3143 | 0.3154 | 0.004357 | 0.3154 | 0.3118 | | | |
| subject | 8 Ind. Judgements | 90 | 90 | 90 | 130 | 110 | 150 | 0.22998 | 150 | 90 | 0.4369 | 169.2722 | |
| | Test Magnitudes | 0.1992 | 0.2509 | 0.3171 | 0.401 | 0.4973 | 0.6389 | 0.42695 | 0.6389 | 0.1992 | | | |
| | Ref Magnitudes | 0.3166 | 0.3179 | 0.3175 | 0.3165 | 0.313 | 0.3173 | 0.005627 | 0.3179 | 0.313 | | | |
| subject | 9 Ind. Judgements | 50 | 110 | 120 | 110 | 130 | 140 | 0.28748 | 140 | 50 | 0.67046 | 209.9639 | |
| | Test Magnitudes | 0.1996 | 0.2477 | 0.3128 | 0.4005 | 0.4997 | 0.6411 | 0.4322 | 0.6411 | 0.1996 | | | |
| | Ref Magnitudes | 0.3158 | 0.3139 | 0.3136 | 0.3167 | 0.3148 | 0.3163 | 0.00407 | 0.3167 | 0.3136 | | | |
| subject | 10 Ind. Judgements | 25 | 30 | 60 | 130 | 120 | 130 | 0.60576 | 130 | 25 | 1.6229 | 358.5777 | |
| | Test Magnitudes | 0.2004 | 0.25 | 0.3176 | 0.3995 | 0.5016 | 0.6388 | 0.42729 | 0.6388 | 0.2004 | | | |
| | Ref Magnitudes | 0.3168 | 0.3157 | 0.3177 | 0.3141 | 0.3169 | 0.3166 | 0.003964 | 0.3177 | 0.3141 | | | |
| subject | 11 Ind. Judgements | 10 | 33 | 80 | 65 | 75 | 50 | 0.51514 | 80 | 10 | 1.2597 | 159.3225 | |
| | Test Magnitudes | 0.1994 | 0.2489 | 0.3148 | 0.3993 | 0.5001 | 0.6351 | 0.42731 | 0.6351 | 0.1994 | | | |
| | Ref Magnitudes | 0.3149 | 0.3155 | 0.3152 | 0.3146 | 0.3152 | 0.3152 | 0.000983 | 0.3155 | 0.3146 | | | |
| subject | 12 Ind. Judgements | 95 | 70 | 115 | 140 | 150 | 180 | 0.31799 | 180 | 70 | 0.69534 | 244.9021 | |
| | Test Magnitudes | 0.1987 | 0.2512 | 0.3145 | 0.401 | 0.5058 | 0.636 | 0.42799 | 0.636 | 0.1987 | | | |
| | Ref Magnitudes | 0.3143 | 0.3174 | 0.3143 | 0.3159 | 0.3175 | 0.3162 | 0.004479 | 0.3175 | 0.3143 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.891 | 235.0599 |

| Frequency 0.5 Hz | | | | | | | | | | | | |
|-------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|------------------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 70 | 90 | 130 | 100 | 130 | 230 | 0.45184 | 230 | 70 | 0.85858 | 337.8668 |
| | Test Magnitudes | 0.1683 | 0.2075 | 0.2473 | 0.3165 | 0.4073 | 0.5145 | 0.42236 | 0.5145 | 0.1683 | | |
| | Ref Magnitudes | 0.3152 | 0.323 | 0.3151 | 0.3178 | 0.3173 | 0.319 | 0.009195 | 0.323 | 0.3151 | | |
| subject | 2 Ind. Judgements | 25 | 25 | 25 | 50 | 300 | 250 | 1.1309 | 300 | 25 | 2.5674 | 1462.603 |
| | Test Magnitudes | 0.1719 | 0.21 | 0.2523 | 0.3211 | 0.4113 | 0.5212 | 0.41988 | 0.5212 | 0.1719 | | |
| | Ref Magnitudes | 0.3209 | 0.3221 | 0.319 | 0.3212 | 0.3238 | 0.3232 | 0.005384 | 0.3238 | 0.319 | | |
| subject | 3 Ind. Judgements | 40 | 30 | 110 | 85 | 200 | 130 | 0.6333 | 200 | 30 | 1.3302 | 438.5071 |
| | Test Magnitudes | 0.1575 | 0.2063 | 0.237 | 0.3171 | 0.4042 | 0.5102 | 0.43495 | 0.5102 | 0.1575 | | |
| | Ref Magnitudes | 0.3015 | 0.3199 | 0.3034 | 0.3191 | 0.3156 | 0.3174 | 0.026172 | 0.3199 | 0.3015 | | |
| subject | 4 Ind. Judgements | 60 | 75 | 80 | 100 | 110 | 90 | 0.20976 | 110 | 60 | 0.42046 | 142.7951 |
| | Test Magnitudes | 0.1661 | 0.2014 | 0.2461 | 0.3135 | 0.4055 | 0.5091 | 0.42553 | 0.5091 | 0.1661 | | |
| | Ref Magnitudes | 0.3122 | 0.3116 | 0.313 | 0.3146 | 0.3164 | 0.3137 | 0.005554 | 0.3164 | 0.3116 | | |
| subject | 5 Ind. Judgements | 230 | 50 | 150 | 110 | 133 | 175 | 0.42996 | 230 | 50 | 0.18647 | 161.1676 |
| | Test Magnitudes | 0.1719 | 0.2085 | 0.2534 | 0.3201 | 0.4105 | 0.5165 | 0.41677 | 0.5165 | 0.1719 | | |
| | Ref Magnitudes | 0.3206 | 0.3207 | 0.3219 | 0.3195 | 0.3198 | 0.3192 | 0.003094 | 0.3219 | 0.3192 | | |
| subject | 6 Ind. Judgements | 60 | 60 | 80 | 140 | 150 | 130 | 0.39979 | 150 | 60 | 0.91625 | 298.9645 |
| | Test Magnitudes | 0.1717 | 0.2062 | 0.2515 | 0.3167 | 0.4069 | 0.5149 | 0.41815 | 0.5149 | 0.1717 | | |
| | Ref Magnitudes | 0.3217 | 0.3158 | 0.3228 | 0.3176 | 0.32 | 0.3181 | 0.008294 | 0.3228 | 0.3158 | | |
| subject | 7 Ind. Judgements | 105 | 105 | 110 | 110 | 175 | 140 | 0.22696 | 175 | 105 | 0.36046 | 193.303 |
| | Test Magnitudes | 0.1529 | 0.1976 | 0.2481 | 0.3134 | 0.3938 | 0.4967 | 0.42754 | 0.4967 | 0.1529 | | |
| | Ref Magnitudes | 0.312 | 0.3124 | 0.3137 | 0.3162 | 0.3106 | 0.3116 | 0.006304 | 0.3162 | 0.3106 | | |
| subject | 8 Ind. Judgements | 125 | 90 | 105 | 145 | 150 | 150 | 1.9959 | 150 | 90 | 0.33959 | 192.1886 |
| | Test Magnitudes | 0.1578 | 0.201 | 0.2526 | 0.3177 | 0.4043 | 0.501 | 0.4231 | 0.501 | 0.1578 | | |
| | Ref Magnitudes | 0.3162 | 0.3176 | 0.3175 | 0.3173 | 0.317 | 0.316 | 0.002146 | 0.3176 | 0.316 | | |
| subject | 9 Ind. Judgements | 70 | 70 | 110 | 80 | 120 | 120 | 0.25568 | 120 | 70 | 0.48717 | 171.2937 |
| | Test Magnitudes | 0.1577 | 0.1964 | 0.2495 | 0.3175 | 0.4023 | 0.5036 | 0.42979 | 0.5036 | 0.1577 | | |
| | Ref Magnitudes | 0.3166 | 0.3112 | 0.3133 | 0.3162 | 0.3144 | 0.3179 | 0.007787 | 0.3179 | 0.3112 | | |
| subject | 10 Ind. Judgements | 20 | 30 | 90 | 105 | 160 | 170 | 0.65699 | 170 | 20 | 1.9637 | 876.4296 |
| | Test Magnitudes | 0.1584 | 0.2009 | 0.2524 | 0.3128 | 0.4018 | 0.5036 | 0.42491 | 0.5036 | 0.1584 | | |
| | Ref Magnitudes | 0.3172 | 0.317 | 0.3177 | 0.3129 | 0.3154 | 0.3164 | 0.005552 | 0.3177 | 0.3129 | | |
| subject | 11 Ind. Judgements | 20 | 65 | 80 | 100 | 85 | 110 | 0.41589 | 110 | 20 | 1.1901 | 305.8206 |
| | Test Magnitudes | 0.158 | 0.2011 | 0.2513 | 0.3154 | 0.3993 | 0.5007 | 0.42234 | 0.5007 | 0.158 | | |
| | Ref Magnitudes | 0.315 | 0.3171 | 0.3163 | 0.3154 | 0.3129 | 0.3149 | 0.004542 | 0.3171 | 0.3129 | | |
| subject | 12 Ind. Judgements | 25 | 20 | 70 | 90 | 160 | 145 | 0.69202 | 160 | 20 | 1.8983 | 711.4086 |
| | Test Magnitudes | 0.159 | 0.2005 | 0.2514 | 0.3162 | 0.4026 | 0.5005 | 0.42233 | 0.5005 | 0.159 | | |
| | Ref Magnitudes | 0.3166 | 0.3154 | 0.3158 | 0.3156 | 0.316 | 0.3154 | 0.001444 | 0.3166 | 0.3154 | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.88742 302.3926 |
| Frequency 0.63 Hz | | | | | | | | | | | | |
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 100 | 180 | 150 | 240 | 100 | 400 | 0.58177 | 400 | 100 | 0.67933 | 466.8501 |
| | Test Magnitudes | 0.1278 | 0.162 | 0.2048 | 0.2545 | 0.3286 | 0.4177 | 0.43599 | 0.4177 | 0.1278 | | |
| | Ref Magnitudes | 0.3149 | 0.3153 | 0.3167 | 0.315 | 0.3179 | 0.3186 | 0.005017 | 0.3186 | 0.3149 | | |
| subject | 2 Ind. Judgements | 25 | 75 | 75 | 50 | 175 | 200 | 0.70711 | 200 | 25 | 1.5168 | 723.3049 |
| | Test Magnitudes | 0.1301 | 0.1622 | 0.2071 | 0.259 | 0.3295 | 0.4244 | 0.4372 | 0.4244 | 0.1301 | | |
| | Ref Magnitudes | 0.3234 | 0.3223 | 0.3229 | 0.3185 | 0.3207 | 0.3211 | 0.005566 | 0.3234 | 0.3185 | | |
| subject | 3 Ind. Judgements | 10 | 20 | 80 | 130 | 150 | 250 | 0.8441 | 250 | 10 | 2.7602 | 3923.101 |
| | Test Magnitudes | 0.1291 | 0.1587 | 0.2009 | 0.2515 | 0.3173 | 0.4149 | 0.43494 | 0.4149 | 0.1291 | | |
| | Ref Magnitudes | 0.3208 | 0.3128 | 0.3135 | 0.3147 | 0.3077 | 0.3162 | 0.013683 | 0.3208 | 0.3077 | | |
| subject | 4 Ind. Judgements | 90 | 110 | 80 | 100 | 90 | 120 | 0.14989 | 120 | 80 | 0.13209 | 118.3173 |
| | Test Magnitudes | 0.1285 | 0.1636 | 0.2051 | 0.2548 | 0.3249 | 0.4193 | 0.43628 | 0.4193 | 0.1285 | | |
| | Ref Magnitudes | 0.3122 | 0.3171 | 0.3158 | 0.3145 | 0.3138 | 0.3163 | 0.005725 | 0.3171 | 0.3122 | | |
| subject | 5 Ind. Judgements | 80 | 100 | 100 | 190 | 140 | 85 | 0.36261 | 190 | 80 | 0.23244 | 154.8306 |
| | Test Magnitudes | 0.1273 | 0.165 | 0.2076 | 0.2617 | 0.3327 | 0.4238 | 0.43728 | 0.4238 | 0.1273 | | |
| | Ref Magnitudes | 0.3148 | 0.319 | 0.32 | 0.322 | 0.3217 | 0.3213 | 0.008435 | 0.322 | 0.3148 | | |
| subject | 6 Ind. Judgements | 40 | 70 | 110 | 80 | 120 | 180 | 0.4858 | 180 | 40 | 1.0977 | 444.701 |
| | Test Magnitudes | 0.1321 | 0.1664 | 0.2066 | 0.2573 | 0.329 | 0.4202 | 0.42755 | 0.4202 | 0.1321 | | |
| | Ref Magnitudes | 0.3214 | 0.3202 | 0.3209 | 0.3173 | 0.3225 | 0.3203 | 0.005462 | 0.3225 | 0.3173 | | |
| subject | 7 Ind. Judgements | 85 | 75 | 140 | 120 | 160 | 140 | 0.28013 | 160 | 75 | 0.55271 | 267.6513 |
| | Test Magnitudes | 0.119 | 0.1562 | 0.1964 | 0.2501 | 0.3083 | 0.395 | 0.43071 | 0.395 | 0.119 | | |
| | Ref Magnitudes | 0.315 | 0.3115 | 0.3145 | 0.313 | 0.3116 | 0.3154 | 0.005473 | 0.3154 | 0.3115 | | |
| subject | 8 Ind. Judgements | 120 | 130 | 145 | 170 | 135 | 170 | 0.14466 | 170 | 120 | 0.24378 | 207.2269 |
| | Test Magnitudes | 0.1222 | 0.1585 | 0.1999 | 0.2496 | 0.3172 | 0.4022 | 0.43202 | 0.4022 | 0.1222 | | |
| | Ref Magnitudes | 0.3167 | 0.3175 | 0.317 | 0.3171 | 0.3176 | 0.3159 | 0.001952 | 0.3176 | 0.3159 | | |
| subject | 9 Ind. Judgements | 20 | 50 | 130 | 110 | 110 | 120 | 0.49191 | 130 | 20 | 1.3631 | 592.3922 |
| | Test Magnitudes | 0.1221 | 0.1559 | 0.198 | 0.2477 | 0.3154 | 0.3971 | 0.43077 | 0.3971 | 0.1221 | | |
| | Ref Magnitudes | 0.3162 | 0.3114 | 0.3161 | 0.315 | 0.3155 | 0.3129 | 0.006176 | 0.3162 | 0.3114 | | |
| subject | 10 Ind. Judgements | 20 | 75 | 140 | 80 | 60 | 150 | 0.56424 | 150 | 20 | 1.0908 | 379.9479 |
| | Test Magnitudes | 0.1181 | 0.1572 | 0.1982 | 0.2486 | 0.3144 | 0.3984 | 0.43519 | 0.3984 | 0.1181 | | |
| | Ref Magnitudes | 0.3142 | 0.3162 | 0.3156 | 0.3166 | 0.3154 | 0.3146 | 0.002903 | 0.3166 | 0.3142 | | |
| subject | 11 Ind. Judgements | 40 | 85 | 90 | 115 | 133 | 110 | 0.33825 | 133 | 40 | 0.80171 | 299.3627 |
| | Test Magnitudes | 0.1224 | 0.1546 | 0.1992 | 0.2505 | 0.3151 | 0.4008 | 0.4338 | 0.4008 | 0.1224 | | |
| | Ref Magnitudes | 0.3146 | 0.3107 | 0.3144 | 0.3175 | 0.3149 | 0.3151 | 0.006962 | 0.3175 | 0.3107 | | |
| subject | 12 Ind. Judgements | 20 | 15 | 70 | 120 | 140 | 140 | 0.68502 | 140 | 15 | 2.0504 | 1315.087 |
| | Test Magnitudes | 0.1232 | 0.1586 | 0.1982 | 0.248 | 0.3181 | 0.4014 | 0.43184 | 0.4014 | 0.1232 | | |
| | Ref Magnitudes | 0.3163 | 0.3154 | 0.3142 | 0.3145 | 0.3193 | 0.3153 | 0.005865 | 0.3193 | 0.3142 | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.94626 412.3244 |

| Frequency 0.8 Hz | | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|-----------|----------|----------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 60 | 60 | 150 | 250 | 200 | 120 | 0.54398 | 250 | 60 | 0.96727 | 640.7371 | |
| | Test Magnitudes | 0.101 | 0.1241 | 0.1624 | 0.203 | 0.2569 | 0.3148 | 0.42045 | 0.3148 | 0.101 | | | |
| | Ref Magnitudes | 0.3164 | 0.318 | 0.3139 | 0.3167 | 0.3152 | 0.3197 | 0.00645 | 0.3197 | 0.3139 | | | |
| subject | 2 Ind. Judgements | 10 | 25 | 175 | 50 | 110 | 225 | 0.87413 | 225 | 10 | 2.2991 | 3225.281 | |
| | Test Magnitudes | 0.1001 | 0.1236 | 0.1602 | 0.2036 | 0.2547 | 0.3164 | 0.42496 | 0.3164 | 0.1001 | | | |
| | Ref Magnitudes | 0.3225 | 0.3214 | 0.3212 | 0.3224 | 0.3213 | 0.3227 | 0.002129 | 0.3227 | 0.3212 | | | |
| subject | 3 Ind. Judgements | 30 | 50 | 95 | 70 | 160 | 180 | 0.62028 | 180 | 30 | 1.4804 | 1038.558 | |
| | Test Magnitudes | 0.0935 | 0.1219 | 0.1608 | 0.1957 | 0.2543 | 0.3112 | 0.43281 | 0.3112 | 0.0935 | | | |
| | Ref Magnitudes | 0.3062 | 0.319 | 0.32 | 0.31 | 0.314 | 0.3112 | 0.017095 | 0.3112 | 0.3062 | | | |
| subject | 4 Ind. Judgements | 60 | 60 | 130 | 110 | 140 | 70 | 0.38099 | 140 | 60 | 0.42149 | 184.3858 | |
| | Test Magnitudes | 0.1012 | 0.1218 | 0.1638 | 0.201 | 0.2561 | 0.3134 | 0.42064 | 0.3134 | 0.1012 | | | |
| | Ref Magnitudes | 0.3168 | 0.3125 | 0.3172 | 0.3129 | 0.3124 | 0.3139 | 0.006917 | 0.3172 | 0.3124 | | | |
| subject | 5 Ind. Judgements | 133 | 75 | 100 | 150 | 133 | 120 | 0.22799 | 150 | 75 | 0.21679 | 167.4676 | |
| | Test Magnitudes | 0.1033 | 0.1258 | 0.1618 | 0.2037 | 0.2613 | 0.3143 | 0.41657 | 0.3143 | 0.1033 | | | |
| | Ref Magnitudes | 0.3216 | 0.3198 | 0.3145 | 0.316 | 0.3183 | 0.3143 | 0.003366 | 0.3216 | 0.3143 | | | |
| subject | 6 Ind. Judgements | 40 | 10 | 80 | 120 | 80 | 140 | 0.61709 | 140 | 10 | 1.6284 | 954.4119 | |
| | Test Magnitudes | 0.1011 | 0.1251 | 0.1668 | 0.2039 | 0.2608 | 0.317 | 0.41987 | 0.317 | 0.1011 | | | |
| | Ref Magnitudes | 0.3182 | 0.3161 | 0.3244 | 0.3173 | 0.3186 | 0.3194 | 0.009023 | 0.3244 | 0.3161 | | | |
| subject | 7 Ind. Judgements | 110 | 145 | 130 | 150 | 135 | 115 | 0.12185 | 150 | 110 | 0.010772 | 132.5062 | |
| | Test Magnitudes | 0.096 | 0.1109 | 0.1576 | 0.1968 | 0.2455 | 0.3074 | 0.43709 | 0.3074 | 0.096 | | | |
| | Ref Magnitudes | 0.3139 | 0.3128 | 0.313 | 0.3134 | 0.3119 | 0.3134 | 0.002191 | 0.3139 | 0.3119 | | | |
| subject | 8 Ind. Judgements | 130 | 125 | 155 | 120 | 145 | 230 | 0.27127 | 230 | 120 | 0.3629 | 275.3478 | |
| | Test Magnitudes | 0.0968 | 0.1232 | 0.1614 | 0.2016 | 0.2521 | 0.3176 | 0.43057 | 0.3176 | 0.0968 | | | |
| | Ref Magnitudes | 0.3164 | 0.3176 | 0.3168 | 0.3169 | 0.3171 | 0.3167 | 0.001284 | 0.3176 | 0.3164 | | | |
| subject | 9 Ind. Judgements | 115 | 90 | 110 | 110 | 80 | 105 | 0.13439 | 115 | 80 | -0.096842 | 85.2386 | |
| | Test Magnitudes | 0.098 | 0.1235 | 0.158 | 0.1978 | 0.2495 | 0.3165 | 0.42964 | 0.3165 | 0.098 | | | |
| | Ref Magnitudes | 0.3185 | 0.3181 | 0.313 | 0.3145 | 0.3152 | 0.3173 | 0.006957 | 0.3185 | 0.313 | | | |
| subject | 10 Ind. Judgements | 70 | 60 | 60 | 80 | 130 | 160 | 0.44778 | 160 | 60 | 0.79241 | 343.7792 | |
| | Test Magnitudes | 0.0952 | 0.1218 | 0.1602 | 0.1994 | 0.2505 | 0.313 | 0.43015 | 0.313 | 0.0952 | | | |
| | Ref Magnitudes | 0.3162 | 0.3174 | 0.3173 | 0.316 | 0.3169 | 0.313 | 0.005177 | 0.3174 | 0.313 | | | |
| subject | 11 Ind. Judgements | 60 | 90 | 120 | 150 | 160 | 140 | 0.32059 | 160 | 60 | 0.76243 | 427.0188 | |
| | Test Magnitudes | 0.0977 | 0.1222 | 0.1604 | 0.2019 | 0.2503 | 0.3134 | 0.42533 | 0.3134 | 0.0977 | | | |
| | Ref Magnitudes | 0.3156 | 0.3145 | 0.3156 | 0.3179 | 0.3148 | 0.3127 | 0.005405 | 0.3179 | 0.3127 | | | |
| subject | 12 Ind. Judgements | 20 | 30 | 50 | 120 | 130 | 150 | 0.67741 | 150 | 20 | 1.8705 | 1651.338 | |
| | Test Magnitudes | 0.0977 | 0.1222 | 0.1594 | 0.1999 | 0.2501 | 0.315 | 0.42845 | 0.315 | 0.0977 | | | |
| | Ref Magnitudes | 0.3152 | 0.3133 | 0.3129 | 0.315 | 0.316 | 0.3152 | 0.003872 | 0.316 | 0.3129 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.77742 | 385.399 |
| Frequency 1 Hz | | | | | | | | | | | | | |
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 70 | 200 | 280 | 120 | 150 | 80 | 0.52999 | 280 | 70 | -0.14781 | 99.4998 | |
| | Test Magnitudes | 0.078 | 0.0945 | 0.1212 | 0.1591 | 0.1964 | 0.2401 | 0.42057 | 0.2401 | 0.078 | | | |
| | Ref Magnitudes | 0.3182 | 0.3194 | 0.316 | 0.3169 | 0.3189 | 0.3195 | 0.004475 | 0.3195 | 0.316 | | | |
| subject | 2 Ind. Judgements | 25 | 10 | 75 | 90 | 150 | 125 | 0.69119 | 150 | 10 | 2.0407 | 3233.365 | |
| | Test Magnitudes | 0.0775 | 0.095 | 0.1205 | 0.1595 | 0.1965 | 0.2411 | 0.42298 | 0.2411 | 0.0775 | | | |
| | Ref Magnitudes | 0.3223 | 0.3209 | 0.3239 | 0.3211 | 0.3207 | 0.321 | 0.003852 | 0.3239 | 0.3207 | | | |
| subject | 3 Ind. Judgements | 80 | 40 | 120 | 150 | 70 | 300 | 0.73665 | 300 | 40 | 1.0354 | 827.7674 | |
| | Test Magnitudes | 0.0751 | 0.0921 | 0.1177 | 0.1561 | 0.1929 | 0.235 | 0.42508 | 0.235 | 0.0751 | | | |
| | Ref Magnitudes | 0.3145 | 0.3111 | 0.3142 | 0.3139 | 0.3129 | 0.3152 | 0.004632 | 0.3152 | 0.3111 | | | |
| subject | 4 Ind. Judgements | 50 | 120 | 60 | 100 | 120 | 120 | 0.33783 | 120 | 50 | 0.60003 | 296.8066 | |
| | Test Magnitudes | 0.0754 | 0.095 | 0.1196 | 0.1585 | 0.1949 | 0.2384 | 0.42342 | 0.2384 | 0.0754 | | | |
| | Ref Magnitudes | 0.3129 | 0.3158 | 0.3108 | 0.314 | 0.3141 | 0.312 | 0.005616 | 0.3158 | 0.3108 | | | |
| subject | 5 Ind. Judgements | 40 | 100 | 80 | 50 | 25 | 160 | 0.65194 | 160 | 25 | 0.23761 | 101.1599 | |
| | Test Magnitudes | 0.0775 | 0.0963 | 0.1237 | 0.1605 | 0.1977 | 0.2412 | 0.41813 | 0.2412 | 0.0775 | | | |
| | Ref Magnitudes | 0.3178 | 0.3189 | 0.3224 | 0.3192 | 0.3181 | 0.3208 | 0.005491 | 0.3224 | 0.3178 | | | |
| subject | 6 Ind. Judgements | 10 | 20 | 70 | 60 | 50 | 130 | 0.75423 | 130 | 10 | 1.895 | 1779.165 | |
| | Test Magnitudes | 0.0776 | 0.0963 | 0.1228 | 0.1602 | 0.1973 | 0.2426 | 0.4208 | 0.2426 | 0.0776 | | | |
| | Ref Magnitudes | 0.3204 | 0.3181 | 0.3215 | 0.3221 | 0.3186 | 0.3233 | 0.006332 | 0.3233 | 0.3181 | | | |
| subject | 7 Ind. Judgements | 90 | 135 | 125 | 130 | 130 | 165 | 0.18551 | 165 | 90 | 0.34782 | 255.4675 | |
| | Test Magnitudes | 0.0723 | 0.0937 | 0.1223 | 0.1502 | 0.1973 | 0.2429 | 0.44005 | 0.2429 | 0.0723 | | | |
| | Ref Magnitudes | 0.3115 | 0.313 | 0.3129 | 0.3138 | 0.3117 | 0.3141 | 0.003393 | 0.3141 | 0.3115 | | | |
| subject | 8 Ind. Judgements | 120 | 160 | 140 | 180 | 200 | 260 | 0.28113 | 260 | 120 | 0.57005 | 535.2313 | |
| | Test Magnitudes | 0.0708 | 0.0981 | 0.122 | 0.1579 | 0.1927 | 0.2386 | 0.42487 | 0.2386 | 0.0708 | | | |
| | Ref Magnitudes | 0.3171 | 0.3171 | 0.3175 | 0.3167 | 0.3168 | 0.3179 | 0.001416 | 0.3179 | 0.3167 | | | |
| subject | 9 Ind. Judgements | 90 | 115 | 110 | 60 | 75 | 120 | 0.25351 | 120 | 60 | -0.066631 | 80.6784 | |
| | Test Magnitudes | 0.07 | 0.0977 | 0.1213 | 0.1577 | 0.1926 | 0.2361 | 0.42412 | 0.2361 | 0.07 | | | |
| | Ref Magnitudes | 0.3128 | 0.3126 | 0.3184 | 0.315 | 0.3195 | 0.3148 | 0.009059 | 0.3195 | 0.3126 | | | |
| subject | 10 Ind. Judgements | 40 | 50 | 120 | 120 | 160 | 115 | 0.45922 | 160 | 40 | 1.0754 | 781.2762 | |
| | Test Magnitudes | 0.0705 | 0.0977 | 0.1209 | 0.1548 | 0.1907 | 0.2353 | 0.42189 | 0.2353 | 0.0705 | | | |
| | Ref Magnitudes | 0.3172 | 0.3169 | 0.3171 | 0.312 | 0.3168 | 0.3128 | 0.007586 | 0.3172 | 0.312 | | | |
| subject | 11 Ind. Judgements | 40 | 125 | 85 | 160 | 140 | 140 | 0.38693 | 160 | 40 | 0.93106 | 674.1169 | |
| | Test Magnitudes | 0.0706 | 0.0994 | 0.1225 | 0.1596 | 0.1916 | 0.2379 | 0.421 | 0.2379 | 0.0706 | | | |
| | Ref Magnitudes | 0.3145 | 0.3175 | 0.3156 | 0.3161 | 0.3148 | 0.3154 | 0.003393 | 0.3175 | 0.3145 | | | |
| subject | 12 Ind. Judgements | 25 | 20 | 60 | 100 | 95 | 190 | 0.76926 | 190 | 20 | 1.8191 | 2333.133 | |
| | Test Magnitudes | 0.0707 | 0.1002 | 0.1222 | 0.1579 | 0.1913 | 0.2369 | 0.41834 | 0.2369 | 0.0707 | | | |
| | Ref Magnitudes | 0.3127 | 0.3185 | 0.3165 | 0.3158 | 0.3152 | 0.316 | 0.005973 | 0.3185 | 0.3127 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.76555 | 604.6741 |

| Frequency 1.25 Hz | | | | | | | | | | | | |
|-------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|----------|----------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 260 | 80 | 100 | 140 | 180 | 180 | 0.41498 | 260 | 80 | 0.13759 | 200.4319 |
| | Test Magnitudes | 0.0544 | 0.0667 | 0.0858 | 0.1074 | 0.1422 | 0.1735 | 0.43597 | 0.1735 | 0.0544 | | |
| | Ref Magnitudes | 0.3194 | 0.3198 | 0.3214 | 0.3135 | 0.3205 | 0.3203 | 0.00893 | 0.3214 | 0.3135 | | |
| subject | 2 Ind. Judgements | 15 | 50 | 50 | 60 | 50 | 75 | 0.39497 | 75 | 15 | 0.94673 | 406.0379 |
| | Test Magnitudes | 0.0549 | 0.0668 | 0.0886 | 0.1075 | 0.1454 | 0.1771 | 0.44112 | 0.1771 | 0.0549 | | |
| | Ref Magnitudes | 0.3218 | 0.3244 | 0.3215 | 0.3213 | 0.3226 | 0.3223 | 0.003507 | 0.3244 | 0.3213 | | |
| subject | 3 Ind. Judgements | 30 | 40 | 30 | 80 | 120 | 90 | 0.57358 | 120 | 30 | 1.1649 | 852.8484 |
| | Test Magnitudes | 0.0536 | 0.0668 | 0.0863 | 0.1062 | 0.1429 | 0.1744 | 0.44099 | 0.1744 | 0.0536 | | |
| | Ref Magnitudes | 0.3199 | 0.3148 | 0.3113 | 0.3113 | 0.3044 | 0.3128 | 0.016232 | 0.3199 | 0.3044 | | |
| subject | 4 Ind. Judgements | 60 | 140 | 70 | 160 | 120 | 120 | 0.35105 | 160 | 60 | 0.4166 | 276.8303 |
| | Test Magnitudes | 0.0538 | 0.0668 | 0.0881 | 0.1067 | 0.1457 | 0.1801 | 0.45158 | 0.1801 | 0.0538 | | |
| | Ref Magnitudes | 0.3112 | 0.3139 | 0.3142 | 0.3157 | 0.3122 | 0.3158 | 0.005892 | 0.3158 | 0.3112 | | |
| subject | 5 Ind. Judgements | 133 | 50 | 120 | 120 | 33 | 125 | 0.44879 | 133 | 33 | -0.21846 | 51.6394 |
| | Test Magnitudes | 0.0549 | 0.068 | 0.0892 | 0.1075 | 0.1458 | 0.1762 | 0.43556 | 0.1762 | 0.0549 | | |
| | Ref Magnitudes | 0.3208 | 0.318 | 0.3185 | 0.3196 | 0.3194 | 0.3203 | 0.003305 | 0.3208 | 0.318 | | |
| subject | 6 Ind. Judgements | 30 | 60 | 20 | 60 | 120 | 120 | 0.63057 | 120 | 20 | 1.2088 | 928.6497 |
| | Test Magnitudes | 0.0547 | 0.0676 | 0.0877 | 0.1071 | 0.1453 | 0.1763 | 0.43917 | 0.1763 | 0.0547 | | |
| | Ref Magnitudes | 0.3222 | 0.3181 | 0.3163 | 0.3191 | 0.3183 | 0.3207 | 0.006521 | 0.3222 | 0.3163 | | |
| subject | 7 Ind. Judgements | 105 | 95 | 155 | 115 | 95 | 140 | 0.21149 | 155 | 95 | 0.14666 | 162.3057 |
| | Test Magnitudes | 0.0582 | 0.0555 | 0.0878 | 0.1168 | 0.1441 | 0.184 | 0.46966 | 0.184 | 0.0555 | | |
| | Ref Magnitudes | 0.3127 | 0.3123 | 0.3155 | 0.3142 | 0.3091 | 0.3152 | 0.007577 | 0.3155 | 0.3091 | | |
| subject | 8 Ind. Judgements | 150 | 120 | 210 | 190 | 160 | 180 | 0.18942 | 210 | 120 | 0.22248 | 276.8775 |
| | Test Magnitudes | 0.0575 | 0.0709 | 0.0871 | 0.1174 | 0.1325 | 0.1751 | 0.4093 | 0.1751 | 0.0575 | | |
| | Ref Magnitudes | 0.3176 | 0.3179 | 0.3174 | 0.3174 | 0.3176 | 0.317 | 0.000943 | 0.3179 | 0.317 | | |
| subject | 9 Ind. Judgements | 70 | 80 | 80 | 120 | 120 | 70 | 0.26294 | 120 | 70 | 0.20488 | 140.9766 |
| | Test Magnitudes | 0.0563 | 0.0689 | 0.0866 | 0.1162 | 0.1302 | 0.1741 | 0.41466 | 0.1741 | 0.0563 | | |
| | Ref Magnitudes | 0.3179 | 0.315 | 0.3159 | 0.3152 | 0.3144 | 0.3153 | 0.003862 | 0.3179 | 0.3144 | | |
| subject | 10 Ind. Judgements | 50 | 90 | 80 | 130 | 120 | 140 | 0.3374 | 140 | 50 | 0.83333 | 668.091 |
| | Test Magnitudes | 0.0559 | 0.069 | 0.0856 | 0.1157 | 0.13 | 0.1737 | 0.41612 | 0.1737 | 0.0559 | | |
| | Ref Magnitudes | 0.3165 | 0.3166 | 0.3125 | 0.3166 | 0.3139 | 0.3159 | 0.005488 | 0.3166 | 0.3125 | | |
| subject | 11 Ind. Judgements | 75 | 90 | 133 | 150 | 140 | 220 | 0.38014 | 220 | 75 | 0.88217 | 968.4334 |
| | Test Magnitudes | 0.0578 | 0.0704 | 0.0877 | 0.117 | 0.1332 | 0.1772 | 0.41391 | 0.1772 | 0.0578 | | |
| | Ref Magnitudes | 0.3151 | 0.3153 | 0.3175 | 0.3151 | 0.315 | 0.3163 | 0.003157 | 0.3175 | 0.315 | | |
| subject | 12 Ind. Judgements | 35 | 40 | 80 | 150 | 110 | 130 | 0.52153 | 150 | 35 | 1.3548 | 1810.433 |
| | Test Magnitudes | 0.0577 | 0.0702 | 0.0869 | 0.1169 | 0.1312 | 0.1738 | 0.40707 | 0.1738 | 0.0577 | | |
| | Ref Magnitudes | 0.3193 | 0.3146 | 0.3145 | 0.3159 | 0.3142 | 0.3142 | 0.006304 | 0.3193 | 0.3142 | | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.62497 | 341.4577 |
| Frequency 1.6 Hz | | | | | | | | | | | | |
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 80 | 80 | 150 | 40 | 250 | 220 | 0.61857 | 250 | 40 | 0.92189 | 1432.567 |
| | Test Magnitudes | 0.0368 | 0.0441 | 0.0574 | 0.0699 | 0.0889 | 0.1162 | 0.43143 | 0.1162 | 0.0368 | | |
| | Ref Magnitudes | 0.3186 | 0.3184 | 0.318 | 0.3209 | 0.3177 | 0.3171 | 0.004122 | 0.3209 | 0.3177 | | |
| subject | 2 Ind. Judgements | 50 | 10 | 25 | 75 | 125 | 50 | 0.72844 | 125 | 10 | 1.0928 | 837.9751 |
| | Test Magnitudes | 0.0377 | 0.0465 | 0.0576 | 0.0716 | 0.0914 | 0.1171 | 0.4232 | 0.1171 | 0.0377 | | |
| | Ref Magnitudes | 0.3213 | 0.3202 | 0.3237 | 0.323 | 0.3207 | 0.3237 | 0.004838 | 0.3237 | 0.3202 | | |
| subject | 3 Ind. Judgements | 30 | 30 | 50 | 40 | 80 | 90 | 0.48412 | 90 | 30 | 1.0491 | 852.1769 |
| | Test Magnitudes | 0.0375 | 0.0456 | 0.0587 | 0.0705 | 0.0918 | 0.1165 | 0.42399 | 0.1165 | 0.0375 | | |
| | Ref Magnitudes | 0.3189 | 0.3165 | 0.3146 | 0.3186 | 0.3156 | 0.3187 | 0.005796 | 0.3189 | 0.3146 | | |
| subject | 4 Ind. Judgements | 75 | 75 | 60 | 90 | 100 | 110 | 0.21693 | 110 | 60 | 0.42202 | 256.4308 |
| | Test Magnitudes | 0.0388 | 0.0572 | 0.0594 | 0.0724 | 0.0965 | 0.1239 | 0.41176 | 0.1239 | 0.0388 | | |
| | Ref Magnitudes | 0.3134 | 0.3556 | 0.3138 | 0.3125 | 0.3078 | 0.3145 | 0.055687 | 0.3556 | 0.3078 | | |
| subject | 5 Ind. Judgements | 50 | 125 | 85 | 30 | 100 | 50 | 0.49104 | 125 | 30 | -0.20923 | 37.0308 |
| | Test Magnitudes | 0.0374 | 0.0457 | 0.0575 | 0.0706 | 0.0912 | 0.1195 | 0.43843 | 0.1195 | 0.0374 | | |
| | Ref Magnitudes | 0.3232 | 0.3209 | 0.3212 | 0.3198 | 0.3209 | 0.3158 | 0.007703 | 0.3232 | 0.3158 | | |
| subject | 6 Ind. Judgements | 30 | 20 | 10 | 70 | 80 | 150 | 0.86923 | 150 | 10 | 1.816 | 5793.463 |
| | Test Magnitudes | 0.0385 | 0.0459 | 0.0577 | 0.0721 | 0.0924 | 0.1197 | 0.43124 | 0.1197 | 0.0385 | | |
| | Ref Magnitudes | 0.317 | 0.319 | 0.3204 | 0.3205 | 0.3205 | 0.3182 | 0.004576 | 0.3205 | 0.317 | | |
| subject | 7 Ind. Judgements | 90 | 125 | 130 | 105 | 140 | 95 | 0.17826 | 140 | 90 | 0.087011 | 141.9345 |
| | Test Magnitudes | 0.0316 | 0.0487 | 0.0656 | 0.0856 | 0.1105 | 0.125 | 0.46281 | 0.125 | 0.0316 | | |
| | Ref Magnitudes | 0.3139 | 0.3124 | 0.3119 | 0.3122 | 0.3138 | 0.315 | 0.00389 | 0.315 | 0.3119 | | |
| subject | 8 Ind. Judgements | 120 | 130 | 160 | 190 | 170 | 140 | 0.17403 | 190 | 120 | 0.19046 | 249.658 |
| | Test Magnitudes | 0.0324 | 0.0442 | 0.0715 | 0.0733 | 0.1045 | 0.1302 | 0.48118 | 0.1302 | 0.0324 | | |
| | Ref Magnitudes | 0.313 | 0.3173 | 0.3173 | 0.3171 | 0.3171 | 0.3124 | 0.007391 | 0.3173 | 0.3124 | | |
| subject | 9 Ind. Judgements | 90 | 40 | 70 | 70 | 90 | 110 | 0.30656 | 110 | 40 | 0.34511 | 188.6619 |
| | Test Magnitudes | 0.0328 | 0.0438 | 0.0723 | 0.0727 | 0.104 | 0.1306 | 0.48119 | 0.1306 | 0.0328 | | |
| | Ref Magnitudes | 0.3179 | 0.3154 | 0.3177 | 0.3169 | 0.3145 | 0.3163 | 0.004191 | 0.3179 | 0.3145 | | |
| subject | 10 Ind. Judgements | 60 | 60 | 120 | 60 | 120 | 170 | 0.46565 | 170 | 60 | 0.7358 | 651.9383 |
| | Test Magnitudes | 0.0321 | 0.0433 | 0.0711 | 0.0721 | 0.1041 | 0.1301 | 0.48688 | 0.1301 | 0.0321 | | |
| | Ref Magnitudes | 0.3168 | 0.3148 | 0.3155 | 0.3096 | 0.3161 | 0.3173 | 0.008887 | 0.3173 | 0.3096 | | |
| subject | 11 Ind. Judgements | 110 | 80 | 160 | 160 | 190 | 180 | 0.29141 | 190 | 80 | 0.54659 | 604.9233 |
| | Test Magnitudes | 0.0333 | 0.044 | 0.0722 | 0.0743 | 0.1054 | 0.1328 | 0.48416 | 0.1328 | 0.0333 | | |
| | Ref Magnitudes | 0.3169 | 0.3149 | 0.3152 | 0.3152 | 0.3151 | 0.3174 | 0.003407 | 0.3174 | 0.3149 | | |
| subject | 12 Ind. Judgements | 50 | 90 | 75 | 75 | 120 | 115 | 0.30399 | 120 | 50 | 0.51211 | 331.5491 |
| | Test Magnitudes | 0.0327 | 0.0436 | 0.0718 | 0.0734 | 0.104 | 0.1307 | 0.48235 | 0.1307 | 0.0327 | | |
| | Ref Magnitudes | 0.315 | 0.3165 | 0.3157 | 0.3191 | 0.3147 | 0.3155 | 0.005072 | 0.3191 | 0.3147 | | |
| +++ | +++ +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.52935 | 468.2362 |

Condition R

| Frequency 0.2 Hz | | | | | | | | | | | | |
|-------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|-----------|-----------------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 10 | 20 | 20 | 20 | 130 | 200 | 1.1912 | 200 | 10 | 2,5729 | 512.7622 |
| | Test Magnitudes | 0.2003 | 0.2523 | 0.3179 | 0.3987 | 0.4971 | 0.6297 | 0.41946 | 0.6297 | 0.2003 | | |
| | Ref Magnitudes | 0.3225 | 0.3186 | 0.3207 | 0.3207 | 0.3162 | 0.3139 | 0.010089 | 0.3225 | 0.3139 | | |
| subject | 2 Ind. Judgements | 5 | 25 | 10 | 50 | 100 | 50 | 0.87678 | 100 | 5 | 2.159 | 243.9217 |
| | Test Magnitudes | 0.2002 | 0.2521 | 0.3177 | 0.3985 | 0.497 | 0.6287 | 0.41913 | 0.6287 | 0.2002 | | |
| | Ref Magnitudes | 0.324 | 0.3222 | 0.3211 | 0.3212 | 0.3225 | 0.3214 | 0.003422 | 0.324 | 0.3211 | | |
| subject | 3 Ind. Judgements | 40 | 20 | 10 | 20 | 15 | 90 | 0.92179 | 90 | 10 | 0.50554 | 41.5362 |
| | Test Magnitudes | 0.199 | 0.2506 | 0.3114 | 0.3942 | 0.4933 | 0.628 | 0.42294 | 0.628 | 0.199 | | |
| | Ref Magnitudes | 0.317 | 0.3175 | 0.3151 | 0.3173 | 0.3176 | 0.3177 | 0.003088 | 0.3177 | 0.3151 | | |
| subject | 4 Ind. Judgements | 50 | 40 | 70 | 50 | 50 | 80 | 0.26568 | 80 | 40 | 0.33977 | 78.2524 |
| | Test Magnitudes | 0.2027 | 0.2523 | 0.3168 | 0.4001 | 0.4973 | 0.634 | 0.42058 | 0.634 | 0.2027 | | |
| | Ref Magnitudes | 0.3145 | 0.3167 | 0.319 | 0.3142 | 0.3163 | 0.3149 | 0.005707 | 0.319 | 0.3142 | | |
| subject | 5 Ind. Judgements | 10 | 75 | 80 | 50 | 50 | 90 | 0.49106 | 90 | 10 | 1.1661 | 162.6424 |
| | Test Magnitudes | 0.2006 | 0.2534 | 0.3175 | 0.3997 | 0.4983 | 0.635 | 0.42211 | 0.635 | 0.2006 | | |
| | Ref Magnitudes | 0.3231 | 0.3211 | 0.3206 | 0.3201 | 0.317 | 0.321 | 0.006208 | 0.3231 | 0.317 | | |
| subject | 6 Ind. Judgements | 10 | 10 | 20 | 60 | 50 | 150 | 1.0658 | 150 | 10 | 2.4414 | 386.0999 |
| | Test Magnitudes | 0.2019 | 0.2513 | 0.3182 | 0.4015 | 0.4972 | 0.6344 | 0.4213 | 0.6344 | 0.2019 | | |
| | Ref Magnitudes | 0.3161 | 0.3164 | 0.3156 | 0.3185 | 0.3157 | 0.3174 | 0.0039 | 0.3185 | 0.3154 | | |
| subject | 7 Ind. Judgements | 30 | 30 | 25 | 60 | 60 | 90 | 0.51621 | 90 | 25 | 1.0333 | 128.5293 |
| | Test Magnitudes | 0.1985 | 0.2479 | 0.3161 | 0.3995 | 0.5031 | 0.6362 | 0.42932 | 0.6362 | 0.1985 | | |
| | Ref Magnitudes | 0.3148 | 0.3149 | 0.3173 | 0.3133 | 0.3198 | 0.3157 | 0.004212 | 0.3173 | 0.3133 | | |
| subject | 8 Ind. Judgements | 30 | 50 | 50 | 65 | 55 | 90 | 0.35147 | 90 | 30 | 0.74508 | 117.1271 |
| | Test Magnitudes | 0.1965 | 0.2476 | 0.3121 | 0.4005 | 0.4955 | 0.627 | 0.42543 | 0.627 | 0.1965 | | |
| | Ref Magnitudes | 0.3151 | 0.3143 | 0.3151 | 0.3183 | 0.3153 | 0.3155 | 0.004386 | 0.3183 | 0.3143 | | |
| subject | 9 Ind. Judgements | 20 | 20 | 70 | 120 | 115 | 90 | 0.61337 | 120 | 20 | 1.6216 | 320.3119 |
| | Test Magnitudes | 0.2002 | 0.2406 | 0.2988 | 0.3975 | 0.4842 | 0.6286 | 0.43326 | 0.6286 | 0.2002 | | |
| | Ref Magnitudes | 0.3141 | 0.3061 | 0.3067 | 0.307 | 0.3062 | 0.3144 | 0.012995 | 0.3144 | 0.3061 | | |
| subject | 10 Ind. Judgements | 1 | 2 | 20 | 15 | 10 | 30 | 0.85381 | 30 | 1 | 2.6695 | 115.601 |
| | Test Magnitudes | 0.2008 | 0.2504 | 0.322 | 0.4098 | 0.5051 | 0.6408 | 0.42557 | 0.6408 | 0.2008 | | |
| | Ref Magnitudes | 0.3181 | 0.3171 | 0.3229 | 0.3215 | 0.3176 | 0.3172 | 0.007811 | 0.3229 | 0.3171 | | |
| subject | 11 Ind. Judgements | 5 | 10 | 33 | 25 | 25 | 25 | 0.51969 | 33 | 5 | 1.2813 | 63.331 |
| | Test Magnitudes | 0.2025 | 0.2536 | 0.3203 | 0.4079 | 0.5102 | 0.6505 | 0.43004 | 0.6505 | 0.2025 | | |
| | Ref Magnitudes | 0.3232 | 0.3229 | 0.3221 | 0.3231 | 0.3218 | 0.3235 | 0.002071 | 0.3235 | 0.3218 | | |
| subject | 12 Ind. Judgements | 50 | 60 | 50 | 100 | 130 | 130 | 0.44189 | 130 | 50 | 0.97944 | 220.2732 |
| | Test Magnitudes | 0.2014 | 0.2497 | 0.3088 | 0.3999 | 0.5002 | 0.6284 | 0.42355 | 0.6284 | 0.2014 | | |
| | Ref Magnitudes | 0.3157 | 0.3158 | 0.3148 | 0.3154 | 0.3164 | 0.3154 | 0.001682 | 0.3164 | 0.3148 | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 1.2237 145.5859 |
| Frequency 0.25 Hz | | | | | | | | | | | | |
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 20 | 70 | 25 | 100 | 50 | 130 | 0.65584 | 130 | 20 | 1.2054 | 186.7599 |
| | Test Magnitudes | 0.1997 | 0.2492 | 0.3161 | 0.3943 | 0.4983 | 0.6258 | 0.42094 | 0.6258 | 0.1997 | | |
| | Ref Magnitudes | 0.3214 | 0.3151 | 0.3202 | 0.3158 | 0.323 | 0.32 | 0.009833 | 0.323 | 0.3151 | | |
| subject | 2 Ind. Judgements | 50 | 5 | 25 | 50 | 75 | 50 | 0.57032 | 75 | 5 | 1.0943 | 101.1275 |
| | Test Magnitudes | 0.1998 | 0.2517 | 0.316 | 0.3973 | 0.4959 | 0.6298 | 0.42099 | 0.6298 | 0.1998 | | |
| | Ref Magnitudes | 0.3238 | 0.3248 | 0.3216 | 0.3239 | 0.3234 | 0.3252 | 0.003899 | 0.3252 | 0.3216 | | |
| subject | 3 Ind. Judgements | 15 | 10 | 25 | 85 | 120 | 150 | 0.88238 | 150 | 10 | 2.5266 | 599.8223 |
| | Test Magnitudes | 0.1981 | 0.2498 | 0.3116 | 0.3918 | 0.4897 | 0.6227 | 0.42034 | 0.6227 | 0.1981 | | |
| | Ref Magnitudes | 0.3178 | 0.3186 | 0.3189 | 0.3165 | 0.3155 | 0.3156 | 0.004705 | 0.3189 | 0.3155 | | |
| subject | 4 Ind. Judgements | 50 | 30 | 50 | 80 | 90 | 110 | 0.43821 | 110 | 30 | 0.97374 | 171.981 |
| | Test Magnitudes | 0.2016 | 0.2501 | 0.3142 | 0.396 | 0.4951 | 0.6274 | 0.41981 | 0.6274 | 0.2016 | | |
| | Ref Magnitudes | 0.3169 | 0.3151 | 0.3168 | 0.3168 | 0.315 | 0.3167 | 0.002867 | 0.3169 | 0.3151 | | |
| subject | 5 Ind. Judgements | 5 | 75 | 50 | 120 | 200 | 175 | 0.71931 | 200 | 5 | 2.7172 | 1099.084 |
| | Test Magnitudes | 0.2003 | 0.2514 | 0.3177 | 0.3968 | 0.4985 | 0.6234 | 0.41671 | 0.6234 | 0.2003 | | |
| | Ref Magnitudes | 0.3198 | 0.3221 | 0.3208 | 0.3146 | 0.3215 | 0.318 | 0.008727 | 0.3221 | 0.3146 | | |
| subject | 6 Ind. Judgements | 10 | 20 | 30 | 30 | 120 | 120 | 0.92531 | 120 | 10 | 2.2349 | 377.8347 |
| | Test Magnitudes | 0.2014 | 0.2524 | 0.3116 | 0.3979 | 0.4972 | 0.6264 | 0.41916 | 0.6264 | 0.2014 | | |
| | Ref Magnitudes | 0.3202 | 0.3205 | 0.3163 | 0.3198 | 0.3204 | 0.3191 | 0.004992 | 0.3205 | 0.3163 | | |
| subject | 7 Ind. Judgements | 45 | 70 | 95 | 95 | 110 | 95 | 0.27591 | 110 | 45 | 0.60928 | 154.2313 |
| | Test Magnitudes | 0.1971 | 0.2422 | 0.3135 | 0.3996 | 0.501 | 0.6386 | 0.43606 | 0.6386 | 0.1971 | | |
| | Ref Magnitudes | 0.3146 | 0.3148 | 0.3155 | 0.3149 | 0.3157 | 0.317 | 0.002803 | 0.317 | 0.3146 | | |
| subject | 8 Ind. Judgements | 45 | 25 | 70 | 70 | 85 | 75 | 0.36139 | 85 | 25 | 0.77395 | 128.9734 |
| | Test Magnitudes | 0.1967 | 0.2417 | 0.3132 | 0.3974 | 0.4937 | 0.6293 | 0.42999 | 0.6293 | 0.1967 | | |
| | Ref Magnitudes | 0.3151 | 0.3151 | 0.3154 | 0.3156 | 0.3132 | 0.3149 | 0.002735 | 0.3156 | 0.3132 | | |
| subject | 9 Ind. Judgements | 140 | 130 | 135 | 90 | 120 | 140 | 0.15165 | 140 | 90 | -0.084667 | 113.8552 |
| | Test Magnitudes | 0.1967 | 0.2506 | 0.3029 | 0.3991 | 0.486 | 0.6309 | 0.42824 | 0.6309 | 0.1967 | | |
| | Ref Magnitudes | 0.3143 | 0.3143 | 0.3056 | 0.3142 | 0.3063 | 0.314 | 0.013702 | 0.3143 | 0.3056 | | |
| subject | 10 Ind. Judgements | 5 | 15 | 15 | 30 | 20 | 50 | 0.69921 | 50 | 5 | 1.5976 | 92.9832 |
| | Test Magnitudes | 0.2008 | 0.2481 | 0.3169 | 0.4098 | 0.5048 | 0.6391 | 0.42792 | 0.6391 | 0.2008 | | |
| | Ref Magnitudes | 0.3188 | 0.3227 | 0.3159 | 0.3226 | 0.3157 | 0.3128 | 0.012621 | 0.3227 | 0.3128 | | |
| subject | 11 Ind. Judgements | 5 | 20 | 30 | 33 | 40 | 85 | 0.76395 | 85 | 5 | 1.9686 | 195.8787 |
| | Test Magnitudes | 0.2027 | 0.248 | 0.3233 | 0.4087 | 0.5103 | 0.6527 | 0.43323 | 0.6527 | 0.2027 | | |
| | Ref Magnitudes | 0.3251 | 0.3215 | 0.325 | 0.3235 | 0.3223 | 0.3233 | 0.004432 | 0.3251 | 0.3215 | | |
| subject | 12 Ind. Judgements | 40 | 25 | 50 | 80 | 130 | 150 | 0.64212 | 150 | 25 | 1.4714 | 301.543 |
| | Test Magnitudes | 0.1968 | 0.2511 | 0.314 | 0.3986 | 0.5014 | 0.6321 | 0.4268 | 0.6321 | 0.1968 | | |
| | Ref Magnitudes | 0.3153 | 0.3156 | 0.3159 | 0.3139 | 0.3158 | 0.3184 | 0.002715 | 0.3164 | 0.3139 | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 1.3384 179.3705 |

| Frequency 0.315 Hz | | | | | | | | | | | | | |
|--------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|--------|---------|----------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 50 | 20 | 40 | 30 | 80 | 140 | 0.73786 | 140 | 20 | | 1.1054 | 154.3196 |
| | Test Magnitudes | 0.1971 | 0.2508 | 0.3148 | 0.3989 | 0.4964 | 0.6244 | 0.42066 | 0.6244 | 0.1971 | | | |
| | Ref Magnitudes | 0.3146 | 0.323 | 0.3221 | 0.3227 | 0.3217 | 0.3199 | 0.009871 | 0.323 | 0.3146 | | | |
| subject | 2 Ind. Judgements | 20 | 15 | 20 | 75 | 90 | 50 | 0.70972 | 90 | 15 | | 1.3989 | 151.9079 |
| | Test Magnitudes | 0.1994 | 0.2523 | 0.3164 | 0.3953 | 0.4987 | 0.6296 | 0.42146 | 0.6296 | 0.1994 | | | |
| | Ref Magnitudes | 0.3217 | 0.3252 | 0.3248 | 0.3192 | 0.3246 | 0.3242 | 0.007284 | 0.3252 | 0.3192 | | | |
| subject | 3 Ind. Judgements | 30 | 75 | 50 | 40 | 70 | 120 | 0.50359 | 120 | 30 | | 0.8169 | 138.6413 |
| | Test Magnitudes | 0.1979 | 0.2497 | 0.3085 | 0.3927 | 0.4914 | 0.6226 | 0.42197 | 0.6226 | 0.1979 | | | |
| | Ref Magnitudes | 0.3168 | 0.3189 | 0.3165 | 0.3169 | 0.3175 | 0.3172 | 0.002696 | 0.3189 | 0.3165 | | | |
| subject | 4 Ind. Judgements | 40 | 70 | 50 | 30 | 75 | 120 | 0.50359 | 120 | 30 | | 0.65012 | 114.3865 |
| | Test Magnitudes | 0.1994 | 0.2494 | 0.311 | 0.3945 | 0.493 | 0.6236 | 0.42065 | 0.6236 | 0.1994 | | | |
| | Ref Magnitudes | 0.3186 | 0.3169 | 0.316 | 0.3145 | 0.3137 | 0.315 | 0.005634 | 0.3186 | 0.3137 | | | |
| subject | 5 Ind. Judgements | 50 | 100 | 120 | 80 | 175 | 200 | 0.47282 | 200 | 50 | | 1.0177 | 316.0586 |
| | Test Magnitudes | 0.198 | 0.2498 | 0.3116 | 0.3988 | 0.4925 | 0.622 | 0.41962 | 0.622 | 0.198 | | | |
| | Ref Magnitudes | 0.3165 | 0.3205 | 0.3143 | 0.3228 | 0.3166 | 0.3161 | 0.010006 | 0.3228 | 0.3143 | | | |
| subject | 6 Ind. Judgements | 50 | 30 | 60 | 100 | 110 | 110 | 0.44932 | 110 | 30 | | 1.0425 | 205.0809 |
| | Test Magnitudes | 0.2001 | 0.2506 | 0.3095 | 0.3958 | 0.4951 | 0.6282 | 0.42312 | 0.6282 | 0.2001 | | | |
| | Ref Magnitudes | 0.3159 | 0.3192 | 0.3157 | 0.3196 | 0.3203 | 0.3198 | 0.006543 | 0.3203 | 0.3157 | | | |
| subject | 7 Ind. Judgements | 55 | 85 | 90 | 95 | 85 | 115 | 0.22205 | 115 | 55 | | 0.45624 | 137.3197 |
| | Test Magnitudes | 0.1989 | 0.2493 | 0.3118 | 0.3984 | 0.502 | 0.6366 | 0.43008 | 0.6366 | 0.1989 | | | |
| | Ref Magnitudes | 0.3145 | 0.3149 | 0.3144 | 0.3146 | 0.3156 | 0.3157 | 0.001805 | 0.3157 | 0.3144 | | | |
| subject | 8 Ind. Judgements | 65 | 90 | 90 | 90 | 90 | 130 | 0.22612 | 130 | 65 | | 0.4267 | 141.4919 |
| | Test Magnitudes | 0.1981 | 0.248 | 0.3118 | 0.3969 | 0.4965 | 0.6314 | 0.42743 | 0.6314 | 0.1981 | | | |
| | Ref Magnitudes | 0.3152 | 0.3141 | 0.3149 | 0.3154 | 0.3155 | 0.3153 | 0.001639 | 0.3155 | 0.3141 | | | |
| subject | 9 Ind. Judgements | 50 | 30 | 110 | 80 | 90 | 140 | 0.478 | 140 | 30 | | 1.0371 | 221.9665 |
| | Test Magnitudes | 0.1972 | 0.245 | 0.3145 | 0.3881 | 0.4871 | 0.6127 | 0.41653 | 0.6127 | 0.1972 | | | |
| | Ref Magnitudes | 0.3069 | 0.3108 | 0.3144 | 0.3067 | 0.3066 | 0.3064 | 0.01063 | 0.3144 | 0.3064 | | | |
| subject | 10 Ind. Judgements | 10 | 15 | 60 | 60 | 130 | 130 | 0.78358 | 130 | 10 | | 2.3438 | 507.3349 |
| | Test Magnitudes | 0.1997 | 0.2512 | 0.3182 | 0.4032 | 0.5058 | 0.648 | 0.43278 | 0.648 | 0.1997 | | | |
| | Ref Magnitudes | 0.3162 | 0.317 | 0.3189 | 0.3165 | 0.3161 | 0.3213 | 0.006472 | 0.3213 | 0.3161 | | | |
| subject | 11 Ind. Judgements | 20 | 15 | 50 | 80 | 50 | 50 | 0.53779 | 80 | 15 | | 1.0713 | 112.7769 |
| | Test Magnitudes | 0.2038 | 0.2547 | 0.3211 | 0.4079 | 0.5123 | 0.6464 | 0.42599 | 0.6464 | 0.2038 | | | |
| | Ref Magnitudes | 0.3226 | 0.3231 | 0.3238 | 0.3235 | 0.323 | 0.3206 | 0.003531 | 0.3238 | 0.3206 | | | |
| subject | 12 Ind. Judgements | 30 | 50 | 30 | 110 | 80 | 150 | 0.64083 | 150 | 30 | | 1.3592 | 254.2857 |
| | Test Magnitudes | 0.2042 | 0.2509 | 0.315 | 0.4001 | 0.5 | 0.6305 | 0.41935 | 0.6305 | 0.2042 | | | |
| | Ref Magnitudes | 0.3164 | 0.3159 | 0.3156 | 0.3163 | 0.3154 | 0.3155 | 0.00134 | 0.3164 | 0.3154 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 1.0398 | 153.1137 |

| Frequency 0.4 Hz | | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|--------|---------|----------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 140 | 30 | 70 | 100 | 130 | 350 | 0.8196 | 350 | 30 | | 2.0095 | 600.8348 |
| | Test Magnitudes | 0.5938 | 0.243 | 0.3064 | 0.3933 | 0.4988 | 0.6302 | 0.35164 | 0.6302 | 0.243 | | | |
| | Ref Magnitudes | 0.3201 | 0.322 | 0.319 | 0.3215 | 0.3228 | 0.3207 | 0.004269 | 0.3228 | 0.319 | | | |
| subject | 2 Ind. Judgements | 75 | 30 | 75 | 30 | 25 | 175 | 0.83513 | 175 | 25 | | 1.0047 | 126.0493 |
| | Test Magnitudes | 0.5965 | 0.2449 | 0.3085 | 0.3942 | 0.5005 | 0.6342 | 0.352 | 0.6342 | 0.2449 | | | |
| | Ref Magnitudes | 0.3243 | 0.3247 | 0.3217 | 0.3231 | 0.3247 | 0.324 | 0.003601 | 0.3247 | 0.3217 | | | |
| subject | 3 Ind. Judgements | 95 | 70 | 30 | 95 | 110 | 150 | 0.43727 | 150 | 30 | | 1.0243 | 201.9764 |
| | Test Magnitudes | 0.5911 | 0.2409 | 0.3048 | 0.389 | 0.4925 | 0.6294 | 0.35394 | 0.6294 | 0.2409 | | | |
| | Ref Magnitudes | 0.3182 | 0.3164 | 0.3185 | 0.3178 | 0.3174 | 0.3187 | 0.00266 | 0.3187 | 0.3164 | | | |
| subject | 4 Ind. Judgements | 70 | 70 | 100 | 130 | 100 | 130 | 0.26833 | 130 | 70 | | 0.22669 | 118.2436 |
| | Test Magnitudes | 0.5883 | 0.2407 | 0.3044 | 0.3905 | 0.4896 | 0.6258 | 0.3515 | 0.6258 | 0.2407 | | | |
| | Ref Magnitudes | 0.3166 | 0.3167 | 0.3164 | 0.3182 | 0.3156 | 0.3163 | 0.002714 | 0.3182 | 0.3156 | | | |
| subject | 5 Ind. Judgements | 150 | 90 | 100 | 175 | 80 | 300 | 0.5538 | 300 | 80 | | 0.78829 | 267.1229 |
| | Test Magnitudes | 0.5943 | 0.2365 | 0.3057 | 0.3894 | 0.4894 | 0.6236 | 0.35511 | 0.6236 | 0.2365 | | | |
| | Ref Magnitudes | 0.3193 | 0.3113 | 0.3174 | 0.3176 | 0.3136 | 0.3151 | 0.009352 | 0.3193 | 0.3113 | | | |
| subject | 6 Ind. Judgements | 120 | 60 | 70 | 110 | 90 | 140 | 0.31124 | 140 | 60 | | 0.78512 | 187.7148 |
| | Test Magnitudes | 0.5895 | 0.2403 | 0.303 | 0.3872 | 0.4909 | 0.6307 | 0.35588 | 0.6307 | 0.2403 | | | |
| | Ref Magnitudes | 0.3159 | 0.3158 | 0.3159 | 0.3155 | 0.3162 | 0.3189 | 0.003987 | 0.3189 | 0.3155 | | | |
| subject | 7 Ind. Judgements | 70 | 85 | 90 | 110 | 145 | 160 | 0.32397 | 160 | 70 | | 0.7276 | 224.17 |
| | Test Magnitudes | 0.1984 | 0.2489 | 0.3148 | 0.4011 | 0.498 | 0.6359 | 0.42796 | 0.6359 | 0.1984 | | | |
| | Ref Magnitudes | 0.3127 | 0.3148 | 0.3152 | 0.3156 | 0.3126 | 0.3142 | 0.004058 | 0.3156 | 0.3126 | | | |
| subject | 8 Ind. Judgements | 40 | 70 | 85 | 110 | 110 | 140 | 0.3803 | 140 | 40 | | 0.96616 | 235.0926 |
| | Test Magnitudes | 0.1978 | 0.2471 | 0.3159 | 0.3972 | 0.4976 | 0.6334 | 0.42798 | 0.6334 | 0.1978 | | | |
| | Ref Magnitudes | 0.3153 | 0.3135 | 0.3161 | 0.3142 | 0.3154 | 0.3154 | 0.003015 | 0.3161 | 0.3135 | | | |
| subject | 9 Ind. Judgements | 50 | 95 | 105 | 110 | 115 | 110 | 0.2486 | 115 | 50 | | 0.55211 | 168.631 |
| | Test Magnitudes | 0.1951 | 0.2429 | 0.313 | 0.3863 | 0.4866 | 0.6326 | 0.433 | 0.6326 | 0.1951 | | | |
| | Ref Magnitudes | 0.3134 | 0.3069 | 0.3118 | 0.3058 | 0.3073 | 0.3125 | 0.010684 | 0.3134 | 0.3058 | | | |
| subject | 10 Ind. Judgements | 5 | 10 | 60 | 130 | 110 | 150 | 0.79932 | 150 | 5 | | 3.0644 | 1008.035 |
| | Test Magnitudes | 0.2015 | 0.2507 | 0.3166 | 0.402 | 0.5076 | 0.6403 | 0.42813 | 0.6403 | 0.2015 | | | |
| | Ref Magnitudes | 0.3182 | 0.3161 | 0.315 | 0.3157 | 0.3183 | 0.316 | 0.004335 | 0.3183 | 0.315 | | | |
| subject | 11 Ind. Judgements | 10 | 60 | 40 | 75 | 90 | 80 | 0.50256 | 90 | 10 | | 1.4936 | 219.8567 |
| | Test Magnitudes | 0.2027 | 0.2554 | 0.3233 | 0.41 | 0.5131 | 0.6534 | 0.42863 | 0.6534 | 0.2027 | | | |
| | Ref Magnitudes | 0.321 | 0.323 | 0.3232 | 0.3234 | 0.3228 | 0.3238 | 0.003026 | 0.3238 | 0.321 | | | |
| subject | 12 Ind. Judgements | 100 | 60 | 40 | 100 | 150 | 150 | 0.45166 | 150 | 40 | | 0.69445 | 185.1701 |
| | Test Magnitudes | 0.1983 | 0.2519 | 0.3184 | 0.3978 | 0.5011 | 0.6335 | 0.4243 | 0.6335 | 0.1983 | | | |
| | Ref Magnitudes | 0.3156 | 0.3164 | 0.3163 | 0.3155 | 0.3156 | 0.3154 | 0.001373 | 0.3164 | 0.3154 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.87722 | 210.9166 |

| Frequency 0.5 Hz | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|------------------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 70 | 90 | 130 | 100 | 130 | 230 | 0.45184 | 230 | 70 | 0.85858 | 337.8668 |
| | Test Magnitudes | 0.1683 | 0.2075 | 0.2473 | 0.3165 | 0.4073 | 0.5145 | 0.42236 | 0.5145 | 0.1683 | | |
| | Ref Magnitudes | 0.3152 | 0.323 | 0.3151 | 0.3178 | 0.3173 | 0.319 | 0.009195 | 0.323 | 0.3151 | | |
| subject | 2 Ind. Judgements | 25 | 25 | 25 | 50 | 300 | 250 | 1.1309 | 300 | 25 | 2.5874 | 1462.603 |
| | Test Magnitudes | 0.1719 | 0.21 | 0.2523 | 0.3211 | 0.4113 | 0.5212 | 0.41988 | 0.5212 | 0.1719 | | |
| | Ref Magnitudes | 0.3209 | 0.3221 | 0.319 | 0.3212 | 0.3238 | 0.3232 | 0.005384 | 0.3238 | 0.319 | | |
| subject | 3 Ind. Judgements | 40 | 30 | 110 | 85 | 200 | 130 | 0.6333 | 200 | 30 | 1.3302 | 438.5071 |
| | Test Magnitudes | 0.1575 | 0.2063 | 0.237 | 0.3171 | 0.4042 | 0.5102 | 0.43495 | 0.5102 | 0.1575 | | |
| | Ref Magnitudes | 0.3015 | 0.3199 | 0.3034 | 0.3191 | 0.3156 | 0.3174 | 0.026172 | 0.3199 | 0.3015 | | |
| subject | 4 Ind. Judgements | 60 | 75 | 80 | 100 | 110 | 90 | 0.20976 | 110 | 60 | 0.42046 | 142.7951 |
| | Test Magnitudes | 0.1661 | 0.2014 | 0.2461 | 0.3135 | 0.4055 | 0.5091 | 0.42553 | 0.5091 | 0.1661 | | |
| | Ref Magnitudes | 0.3122 | 0.3116 | 0.313 | 0.3146 | 0.3164 | 0.3137 | 0.005554 | 0.3164 | 0.3116 | | |
| subject | 5 Ind. Judgements | 230 | 50 | 150 | 110 | 133 | 175 | 0.42996 | 230 | 50 | 0.18647 | 161.1676 |
| | Test Magnitudes | 0.1719 | 0.2085 | 0.2534 | 0.3201 | 0.4105 | 0.5165 | 0.41677 | 0.5165 | 0.1719 | | |
| | Ref Magnitudes | 0.3206 | 0.3207 | 0.3219 | 0.3195 | 0.3198 | 0.3192 | 0.003094 | 0.3219 | 0.3192 | | |
| subject | 6 Ind. Judgements | 60 | 60 | 80 | 140 | 150 | 130 | 0.39979 | 150 | 60 | 0.91625 | 298.9645 |
| | Test Magnitudes | 0.1717 | 0.2062 | 0.2515 | 0.3167 | 0.4069 | 0.5149 | 0.41815 | 0.5149 | 0.1717 | | |
| | Ref Magnitudes | 0.3217 | 0.3158 | 0.3228 | 0.3176 | 0.32 | 0.3181 | 0.008294 | 0.3228 | 0.3158 | | |
| subject | 7 Ind. Judgements | 105 | 105 | 110 | 110 | 175 | 140 | 0.22696 | 175 | 105 | 0.36046 | 193.303 |
| | Test Magnitudes | 0.1529 | 0.1976 | 0.2481 | 0.3134 | 0.3938 | 0.4967 | 0.42754 | 0.4967 | 0.1529 | | |
| | Ref Magnitudes | 0.312 | 0.3124 | 0.3137 | 0.3162 | 0.3106 | 0.3116 | 0.006304 | 0.3162 | 0.3106 | | |
| subject | 8 Ind. Judgements | 125 | 90 | 105 | 145 | 150 | 150 | 0.19958 | 150 | 90 | 0.33959 | 192.1886 |
| | Test Magnitudes | 0.1578 | 0.201 | 0.2526 | 0.3177 | 0.4043 | 0.501 | 0.4231 | 0.501 | 0.1578 | | |
| | Ref Magnitudes | 0.3162 | 0.3176 | 0.3175 | 0.3173 | 0.317 | 0.316 | 0.002146 | 0.3176 | 0.316 | | |
| subject | 9 Ind. Judgements | 70 | 70 | 110 | 80 | 120 | 120 | 0.25568 | 120 | 70 | 0.48717 | 171.2937 |
| | Test Magnitudes | 0.1577 | 0.1964 | 0.2495 | 0.3175 | 0.4023 | 0.5036 | 0.42979 | 0.5036 | 0.1577 | | |
| | Ref Magnitudes | 0.3166 | 0.3112 | 0.3133 | 0.3162 | 0.3144 | 0.3179 | 0.007787 | 0.3179 | 0.3112 | | |
| subject | 10 Ind. Judgements | 20 | 30 | 90 | 105 | 160 | 170 | 0.65699 | 170 | 20 | 1.9637 | 876.4296 |
| | Test Magnitudes | 0.1584 | 0.2009 | 0.2524 | 0.3128 | 0.4018 | 0.5036 | 0.42491 | 0.5036 | 0.1584 | | |
| | Ref Magnitudes | 0.3172 | 0.317 | 0.3177 | 0.3129 | 0.3154 | 0.3164 | 0.005552 | 0.3177 | 0.3129 | | |
| subject | 11 Ind. Judgements | 20 | 65 | 80 | 100 | 85 | 110 | 0.41589 | 110 | 20 | 1.1901 | 305.8206 |
| | Test Magnitudes | 0.158 | 0.2011 | 0.2513 | 0.3154 | 0.3993 | 0.5007 | 0.42234 | 0.5007 | 0.158 | | |
| | Ref Magnitudes | 0.315 | 0.3171 | 0.3183 | 0.3154 | 0.3129 | 0.3149 | 0.004542 | 0.3171 | 0.3129 | | |
| subject | 12 Ind. Judgements | 25 | 20 | 70 | 90 | 160 | 145 | 0.69202 | 160 | 20 | 1.8983 | 711.4086 |
| | Test Magnitudes | 0.159 | 0.2005 | 0.2514 | 0.3162 | 0.4026 | 0.5005 | 0.42233 | 0.5005 | 0.159 | | |
| | Ref Magnitudes | 0.3166 | 0.3154 | 0.3158 | 0.3156 | 0.316 | 0.3154 | 0.001444 | 0.3166 | 0.3154 | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.88742 302.3926 |

| Frequency 0.63 Hz | | | | | | | | | | | | |
|-------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|------------------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 100 | 180 | 150 | 240 | 100 | 400 | 0.58177 | 400 | 100 | 0.67933 | 466.8501 |
| | Test Magnitudes | 0.1278 | 0.162 | 0.2048 | 0.2545 | 0.3286 | 0.4177 | 0.43599 | 0.4177 | 0.1278 | | |
| | Ref Magnitudes | 0.3149 | 0.3153 | 0.3167 | 0.315 | 0.3179 | 0.3186 | 0.005017 | 0.3186 | 0.3149 | | |
| subject | 2 Ind. Judgements | 25 | 75 | 75 | 50 | 175 | 200 | 0.70711 | 200 | 25 | 1.5168 | 723.3049 |
| | Test Magnitudes | 0.1301 | 0.1622 | 0.2071 | 0.259 | 0.3295 | 0.4244 | 0.4372 | 0.4244 | 0.1301 | | |
| | Ref Magnitudes | 0.3234 | 0.3223 | 0.3229 | 0.3185 | 0.3207 | 0.3211 | 0.005566 | 0.3234 | 0.3185 | | |
| subject | 3 Ind. Judgements | 10 | 20 | 80 | 130 | 150 | 250 | 0.8441 | 250 | 10 | 2.7602 | 3923.101 |
| | Test Magnitudes | 0.1291 | 0.1587 | 0.2009 | 0.2515 | 0.3173 | 0.4149 | 0.43494 | 0.4149 | 0.1291 | | |
| | Ref Magnitudes | 0.3208 | 0.3128 | 0.3135 | 0.3147 | 0.3077 | 0.3162 | 0.013683 | 0.3208 | 0.3077 | | |
| subject | 4 Ind. Judgements | 90 | 110 | 80 | 100 | 90 | 120 | 0.14969 | 120 | 80 | 0.13209 | 118.3173 |
| | Test Magnitudes | 0.1265 | 0.1636 | 0.2051 | 0.2548 | 0.3249 | 0.4193 | 0.43628 | 0.4193 | 0.1265 | | |
| | Ref Magnitudes | 0.3122 | 0.3171 | 0.3158 | 0.3145 | 0.3138 | 0.3163 | 0.005725 | 0.3171 | 0.3122 | | |
| subject | 5 Ind. Judgements | 80 | 100 | 100 | 190 | 140 | 85 | 0.36261 | 190 | 80 | 0.23244 | 154.8306 |
| | Test Magnitudes | 0.1273 | 0.165 | 0.2076 | 0.2617 | 0.3327 | 0.4238 | 0.43728 | 0.4238 | 0.1273 | | |
| | Ref Magnitudes | 0.3148 | 0.319 | 0.32 | 0.322 | 0.3217 | 0.3213 | 0.008435 | 0.322 | 0.3148 | | |
| subject | 6 Ind. Judgements | 40 | 70 | 110 | 80 | 120 | 180 | 0.4858 | 180 | 40 | 1.0977 | 444.701 |
| | Test Magnitudes | 0.1321 | 0.1664 | 0.2066 | 0.2573 | 0.329 | 0.4202 | 0.42755 | 0.4202 | 0.1321 | | |
| | Ref Magnitudes | 0.3214 | 0.3202 | 0.3209 | 0.3173 | 0.3225 | 0.3203 | 0.005462 | 0.3225 | 0.3173 | | |
| subject | 7 Ind. Judgements | 85 | 75 | 140 | 120 | 160 | 140 | 0.28013 | 160 | 75 | 0.55271 | 267.6513 |
| | Test Magnitudes | 0.119 | 0.1562 | 0.1964 | 0.2501 | 0.3083 | 0.395 | 0.43071 | 0.395 | 0.119 | | |
| | Ref Magnitudes | 0.315 | 0.3115 | 0.3145 | 0.313 | 0.3116 | 0.3154 | 0.005473 | 0.3154 | 0.3115 | | |
| subject | 8 Ind. Judgements | 120 | 130 | 145 | 170 | 135 | 170 | 0.14466 | 170 | 120 | 0.24378 | 207.2269 |
| | Test Magnitudes | 0.1222 | 0.1585 | 0.1999 | 0.2496 | 0.3172 | 0.4022 | 0.43202 | 0.4022 | 0.1222 | | |
| | Ref Magnitudes | 0.3167 | 0.3175 | 0.317 | 0.3171 | 0.3176 | 0.3159 | 0.001952 | 0.3176 | 0.3159 | | |
| subject | 9 Ind. Judgements | 20 | 50 | 130 | 110 | 110 | 120 | 0.49191 | 130 | 20 | 1.3631 | 592.3922 |
| | Test Magnitudes | 0.1221 | 0.1559 | 0.198 | 0.2477 | 0.3154 | 0.3971 | 0.43077 | 0.3971 | 0.1221 | | |
| | Ref Magnitudes | 0.3162 | 0.3114 | 0.3161 | 0.315 | 0.3155 | 0.3129 | 0.006176 | 0.3162 | 0.3114 | | |
| subject | 10 Ind. Judgements | 20 | 75 | 140 | 80 | 60 | 150 | 0.56424 | 150 | 20 | 1.0908 | 379.9479 |
| | Test Magnitudes | 0.1181 | 0.1572 | 0.1982 | 0.2486 | 0.3144 | 0.3984 | 0.43519 | 0.3984 | 0.1181 | | |
| | Ref Magnitudes | 0.3142 | 0.3162 | 0.3156 | 0.3166 | 0.3154 | 0.3146 | 0.002903 | 0.3166 | 0.3142 | | |
| subject | 11 Ind. Judgements | 40 | 85 | 90 | 115 | 133 | 110 | 0.33825 | 133 | 40 | 0.80171 | 299.3627 |
| | Test Magnitudes | 0.1224 | 0.1546 | 0.1992 | 0.2505 | 0.3151 | 0.4008 | 0.4338 | 0.4008 | 0.1224 | | |
| | Ref Magnitudes | 0.3146 | 0.3107 | 0.3144 | 0.3175 | 0.3149 | 0.3151 | 0.006962 | 0.3175 | 0.3107 | | |
| subject | 12 Ind. Judgements | 20 | 15 | 70 | 120 | 140 | 140 | 0.88502 | 140 | 15 | 2.0504 | 1315.087 |
| | Test Magnitudes | 0.1232 | 0.1586 | 0.1982 | 0.248 | 0.3181 | 0.4014 | 0.43164 | 0.4014 | 0.1232 | | |
| | Ref Magnitudes | 0.3163 | 0.3154 | 0.3142 | 0.3145 | 0.3193 | 0.3153 | 0.005865 | 0.3193 | 0.3142 | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.94626 412.3244 |

| Frequency 0.8 Hz | | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|----------|
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 100 | 70 | 180 | 170 | 180 | 400 | 0.6311 | 400 | 70 | 1.2269 | 1272.739 | |
| | Test Magnitudes | 0.1034 | 0.1276 | 0.1653 | 0.2064 | 0.2586 | 0.3161 | 0.41177 | 0.3161 | 0.1034 | | | |
| | Ref Magnitudes | 0.321 | 0.3229 | 0.3198 | 0.3217 | 0.3167 | 0.3167 | 0.00814 | 0.3229 | 0.3167 | | | |
| subject | 2 Ind. Judgements | 50 | 125 | 150 | 150 | 125 | 160 | 0.31743 | 160 | 50 | 0.71503 | 398.073 | |
| | Test Magnitudes | 0.104 | 0.1267 | 0.1679 | 0.2082 | 0.2646 | 0.3219 | 0.41894 | 0.3219 | 0.104 | | | |
| | Ref Magnitudes | 0.323 | 0.32 | 0.3248 | 0.3235 | 0.3246 | 0.3248 | 0.005713 | 0.3248 | 0.32 | | | |
| subject | 3 Ind. Judgements | 50 | 100 | 50 | 130 | 175 | 133 | 0.46783 | 175 | 50 | 0.92775 | 462.2332 | |
| | Test Magnitudes | 0.1026 | 0.127 | 0.1662 | 0.2061 | 0.2622 | 0.3171 | 0.41589 | 0.3171 | 0.1026 | | | |
| | Ref Magnitudes | 0.3179 | 0.319 | 0.3192 | 0.3181 | 0.3188 | 0.3178 | 0.001901 | 0.3192 | 0.3178 | | | |
| subject | 4 Ind. Judgements | 75 | 120 | 85 | 130 | 120 | 170 | 0.29151 | 170 | 75 | 0.54184 | 283.5872 | |
| | Test Magnitudes | 0.1021 | 0.1248 | 0.1655 | 0.2062 | 0.2592 | 0.3179 | 0.41944 | 0.3179 | 0.1021 | | | |
| | Ref Magnitudes | 0.3163 | 0.315 | 0.3166 | 0.3167 | 0.313 | 0.3168 | 0.00473 | 0.3168 | 0.313 | | | |
| subject | 5 Ind. Judgements | 110 | 110 | 200 | 150 | 300 | 325 | 0.47272 | 325 | 110 | 1.001 | 1001.982 | |
| | Test Magnitudes | 0.102 | 0.1218 | 0.166 | 0.2077 | 0.2594 | 0.3179 | 0.42275 | 0.3179 | 0.102 | | | |
| | Ref Magnitudes | 0.319 | 0.3139 | 0.3214 | 0.323 | 0.3161 | 0.3191 | 0.010482 | 0.323 | 0.3139 | | | |
| subject | 6 Ind. Judgements | 70 | 110 | 80 | 120 | 130 | 150 | 0.27574 | 150 | 70 | 0.58373 | 286.6447 | |
| | Test Magnitudes | 0.1038 | 0.1273 | 0.1661 | 0.2059 | 0.2506 | 0.3163 | 0.41218 | 0.3163 | 0.1038 | | | |
| | Ref Magnitudes | 0.3158 | 0.3161 | 0.3158 | 0.3154 | 0.3153 | 0.3156 | 0.000933 | 0.3161 | 0.3153 | | | |
| subject | 7 Ind. Judgements | 115 | 125 | 120 | 160 | 135 | 160 | 0.14616 | 160 | 115 | 0.26146 | 211.7789 | |
| | Test Magnitudes | 0.0978 | 0.1234 | 0.1607 | 0.1987 | 0.2514 | 0.3169 | 0.42894 | 0.3169 | 0.0978 | | | |
| | Ref Magnitudes | 0.3146 | 0.3154 | 0.3148 | 0.3135 | 0.3151 | 0.3156 | 0.002383 | 0.3156 | 0.3135 | | | |
| subject | 8 Ind. Judgements | 100 | 110 | 115 | 125 | 140 | 165 | 0.18708 | 165 | 100 | 0.39752 | 247.2545 | |
| | Test Magnitudes | 0.0972 | 0.122 | 0.1607 | 0.2003 | 0.2514 | 0.3157 | 0.42974 | 0.3157 | 0.0972 | | | |
| | Ref Magnitudes | 0.3152 | 0.3152 | 0.3156 | 0.3153 | 0.3158 | 0.3154 | 0.000761 | 0.3158 | 0.3152 | | | |
| subject | 9 Ind. Judgements | 120 | 110 | 150 | 120 | 175 | 150 | 0.18072 | 175 | 110 | 0.28729 | 224.6292 | |
| | Test Magnitudes | 0.0976 | 0.1139 | 0.1602 | 0.2007 | 0.2469 | 0.3028 | 0.42266 | 0.3028 | 0.0976 | | | |
| | Ref Magnitudes | 0.3143 | 0.3116 | 0.3113 | 0.3145 | 0.3111 | 0.3057 | 0.01022 | 0.3145 | 0.3057 | | | |
| subject | 10 Ind. Judgements | 30 | 90 | 120 | 110 | 190 | 150 | 0.47229 | 190 | 30 | 1.2569 | 877.8104 | |
| | Test Magnitudes | 0.0975 | 0.1255 | 0.1608 | 0.2021 | 0.2522 | 0.3168 | 0.42605 | 0.3168 | 0.0975 | | | |
| | Ref Magnitudes | 0.3179 | 0.3229 | 0.317 | 0.3183 | 0.3186 | 0.3166 | 0.007105 | 0.3229 | 0.3166 | | | |
| subject | 11 Ind. Judgements | 75 | 40 | 150 | 125 | 150 | 160 | 0.4161 | 160 | 40 | 0.92887 | 516.4 | |
| | Test Magnitudes | 0.0986 | 0.125 | 0.1641 | 0.2048 | 0.2564 | 0.3226 | 0.43031 | 0.3226 | 0.0986 | | | |
| | Ref Magnitudes | 0.3222 | 0.3218 | 0.3233 | 0.3228 | 0.3225 | 0.3213 | 0.002215 | 0.3233 | 0.3213 | | | |
| subject | 12 Ind. Judgements | 120 | 120 | 150 | 100 | 200 | 300 | 0.45313 | 300 | 100 | 0.67224 | 494.203 | |
| | Test Magnitudes | 0.0989 | 0.1151 | 0.1614 | 0.2022 | 0.2498 | 0.312 | 0.42998 | 0.312 | 0.0989 | | | |
| | Ref Magnitudes | 0.3157 | 0.3158 | 0.3151 | 0.3156 | 0.3158 | 0.3173 | 0.002347 | 0.3173 | 0.3151 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.69364 | 430.1531 |

| Frequency 1 Hz | | | | | | | | | | | | | |
|----------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|----------|----------|----------|
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 250 | 170 | 120 | 300 | 480 | 400 | 0.47809 | 480 | 120 | 0.79617 | 1246.258 | |
| | Test Magnitudes | 0.0774 | 0.0952 | 0.1217 | 0.1603 | 0.1998 | 0.2427 | 0.42566 | 0.2427 | 0.0774 | | | |
| | Ref Magnitudes | 0.317 | 0.3159 | 0.3167 | 0.3212 | 0.3235 | 0.3195 | 0.009325 | 0.3235 | 0.3159 | | | |
| subject | 2 Ind. Judgements | 125 | 150 | 200 | 50 | 125 | 225 | 0.4257 | 225 | 50 | 0.071151 | 151.7279 | |
| | Test Magnitudes | 0.0795 | 0.0974 | 0.1236 | 0.1622 | 0.2005 | 0.2437 | 0.41743 | 0.2437 | 0.0795 | | | |
| | Ref Magnitudes | 0.3228 | 0.3196 | 0.3187 | 0.3223 | 0.3253 | 0.3253 | 0.008608 | 0.3253 | 0.3187 | | | |
| subject | 3 Ind. Judgements | 50 | 75 | 30 | 130 | 120 | 200 | 0.61649 | 200 | 30 | 1.2171 | 927.4869 | |
| | Test Magnitudes | 0.0783 | 0.0966 | 0.1231 | 0.1608 | 0.1981 | 0.2431 | 0.41967 | 0.2431 | 0.0783 | | | |
| | Ref Magnitudes | 0.3153 | 0.3169 | 0.3162 | 0.3171 | 0.317 | 0.316 | 0.002239 | 0.3171 | 0.3153 | | | |
| subject | 4 Ind. Judgements | 110 | 70 | 130 | 150 | 140 | 140 | 0.2387 | 150 | 70 | 0.44368 | 286.9893 | |
| | Test Magnitudes | 0.0789 | 0.0957 | 0.1234 | 0.1622 | 0.1994 | 0.243 | 0.41988 | 0.243 | 0.0789 | | | |
| | Ref Magnitudes | 0.3165 | 0.3146 | 0.316 | 0.3188 | 0.3157 | 0.3162 | 0.00439 | 0.3188 | 0.3146 | | | |
| subject | 5 Ind. Judgements | 133 | 200 | 66 | 300 | 200 | 400 | 0.54968 | 400 | 66 | 0.86113 | 1018.429 | |
| | Test Magnitudes | 0.0774 | 0.0975 | 0.1241 | 0.1612 | 0.1987 | 0.2436 | 0.41999 | 0.2436 | 0.0774 | | | |
| | Ref Magnitudes | 0.316 | 0.3192 | 0.3208 | 0.3192 | 0.3172 | 0.3192 | 0.005371 | 0.3208 | 0.316 | | | |
| subject | 6 Ind. Judgements | 50 | 70 | 130 | 140 | 130 | 150 | 0.38887 | 150 | 50 | 0.9293 | 642.8853 | |
| | Test Magnitudes | 0.0795 | 0.0974 | 0.1245 | 0.162 | 0.2015 | 0.2431 | 0.41625 | 0.2431 | 0.0795 | | | |
| | Ref Magnitudes | 0.3182 | 0.3191 | 0.3196 | 0.3149 | 0.3198 | 0.3161 | 0.00633 | 0.3198 | 0.3149 | | | |
| subject | 7 Ind. Judgements | 110 | 110 | 115 | 120 | 145 | 165 | 0.17669 | 165 | 110 | 0.33474 | 245.8631 | |
| | Test Magnitudes | 0.0719 | 0.0956 | 0.1226 | 0.159 | 0.1938 | 0.2397 | 0.42785 | 0.2397 | 0.0719 | | | |
| | Ref Magnitudes | 0.3174 | 0.3083 | 0.3145 | 0.3159 | 0.3161 | 0.3159 | 0.010359 | 0.3174 | 0.3083 | | | |
| subject | 8 Ind. Judgements | 130 | 125 | 125 | 120 | 135 | 135 | 0.047184 | 135 | 120 | 0.094699 | 153.5272 | |
| | Test Magnitudes | 0.1291 | 0.0992 | 0.1215 | 0.154 | 0.1929 | 0.2384 | 0.33087 | 0.2384 | 0.0992 | | | |
| | Ref Magnitudes | 0.3137 | 0.3152 | 0.3153 | 0.3072 | 0.3167 | 0.3155 | 0.01094 | 0.3167 | 0.3072 | | | |
| subject | 9 Ind. Judgements | 150 | 130 | 120 | 190 | 130 | 150 | 0.1731 | 190 | 120 | 0.048646 | 157.9138 | |
| | Test Magnitudes | 0.0749 | 0.0944 | 0.1238 | 0.1524 | 0.1962 | 0.2462 | 0.43572 | 0.2462 | 0.0749 | | | |
| | Ref Magnitudes | 0.3143 | 0.3064 | 0.311 | 0.3143 | 0.3062 | 0.3144 | 0.012653 | 0.3144 | 0.3062 | | | |
| subject | 10 Ind. Judgements | 40 | 110 | 130 | 120 | 150 | 160 | 0.36019 | 160 | 40 | 0.97187 | 754.5032 | |
| | Test Magnitudes | 0.0721 | 0.0985 | 0.1224 | 0.1581 | 0.1932 | 0.2402 | 0.42374 | 0.2402 | 0.0721 | | | |
| | Ref Magnitudes | 0.319 | 0.3179 | 0.3183 | 0.318 | 0.3172 | 0.3183 | 0.001859 | 0.319 | 0.3172 | | | |
| subject | 11 Ind. Judgements | 75 | 60 | 140 | 125 | 150 | 175 | 0.36957 | 175 | 60 | 0.80288 | 551.4902 | |
| | Test Magnitudes | 0.0721 | 0.1009 | 0.1249 | 0.1617 | 0.1981 | 0.2439 | 0.42483 | 0.2439 | 0.0721 | | | |
| | Ref Magnitudes | 0.3232 | 0.3229 | 0.3227 | 0.3223 | 0.3253 | 0.3222 | 0.003529 | 0.3253 | 0.3222 | | | |
| subject | 12 Ind. Judgements | 150 | 130 | 100 | 200 | 220 | 250 | 0.32876 | 250 | 100 | 0.56672 | 512.061 | |
| | Test Magnitudes | 0.0753 | 0.0967 | 0.1247 | 0.1534 | 0.2014 | 0.2484 | 0.43313 | 0.2484 | 0.0753 | | | |
| | Ref Magnitudes | 0.3155 | 0.3157 | 0.3162 | 0.3153 | 0.3157 | 0.3156 | 0.000954 | 0.3162 | 0.3153 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.68145 | 531.7756 |

| Frequency 1.25 Hz | | | | | | | | | | | | | |
|-------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|----------|----------|----------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 350 | 250 | 350 | 200 | 450 | 500 | 0.32576 | 500 | 200 | 0.37613 | 796.9043 | |
| | Test Magnitudes | 0.0548 | 0.0676 | 0.0886 | 0.109 | 0.1452 | 0.1785 | 0.44097 | 0.1785 | 0.0548 | | | |
| | Ref Magnitudes | 0.3176 | 0.3238 | 0.3153 | 0.3203 | 0.3218 | 0.321 | 0.009543 | 0.3238 | 0.3153 | | | |
| subject | 2 Ind. Judgements | 50 | 180 | 175 | 75 | 150 | 250 | 0.5018 | 250 | 50 | 0.79644 | 811.0169 | |
| | Test Magnitudes | 0.0545 | 0.0678 | 0.0889 | 0.1077 | 0.1466 | 0.1772 | 0.4402 | 0.1772 | 0.0545 | | | |
| | Ref Magnitudes | 0.3227 | 0.3224 | 0.3212 | 0.3226 | 0.3244 | 0.325 | 0.004333 | 0.325 | 0.3212 | | | |
| subject | 3 Ind. Judgements | 30 | 120 | 80 | 180 | 125 | 250 | 0.5873 | 250 | 30 | 1.3145 | 2326.427 | |
| | Test Magnitudes | 0.0509 | 0.0682 | 0.0851 | 0.1085 | 0.1464 | 0.1778 | 0.45562 | 0.1778 | 0.0509 | | | |
| | Ref Magnitudes | 0.292 | 0.3189 | 0.2984 | 0.3187 | 0.3177 | 0.318 | 0.039019 | 0.3189 | 0.292 | | | |
| subject | 4 Ind. Judgements | 70 | 60 | 90 | 130 | 140 | 160 | 0.37571 | 160 | 60 | 0.84934 | 712.9591 | |
| | Test Magnitudes | 0.0564 | 0.0697 | 0.0907 | 0.1102 | 0.1486 | 0.1805 | 0.43527 | 0.1805 | 0.0564 | | | |
| | Ref Magnitudes | 0.317 | 0.3169 | 0.3174 | 0.3154 | 0.3185 | 0.3167 | 0.003176 | 0.3185 | 0.3154 | | | |
| subject | 5 Ind. Judgements | 233 | 200 | 165 | 200 | 350 | 250 | 0.27558 | 350 | 166 | 0.27943 | 431.0139 | |
| | Test Magnitudes | 0.0554 | 0.0694 | 0.0902 | 0.109 | 0.1484 | 0.18 | 0.4389 | 0.18 | 0.0554 | | | |
| | Ref Magnitudes | 0.32 | 0.3207 | 0.3228 | 0.3207 | 0.321 | 0.3184 | 0.004459 | 0.3228 | 0.3184 | | | |
| subject | 6 Ind. Judgements | 70 | 80 | 90 | 180 | 220 | 200 | 0.49022 | 220 | 70 | 1.0757 | 1481.818 | |
| | Test Magnitudes | 0.0566 | 0.07 | 0.09 | 0.1098 | 0.1498 | 0.182 | 0.43943 | 0.182 | 0.0566 | | | |
| | Ref Magnitudes | 0.3203 | 0.3168 | 0.315 | 0.3149 | 0.3195 | 0.3186 | 0.007257 | 0.3203 | 0.3149 | | | |
| subject | 7 Ind. Judgements | 95 | 175 | 190 | 155 | 185 | 220 | 0.24957 | 220 | 95 | 0.951669 | 540.36 | |
| | Test Magnitudes | 0.0576 | 0.0707 | 0.0888 | 0.1184 | 0.1334 | 0.1778 | 0.41336 | 0.1778 | 0.0576 | | | |
| | Ref Magnitudes | 0.3156 | 0.3154 | 0.3156 | 0.3146 | 0.313 | 0.3156 | 0.003298 | 0.3156 | 0.313 | | | |
| subject | 8 Ind. Judgements | 125 | 145 | 145 | 145 | 135 | 140 | 0.05756 | 145 | 125 | 0.02241 | 145.9343 | |
| | Test Magnitudes | 0.0574 | 0.0711 | 0.0885 | 0.118 | 0.1333 | 0.3611 | 0.816 | 0.3611 | 0.0574 | | | |
| | Ref Magnitudes | 0.3159 | 0.3154 | 0.3154 | 0.3152 | 0.315 | 0.315 | 0.001069 | 0.3159 | 0.315 | | | |
| subject | 9 Ind. Judgements | 140 | 170 | 180 | 180 | 160 | 210 | 0.13489 | 210 | 140 | 0.18776 | 264.8155 | |
| | Test Magnitudes | 0.059 | 0.0584 | 0.0899 | 0.1209 | 0.1461 | 0.1881 | 0.4652 | 0.1881 | 0.0584 | | | |
| | Ref Magnitudes | 0.3064 | 0.3142 | 0.3106 | 0.3142 | 0.3069 | 0.3143 | 0.011979 | 0.3143 | 0.3064 | | | |
| subject | 10 Ind. Judgements | 30 | 110 | 160 | 240 | 220 | 200 | 0.49213 | 240 | 30 | 1.5242 | 4439.222 | |
| | Test Magnitudes | 0.0574 | 0.0702 | 0.0899 | 0.1179 | 0.1331 | 0.178 | 0.41389 | 0.178 | 0.0574 | | | |
| | Ref Magnitudes | 0.3184 | 0.3162 | 0.3229 | 0.3163 | 0.3165 | 0.319 | 0.008106 | 0.3229 | 0.3162 | | | |
| subject | 11 Ind. Judgements | 75 | 150 | 160 | 175 | 230 | 250 | 0.36013 | 250 | 75 | 0.92423 | 1330.431 | |
| | Test Magnitudes | 0.0591 | 0.0721 | 0.0903 | 0.1213 | 0.1368 | 0.1816 | 0.41361 | 0.1816 | 0.0591 | | | |
| | Ref Magnitudes | 0.3235 | 0.3234 | 0.3237 | 0.3231 | 0.3233 | 0.3235 | 0.000631 | 0.3237 | 0.3231 | | | |
| subject | 12 Ind. Judgements | 110 | 90 | 250 | 200 | 250 | 300 | 0.41952 | 300 | 90 | 0.92718 | 1527.968 | |
| | Test Magnitudes | 0.06 | 0.0587 | 0.0905 | 0.1206 | 0.149 | 0.1872 | 0.46112 | 0.1872 | 0.0587 | | | |
| | Ref Magnitudes | 0.3162 | 0.3163 | 0.3159 | 0.3158 | 0.3174 | 0.3155 | 0.002092 | 0.3174 | 0.3155 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.82289 | 803.9606 |

| Frequency 1.6 Hz | | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|----------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 130 | 70 | 120 | 330 | 250 | 550 | 0.73948 | 550 | 70 | 1.5534 | 12834.42 | |
| | Test Magnitudes | 0.0389 | 0.0476 | 0.0569 | 0.0735 | 0.0933 | 0.1185 | 0.41702 | 0.1185 | 0.0389 | | | |
| | Ref Magnitudes | 0.32 | 0.3183 | 0.3201 | 0.3201 | 0.3215 | 0.3228 | 0.004772 | 0.3228 | 0.3183 | | | |
| subject | 2 Ind. Judgements | 75 | 175 | 250 | 250 | 200 | 350 | 0.42343 | 350 | 75 | 0.97608 | 2810.49 | |
| | Test Magnitudes | 0.0378 | 0.0453 | 0.0585 | 0.0714 | 0.0933 | 0.1187 | 0.43326 | 0.1187 | 0.0378 | | | |
| | Ref Magnitudes | 0.3252 | 0.3232 | 0.3229 | 0.3239 | 0.3214 | 0.3222 | 0.004104 | 0.3252 | 0.3214 | | | |
| subject | 3 Ind. Judgements | 125 | 175 | 200 | 150 | 200 | 300 | 0.31593 | 300 | 125 | 0.56471 | 844.0578 | |
| | Test Magnitudes | 0.0386 | 0.0479 | 0.0598 | 0.0727 | 0.0967 | 0.1235 | 0.43628 | 0.1235 | 0.0386 | | | |
| | Ref Magnitudes | 0.3188 | 0.3165 | 0.3174 | 0.3187 | 0.3087 | 0.316 | 0.011893 | 0.3188 | 0.3087 | | | |
| subject | 4 Ind. Judgements | 80 | 60 | 100 | 140 | 150 | 150 | 0.34249 | 150 | 60 | 0.79492 | 897.3765 | |
| | Test Magnitudes | 0.0404 | 0.0486 | 0.0612 | 0.0755 | 0.0965 | 0.1232 | 0.42028 | 0.1232 | 0.0404 | | | |
| | Ref Magnitudes | 0.3164 | 0.3167 | 0.3166 | 0.316 | 0.3148 | 0.3167 | 0.002324 | 0.3167 | 0.3148 | | | |
| subject | 5 Ind. Judgements | 90 | 75 | 150 | 80 | 200 | 375 | 0.713 | 375 | 75 | 1.2898 | 4257.981 | |
| | Test Magnitudes | 0.0414 | 0.0489 | 0.0811 | 0.0738 | 0.0952 | 0.1229 | 0.41496 | 0.1229 | 0.0414 | | | |
| | Ref Magnitudes | 0.314 | 0.3185 | 0.3198 | 0.321 | 0.3215 | 0.3209 | 0.008777 | 0.3215 | 0.314 | | | |
| subject | 8 Ind. Judgements | 50 | 160 | 140 | 180 | 180 | 250 | 0.40889 | 250 | 50 | 1.0872 | 2640.748 | |
| | Test Magnitudes | 0.0401 | 0.0486 | 0.0619 | 0.0766 | 0.0954 | 0.1228 | 0.4168 | 0.1228 | 0.0401 | | | |
| | Ref Magnitudes | 0.3161 | 0.3203 | 0.3195 | 0.3186 | 0.3148 | 0.3154 | 0.007279 | 0.3203 | 0.3148 | | | |
| subject | 7 Ind. Judgements | 130 | 140 | 170 | 175 | 205 | 185 | 0.16754 | 205 | 130 | 0.31059 | 376.0881 | |
| | Test Magnitudes | 0.0338 | 0.0457 | 0.0741 | 0.0763 | 0.1089 | 0.1362 | 0.48427 | 0.1362 | 0.0338 | | | |
| | Ref Magnitudes | 0.3157 | 0.3157 | 0.3148 | 0.3153 | 0.3154 | 0.3145 | 0.00155 | 0.3157 | 0.3145 | | | |
| subject | 8 Ind. Judgements | 120 | 130 | 175 | 160 | 160 | 160 | 0.13973 | 175 | 120 | 0.23084 | 275.8291 | |
| | Test Magnitudes | 0.034 | 0.0495 | 0.0737 | 0.0745 | 0.1076 | 0.134 | 0.47924 | 0.134 | 0.034 | | | |
| | Ref Magnitudes | 0.3151 | 0.3151 | 0.3143 | 0.3139 | 0.3154 | 0.3176 | 0.00409 | 0.3176 | 0.3139 | | | |
| subject | 9 Ind. Judgements | 140 | 180 | 80 | 175 | 200 | 190 | 0.27696 | 200 | 80 | 0.23676 | 288.6527 | |
| | Test Magnitudes | 0.0314 | 0.0513 | 0.0681 | 0.0906 | 0.1142 | 0.1306 | 0.4671 | 0.1306 | 0.0314 | | | |
| | Ref Magnitudes | 0.3146 | 0.3144 | 0.3057 | 0.3142 | 0.3058 | 0.3101 | 0.013686 | 0.3146 | 0.3057 | | | |
| subject | 10 Ind. Judgements | 15 | 90 | 230 | 170 | 290 | 220 | 0.59655 | 290 | 15 | 1.8248 | 15640.38 | |
| | Test Magnitudes | 0.033 | 0.0453 | 0.0731 | 0.0748 | 0.107 | 0.1356 | 0.48861 | 0.1356 | 0.033 | | | |
| | Ref Magnitudes | 0.3187 | 0.3212 | 0.3163 | 0.3176 | 0.3154 | 0.3162 | 0.006703 | 0.3212 | 0.3154 | | | |
| subject | 11 Ind. Judgements | 133 | 175 | 200 | 200 | 220 | 250 | 0.20288 | 250 | 133 | 0.40408 | 556.1539 | |
| | Test Magnitudes | 0.0345 | 0.0466 | 0.0763 | 0.0775 | 0.1114 | 0.1381 | 0.48177 | 0.1381 | 0.0345 | | | |
| | Ref Magnitudes | 0.323 | 0.3243 | 0.3233 | 0.3232 | 0.3233 | 0.322 | 0.002277 | 0.3243 | 0.322 | | | |
| subject | 12 Ind. Judgements | 60 | 180 | 220 | 200 | 240 | 300 | 0.4 | 300 | 60 | 0.95388 | 2215.93 | |
| | Test Magnitudes | 0.0308 | 0.0508 | 0.0683 | 0.0887 | 0.1142 | 0.1289 | 0.46759 | 0.1289 | 0.0308 | | | |
| | Ref Magnitudes | 0.3164 | 0.3164 | 0.316 | 0.3161 | 0.3158 | 0.3153 | 0.001312 | 0.3164 | 0.3153 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.8744 | 1556.653 |

Condition S

| Frequency 0.2 Hz | | | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|----------|--------|--------|----------|----------|----------|--|--|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | Coef.Var | Max | Min | Ind. n | Ind. k | | | |
| subject | 1 Ind. Judgements | 40 | 25 | 40 | 60 | 70 | 0.38061 | 70 | 25 | 0.98472 | 154.3806 | | | |
| | Test Magnitudes | 0.1851 | 0.2311 | 0.29 | 0.364 | 0.385 | 0.2924 | 0.385 | 0.1851 | | | | | |
| | Ref Magnitudes | 0.3303 | 0.3264 | 0.3208 | 0.3154 | 0.3309 | 0.02033 | 0.3309 | 0.3154 | | | | | |
| subject | 2 Ind. Judgements | 10 | 10 | 10 | 30 | 25 | 0.57334 | 30 | 10 | 1.5141 | 103.0284 | | | |
| | Test Magnitudes | 0.1836 | 0.2304 | 0.2876 | 0.3678 | 0.382 | 0.29532 | 0.382 | 0.1836 | | | | | |
| | Ref Magnitudes | 0.3269 | 0.329 | 0.3161 | 0.3193 | 0.3256 | 0.016835 | 0.329 | 0.3161 | | | | | |
| subject | 3 Ind. Judgements | 30 | 50 | 50 | 115 | 150 | 0.64607 | 150 | 30 | 2.02 | 874.7937 | | | |
| | Test Magnitudes | 0.1833 | 0.2292 | 0.2883 | 0.3672 | 0.3808 | 0.29531 | 0.3808 | 0.1833 | | | | | |
| | Ref Magnitudes | 0.3277 | 0.3282 | 0.3248 | 0.3286 | 0.3277 | 0.004587 | 0.3286 | 0.3248 | | | | | |
| subject | 4 Ind. Judgements | 80 | 90 | 100 | 150 | 140 | 0.27808 | 150 | 80 | 0.85151 | 328.2639 | | | |
| | Test Magnitudes | 0.179 | 0.2245 | 0.2824 | 0.3592 | 0.371 | 0.29429 | 0.371 | 0.179 | | | | | |
| | Ref Magnitudes | 0.314 | 0.3183 | 0.3182 | 0.3187 | 0.3095 | 0.012602 | 0.3187 | 0.3095 | | | | | |
| subject | 5 Ind. Judgements | 66 | 75 | 200 | 366 | 200 | 0.67182 | 366 | 66 | 2.1205 | 2223.729 | | | |
| | Test Magnitudes | 0.1831 | 0.2291 | 0.2887 | 0.3676 | 0.3809 | 0.29586 | 0.3809 | 0.1831 | | | | | |
| | Ref Magnitudes | 0.3287 | 0.3265 | 0.3272 | 0.3269 | 0.3217 | 0.008122 | 0.3287 | 0.3217 | | | | | |
| subject | 6 Ind. Judgements | 20 | 70 | 70 | 70 | 200 | 0.78262 | 200 | 20 | 2.1852 | 1082.663 | | | |
| | Test Magnitudes | 0.1831 | 0.2314 | 0.2893 | 0.3709 | 0.3806 | 0.22956 | 0.3806 | 0.1831 | | | | | |
| | Ref Magnitudes | 0.3263 | 0.3278 | 0.3273 | 0.3283 | 0.3261 | 0.002897 | 0.3283 | 0.3261 | | | | | |
| subject | 7 Ind. Judgements | 95 | 110 | 125 | 130 | 160 | 0.1963 | 160 | 95 | 0.54412 | 234.7116 | | | |
| | Test Magnitudes | 0.192 | 0.2409 | 0.3043 | 0.3869 | 0.4538 | 0.33672 | 0.4538 | 0.192 | | | | | |
| | Ref Magnitudes | 0.3158 | 0.3156 | 0.3147 | 0.3152 | 0.3143 | 0.001974 | 0.3158 | 0.3143 | | | | | |
| subject | 8 Ind. Judgements | 149 | 140 | 150 | 140 | 180 | 0.10849 | 180 | 140 | 0.15521 | 182.0614 | | | |
| | Test Magnitudes | 0.193 | 0.2393 | 0.3029 | 0.391 | 0.4542 | 0.33893 | 0.4542 | 0.193 | | | | | |
| | Ref Magnitudes | 0.3206 | 0.317 | 0.3173 | 0.3199 | 0.3178 | 0.005098 | 0.3206 | 0.317 | | | | | |
| subject | 9 Ind. Judgements | 20 | 30 | 110 | 110 | 110 | 0.61435 | 110 | 20 | 2.1846 | 824.5057 | | | |
| | Test Magnitudes | 0.1924 | 0.2425 | 0.3054 | 0.3876 | 0.4555 | 0.33633 | 0.4555 | 0.1924 | | | | | |
| | Ref Magnitudes | 0.3156 | 0.3176 | 0.317 | 0.3151 | 0.3151 | 0.003645 | 0.3176 | 0.3151 | | | | | |
| subject | 10 Ind. Judgements | 30 | 160 | 85 | 170 | 200 | 0.54014 | 200 | 30 | 1.7577 | 867.3737 | | | |
| | Test Magnitudes | 0.1938 | 0.2426 | 0.3068 | 0.3907 | 0.4582 | 0.33743 | 0.4582 | 0.1938 | | | | | |
| | Ref Magnitudes | 0.3155 | 0.3159 | 0.3157 | 0.3166 | 0.3162 | 0.001369 | 0.3166 | 0.3155 | | | | | |
| subject | 11 Ind. Judgements | 45 | 25 | 20 | 20 | 20 | 0.41691 | 45 | 20 | -0.86944 | 8.7218 | | | |
| | Test Magnitudes | 0.1939 | 0.2435 | 0.3085 | 0.3886 | 0.4549 | 0.3328 | 0.4549 | 0.1939 | | | | | |
| | Ref Magnitudes | 0.3155 | 0.3158 | 0.3173 | 0.3152 | 0.3189 | 0.004887 | 0.3189 | 0.3152 | | | | | |
| subject | 12 Ind. Judgements | 25 | 50 | 65 | 100 | 100 | 0.47822 | 100 | 25 | 1.5933 | 403.2595 | | | |
| | Test Magnitudes | 0.1939 | 0.2427 | 0.3078 | 0.3916 | 0.4588 | 0.33771 | 0.4588 | 0.1939 | | | | | |
| | Ref Magnitudes | 0.3162 | 0.3155 | 0.316 | 0.3157 | 0.3153 | 0.001155 | 0.3162 | 0.3153 | | | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | +++ | +++ | Median | 1.5537 | 365.7617 | | |

| Frequency 0.25 Hz | | | | | | | | | | | | | | | |
|-------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|----------|--|--|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | | | |
| subject | 1 Ind. Judgements | 60 | 50 | 100 | 60 | 250 | 230 | 0.72752 | 250 | 50 | 1.3777 | 440.1092 | | | |
| | Test Magnitudes | 0.1946 | 0.2427 | 0.3029 | 0.3835 | 0.4615 | 0.6113 | 0.42338 | 0.6113 | 0.1946 | | | | | |
| | Ref Magnitudes | 0.3278 | 0.3302 | 0.3307 | 0.3302 | 0.328 | 0.3305 | 0.003964 | 0.3307 | 0.3278 | | | | | |
| subject | 2 Ind. Judgements | 10 | 25 | 50 | 25 | 75 | 200 | 1.0969 | 200 | 10 | 2.1903 | 435.9217 | | | |
| | Test Magnitudes | 0.1922 | 0.241 | 0.3006 | 0.3797 | 0.4786 | 0.6052 | 0.42336 | 0.6052 | 0.1922 | | | | | |
| | Ref Magnitudes | 0.3248 | 0.328 | 0.3256 | 0.3221 | 0.325 | 0.3239 | 0.005994 | 0.328 | 0.3221 | | | | | |
| subject | 3 Ind. Judgements | 10 | 40 | 90 | 90 | 150 | 300 | 0.91129 | 300 | 10 | 2.6133 | 1226.421 | | | |
| | Test Magnitudes | 0.1921 | 0.2403 | 0.3008 | 0.3799 | 0.4758 | 0.6038 | 0.4223 | 0.6038 | 0.1921 | | | | | |
| | Ref Magnitudes | 0.3248 | 0.3287 | 0.3303 | 0.3268 | 0.322 | 0.3247 | 0.009224 | 0.3303 | 0.322 | | | | | |
| subject | 4 Ind. Judgements | 60 | 80 | 120 | 120 | 130 | 190 | 0.38587 | 190 | 60 | 0.89507 | 294.7475 | | | |
| | Test Magnitudes | 0.1864 | 0.2345 | 0.2924 | 0.3688 | 0.467 | 0.5888 | 0.42424 | 0.5888 | 0.1864 | | | | | |
| | Ref Magnitudes | 0.3113 | 0.3165 | 0.3141 | 0.3113 | 0.3189 | 0.3107 | 0.010617 | 0.3189 | 0.3107 | | | | | |
| subject | 5 Ind. Judgements | 20 | 150 | 85 | 250 | 200 | 350 | 0.67109 | 350 | 20 | 2.0221 | 1142.934 | | | |
| | Test Magnitudes | 0.1922 | 0.2404 | 0.2997 | 0.3804 | 0.4776 | 0.6043 | 0.42324 | 0.6043 | 0.1922 | | | | | |
| | Ref Magnitudes | 0.3294 | 0.3289 | 0.3272 | 0.3295 | 0.3273 | 0.3265 | 0.003925 | 0.3295 | 0.3265 | | | | | |
| subject | 6 Ind. Judgements | 30 | 20 | 80 | 150 | 200 | 250 | 0.77 | 250 | 20 | 2.237 | 938.6829 | | | |
| | Test Magnitudes | 0.1914 | 0.2405 | 0.3018 | 0.3829 | 0.4819 | 0.6087 | 0.42629 | 0.6087 | 0.1914 | | | | | |
| | Ref Magnitudes | 0.327 | 0.3291 | 0.3277 | 0.3269 | 0.33 | 0.3301 | 0.004436 | 0.3301 | 0.3269 | | | | | |
| subject | 7 Ind. Judgements | 80 | 85 | 120 | 140 | 140 | 185 | 0.31394 | 185 | 80 | 0.72103 | 259.0774 | | | |
| | Test Magnitudes | 0.1926 | 0.2406 | 0.3057 | 0.3888 | 0.4843 | 0.6123 | 0.42561 | 0.6123 | 0.1926 | | | | | |
| | Ref Magnitudes | 0.3162 | 0.3148 | 0.3155 | 0.3152 | 0.3159 | 0.3156 | 0.001574 | 0.3162 | 0.3148 | | | | | |
| subject | 8 Ind. Judgements | 120 | 90 | 160 | 150 | 160 | 225 | 0.30121 | 225 | 90 | 0.58963 | 272.9246 | | | |
| | Test Magnitudes | 0.1909 | 0.2428 | 0.3035 | 0.392 | 0.4806 | 0.609 | 0.4233 | 0.609 | 0.1909 | | | | | |
| | Ref Magnitudes | 0.3173 | 0.3198 | 0.3166 | 0.3206 | 0.3165 | 0.3171 | 0.005539 | 0.3206 | 0.3165 | | | | | |
| subject | 9 Ind. Judgements | 50 | 60 | 60 | 60 | 120 | 210 | 0.66968 | 210 | 50 | 1.1332 | 270.1646 | | | |
| | Test Magnitudes | 0.1923 | 0.2419 | 0.3052 | 0.3908 | 0.484 | 0.6123 | 0.42492 | 0.6123 | 0.1923 | | | | | |
| | Ref Magnitudes | 0.3173 | 0.3161 | 0.3147 | 0.3319 | 0.3163 | 0.3154 | 0.020806 | 0.3319 | 0.3147 | | | | | |
| subject | 10 Ind. Judgements | 60 | 145 | 80 | 130 | 200 | 220 | 0.45583 | 220 | 60 | 0.97588 | 355.0278 | | | |
| | Test Magnitudes | 0.1937 | 0.2432 | 0.3077 | 0.392 | 0.4865 | 0.6167 | 0.42507 | 0.6167 | 0.1937 | | | | | |
| | Ref Magnitudes | 0.3157 | 0.3165 | 0.3157 | 0.3162 | 0.315 | 0.316 | 0.001636 | 0.3165 | 0.315 | | | | | |
| subject | 11 Ind. Judgements | 15 | 20 | 20 | 50 | 33 | 65 | 0.58681 | 65 | 15 | 1.1984 | 105.2319 | | | |
| | Test Magnitudes | 0.1925 | 0.2426 | 0.3092 | 0.3886 | 0.4891 | 0.6132 | 0.42455 | 0.6132 | 0.1925 | | | | | |
| | Ref Magnitudes | 0.316 | 0.3149 | 0.3183 | 0.3187 | 0.3169 | 0.316 | 0.004631 | 0.3187 | 0.3149 | | | | | |
| subject | 12 Ind. Judgements | 30 | 15 | 50 | 110 | 135 | 125 | 0.6714 | 135 | 15 | 1.802 | 398.7888 | | | |
| | Test Magnitudes | 0.1942 | 0.2424 | 0.3105 | 0.3922 | 0.4847 | 0.6174 | 0.42411 | 0.6174 | 0.1942 | | | | | |
| | Ref Magnitudes | 0.3163 | 0.315 | 0.3169 | 0.3152 | 0.3139 | 0.3162 | 0.003456 | 0.3169 | 0.3139 | | | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 1.2881 | 376.9083 | | |

| Frequency 0.315 Hz | | | | | | | | | | | | | |
|--------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|--------|---------|----------|
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 50 | 40 | 40 | 130 | 70 | 200 | 0.72812 | 200 | 40 | | 1.2038 | 256.318 |
| | Test Magnitudes | 0.1946 | 0.2477 | 0.3156 | 0.3972 | 0.4938 | 0.6204 | 0.42145 | 0.6204 | 0.1946 | | | |
| | Ref Magnitudes | 0.3154 | 0.3225 | 0.3308 | 0.3275 | 0.3244 | 0.3241 | 0.016019 | 0.3308 | 0.3154 | | | |
| subject | 2 Ind. Judgements | 25 | 20 | 25 | 50 | 50 | 75 | 0.52191 | 75 | 20 | | 1.117 | 117.6097 |
| | Test Magnitudes | 0.1971 | 0.2492 | 0.3125 | 0.3958 | 0.4919 | 0.619 | 0.41871 | 0.619 | 0.1971 | | | |
| | Ref Magnitudes | 0.3233 | 0.3276 | 0.3274 | 0.329 | 0.3279 | 0.3284 | 0.006195 | 0.329 | 0.3233 | | | |
| subject | 3 Ind. Judgements | 33 | 100 | 66 | 120 | 133 | 250 | 0.63846 | 250 | 33 | | 1.4586 | 450.8021 |
| | Test Magnitudes | 0.199 | 0.2489 | 0.3127 | 0.3944 | 0.4909 | 0.618 | 0.41667 | 0.618 | 0.199 | | | |
| | Ref Magnitudes | 0.3276 | 0.3291 | 0.3288 | 0.329 | 0.3275 | 0.3293 | 0.00241 | 0.3293 | 0.3275 | | | |
| subject | 4 Ind. Judgements | 50 | 120 | 120 | 100 | 130 | 160 | 0.3238 | 160 | 50 | | 0.72929 | 233.9799 |
| | Test Magnitudes | 0.1937 | 0.2403 | 0.3059 | 0.3885 | 0.4794 | 0.6021 | 0.41741 | 0.6021 | 0.1937 | | | |
| | Ref Magnitudes | 0.3158 | 0.3129 | 0.3183 | 0.3169 | 0.3163 | 0.3163 | 0.00564 | 0.3183 | 0.3129 | | | |
| subject | 5 Ind. Judgements | 90 | 200 | 110 | 300 | 300 | 300 | 0.45472 | 300 | 90 | | 1.0341 | 575.8801 |
| | Test Magnitudes | 0.1982 | 0.2473 | 0.3111 | 0.3935 | 0.4906 | 0.6174 | 0.41861 | 0.6174 | 0.1982 | | | |
| | Ref Magnitudes | 0.3273 | 0.327 | 0.3278 | 0.3252 | 0.3293 | 0.3262 | 0.004278 | 0.3293 | 0.3252 | | | |
| subject | 6 Ind. Judgements | 100 | 40 | 110 | 160 | 140 | 200 | 0.44036 | 200 | 40 | | 0.96672 | 308.5102 |
| | Test Magnitudes | 0.2009 | 0.2483 | 0.3059 | 0.3929 | 0.4941 | 0.6179 | 0.41748 | 0.6179 | 0.2009 | | | |
| | Ref Magnitudes | 0.3273 | 0.3287 | 0.3266 | 0.3275 | 0.3278 | 0.3278 | 0.00211 | 0.3287 | 0.3266 | | | |
| subject | 7 Ind. Judgements | 85 | 85 | 95 | 115 | 170 | 190 | 0.37038 | 190 | 85 | | 0.7858 | 269.2385 |
| | Test Magnitudes | 0.196 | 0.244 | 0.307 | 0.39 | 0.4871 | 0.613 | 0.42106 | 0.613 | 0.196 | | | |
| | Ref Magnitudes | 0.3151 | 0.3154 | 0.3159 | 0.3152 | 0.3166 | 0.3155 | 0.001763 | 0.3166 | 0.3151 | | | |
| subject | 8 Ind. Judgements | 90 | 110 | 140 | 170 | 170 | 230 | 0.32945 | 230 | 90 | | 0.76805 | 328.1044 |
| | Test Magnitudes | 0.1959 | 0.2419 | 0.304 | 0.3895 | 0.489 | 0.6112 | 0.42304 | 0.6112 | 0.1959 | | | |
| | Ref Magnitudes | 0.3169 | 0.3173 | 0.3174 | 0.3185 | 0.3212 | 0.3175 | 0.005008 | 0.3212 | 0.3169 | | | |
| subject | 9 Ind. Judgements | 120 | 70 | 110 | 80 | 170 | 120 | 0.31746 | 170 | 70 | | 0.3013 | 147.5931 |
| | Test Magnitudes | 0.1968 | 0.2438 | 0.3059 | 0.3833 | 0.4869 | 0.6134 | 0.42216 | 0.6134 | 0.1968 | | | |
| | Ref Magnitudes | 0.3167 | 0.3178 | 0.3155 | 0.3095 | 0.3177 | 0.3152 | 0.009783 | 0.3178 | 0.3095 | | | |
| subject | 10 Ind. Judgements | 25 | 40 | 110 | 170 | 160 | 150 | 0.57675 | 170 | 25 | | 1.6911 | 522.2858 |
| | Test Magnitudes | 0.1973 | 0.2449 | 0.3082 | 0.3932 | 0.4893 | 0.6166 | 0.42128 | 0.6166 | 0.1973 | | | |
| | Ref Magnitudes | 0.317 | 0.3153 | 0.3162 | 0.3153 | 0.3159 | 0.3146 | 0.002653 | 0.317 | 0.3146 | | | |
| subject | 11 Ind. Judgements | 20 | 33 | 60 | 33 | 50 | 75 | 0.44971 | 75 | 20 | | 0.89752 | 106.7361 |
| | Test Magnitudes | 0.1959 | 0.2447 | 0.3071 | 0.3894 | 0.4914 | 0.613 | 0.42163 | 0.613 | 0.1959 | | | |
| | Ref Magnitudes | 0.317 | 0.3187 | 0.316 | 0.3192 | 0.3176 | 0.3193 | 0.004166 | 0.3193 | 0.316 | | | |
| subject | 12 Ind. Judgements | 50 | 40 | 60 | 85 | 170 | 200 | 0.67 | 200 | 40 | | 1.4576 | 391.2548 |
| | Test Magnitudes | 0.1974 | 0.2456 | 0.3081 | 0.3939 | 0.4872 | 0.6143 | 0.41885 | 0.6143 | 0.1974 | | | |
| | Ref Magnitudes | 0.3151 | 0.3167 | 0.316 | 0.3157 | 0.3146 | 0.3142 | 0.002943 | 0.3167 | 0.3142 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 1.0004 | 288.8744 |

| Frequency 0.4 Hz | | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|--------|----------|----------|
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 100 | 100 | 100 | 220 | 380 | 260 | 0.59487 | 380 | 100 | | 1.1868 | 559.664 |
| | Test Magnitudes | 0.2034 | 0.2526 | 0.3217 | 0.407 | 0.5138 | 0.641 | 0.42449 | 0.641 | 0.2034 | | | |
| | Ref Magnitudes | 0.3251 | 0.323 | 0.3259 | 0.326 | 0.3264 | 0.3236 | 0.004295 | 0.3264 | 0.323 | | | |
| subject | 2 Ind. Judgements | 25 | 50 | 90 | 100 | 150 | 175 | 0.58123 | 175 | 25 | | 1.6457 | 439.7518 |
| | Test Magnitudes | 0.2043 | 0.2548 | 0.3204 | 0.4027 | 0.5017 | 0.6389 | 0.41994 | 0.6389 | 0.2043 | | | |
| | Ref Magnitudes | 0.3279 | 0.3257 | 0.3258 | 0.3207 | 0.3156 | 0.3221 | 0.013847 | 0.3279 | 0.3156 | | | |
| subject | 3 Ind. Judgements | 40 | 75 | 150 | 133 | 175 | 300 | 0.62225 | 300 | 40 | | 1.5504 | 584.4622 |
| | Test Magnitudes | 0.2042 | 0.256 | 0.3212 | 0.4097 | 0.5118 | 0.6408 | 0.42118 | 0.6408 | 0.2042 | | | |
| | Ref Magnitudes | 0.3289 | 0.3285 | 0.3266 | 0.3286 | 0.3263 | 0.3289 | 0.003627 | 0.3289 | 0.3263 | | | |
| subject | 4 Ind. Judgements | 90 | 100 | 130 | 120 | 130 | 160 | 0.2041 | 160 | 90 | | 0.43839 | 189.2318 |
| | Test Magnitudes | 0.1959 | 0.2446 | 0.3136 | 0.3988 | 0.5005 | 0.6217 | 0.42512 | 0.6217 | 0.1959 | | | |
| | Ref Magnitudes | 0.3142 | 0.3131 | 0.3197 | 0.3199 | 0.3188 | 0.3132 | 0.010463 | 0.3199 | 0.3131 | | | |
| subject | 5 Ind. Judgements | 75 | 125 | 175 | 350 | 200 | 300 | 0.51029 | 350 | 75 | | 1.1222 | 567.9202 |
| | Test Magnitudes | 0.2026 | 0.254 | 0.3204 | 0.4052 | 0.509 | 0.6387 | 0.42266 | 0.6387 | 0.2026 | | | |
| | Ref Magnitudes | 0.3241 | 0.3265 | 0.3272 | 0.3247 | 0.3274 | 0.324 | 0.0048 | 0.3274 | 0.324 | | | |
| subject | 6 Ind. Judgements | 60 | 90 | 110 | 120 | 180 | 200 | 0.42269 | 200 | 60 | | 1.0237 | 331.4042 |
| | Test Magnitudes | 0.2058 | 0.2547 | 0.3225 | 0.4057 | 0.5099 | 0.64 | 0.41988 | 0.64 | 0.2058 | | | |
| | Ref Magnitudes | 0.3277 | 0.3275 | 0.3282 | 0.3265 | 0.3276 | 0.3269 | 0.001853 | 0.3282 | 0.3265 | | | |
| subject | 7 Ind. Judgements | 90 | 90 | 105 | 110 | 180 | 200 | 0.37324 | 200 | 90 | | 0.76148 | 273.1031 |
| | Test Magnitudes | 0.1961 | 0.2478 | 0.3118 | 0.3959 | 0.4872 | 0.6149 | 0.41715 | 0.6149 | 0.1961 | | | |
| | Ref Magnitudes | 0.3148 | 0.3154 | 0.3155 | 0.3157 | 0.3149 | 0.3166 | 0.002058 | 0.3166 | 0.3148 | | | |
| subject | 8 Ind. Judgements | 80 | 110 | 120 | 125 | 160 | 200 | 0.3164 | 200 | 80 | | 0.73737 | 275.4048 |
| | Test Magnitudes | 0.1989 | 0.2527 | 0.3147 | 0.397 | 0.4839 | 0.6107 | 0.40735 | 0.6107 | 0.1989 | | | |
| | Ref Magnitudes | 0.3185 | 0.3202 | 0.3196 | 0.3198 | 0.3166 | 0.3172 | 0.004645 | 0.3202 | 0.3166 | | | |
| subject | 9 Ind. Judgements | 110 | 90 | 110 | 120 | 110 | 110 | 0.090756 | 120 | 90 | | 0.085753 | 118.1115 |
| | Test Magnitudes | 0.1972 | 0.2498 | 0.3071 | 0.3951 | 0.5044 | 0.6069 | 0.41598 | 0.6069 | 0.1972 | | | |
| | Ref Magnitudes | 0.316 | 0.3169 | 0.3095 | 0.3161 | 0.3246 | 0.3099 | 0.017518 | 0.3246 | 0.3095 | | | |
| subject | 10 Ind. Judgements | 10 | 90 | 60 | 160 | 150 | 210 | 0.64759 | 210 | 10 | | 2.239 | 844.3897 |
| | Test Magnitudes | 0.1972 | 0.2486 | 0.3138 | 0.3968 | 0.4893 | 0.6158 | 0.41585 | 0.6158 | 0.1972 | | | |
| | Ref Magnitudes | 0.3166 | 0.3151 | 0.3163 | 0.3157 | 0.3154 | 0.3153 | 0.001886 | 0.3166 | 0.3151 | | | |
| subject | 11 Ind. Judgements | 75 | 80 | 90 | 110 | 115 | 125 | 0.20522 | 125 | 75 | | 0.49162 | 163.3928 |
| | Test Magnitudes | 0.1988 | 0.2509 | 0.3134 | 0.392 | 0.4825 | 0.6127 | 0.41063 | 0.6127 | 0.1988 | | | |
| | Ref Magnitudes | 0.3192 | 0.3192 | 0.3193 | 0.3168 | 0.3169 | 0.3196 | 0.00404 | 0.3196 | 0.3168 | | | |
| subject | 12 Ind. Judgements | 70 | 40 | 95 | 125 | 145 | 115 | 0.39079 | 145 | 40 | | 0.84669 | 220.0513 |
| | Test Magnitudes | 0.2003 | 0.2486 | 0.3133 | 0.3952 | 0.4919 | 0.6143 | 0.41338 | 0.6143 | 0.2003 | | | |
| | Ref Magnitudes | 0.3196 | 0.3142 | 0.3148 | 0.3147 | 0.3168 | 0.3143 | 0.006709 | 0.3196 | 0.3142 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.93519 | 303.4045 |

| Frequency 0.5 Hz | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|-----------------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 70 | 120 | 120 | 400 | 450 | 500 | 0.69888 | 500 | 70 | 1.8203 | 1286.565 |
| | Test Magnitudes | 0.208 | 0.2588 | 0.3258 | 0.4207 | 0.5285 | 0.6723 | 0.43528 | 0.6723 | 0.208 | | |
| | Ref Magnitudes | 0.3305 | 0.3268 | 0.3256 | 0.3303 | 0.3258 | 0.3266 | 0.006768 | 0.3305 | 0.3256 | | |
| subject | 2 Ind. Judgements | 10 | 25 | 100 | 75 | 225 | 250 | 0.86697 | 250 | 10 | 2.7028 | 1031.28 |
| | Test Magnitudes | 0.2076 | 0.2546 | 0.3214 | 0.4139 | 0.5255 | 0.6627 | 0.43453 | 0.6627 | 0.2076 | | |
| | Ref Magnitudes | 0.3276 | 0.3206 | 0.3215 | 0.3215 | 0.3268 | 0.3212 | 0.009672 | 0.3276 | 0.3206 | | |
| subject | 3 Ind. Judgements | 20 | 75 | 75 | 80 | 250 | 300 | 0.84775 | 300 | 20 | 2.0282 | 690.5569 |
| | Test Magnitudes | 0.208 | 0.2607 | 0.3242 | 0.4211 | 0.523 | 0.7004 | 0.45068 | 0.7004 | 0.208 | | |
| | Ref Magnitudes | 0.329 | 0.3291 | 0.3218 | 0.3278 | 0.3247 | 0.3432 | 0.022441 | 0.3432 | 0.3218 | 1.237 | 323.8143 |
| subject | 4 Ind. Judgements | 40 | 50 | 110 | 100 | 160 | 160 | 0.49974 | 160 | 40 | 1.237 | 323.8143 |
| | Test Magnitudes | 0.2004 | 0.2506 | 0.3135 | 0.405 | 0.504 | 0.6552 | 0.43841 | 0.6552 | 0.2004 | | |
| | Ref Magnitudes | 0.3178 | 0.3167 | 0.3132 | 0.3158 | 0.3107 | 0.318 | 0.009113 | 0.318 | 0.3107 | 1.9968 | 984.3683 |
| subject | 5 Ind. Judgements | 33 | 100 | 100 | 130 | 350 | 400 | 0.8141 | 400 | 33 | 1.9968 | 984.3683 |
| | Test Magnitudes | 0.2067 | 0.2575 | 0.3278 | 0.4174 | 0.5242 | 0.6667 | 0.43259 | 0.6667 | 0.2067 | | |
| | Ref Magnitudes | 0.3291 | 0.3269 | 0.3282 | 0.328 | 0.3268 | 0.3294 | 0.003292 | 0.3294 | 0.3268 | 1.0244 | 297.556 |
| subject | 6 Ind. Judgements | 50 | 100 | 90 | 120 | 130 | 220 | 0.48226 | 220 | 50 | 1.0244 | 297.556 |
| | Test Magnitudes | 0.2073 | 0.2574 | 0.3269 | 0.4197 | 0.5274 | 0.6667 | 0.43284 | 0.6667 | 0.2073 | | |
| | Ref Magnitudes | 0.3294 | 0.3271 | 0.3267 | 0.3284 | 0.3281 | 0.3278 | 0.002934 | 0.3294 | 0.3267 | 0.63432 | 239.9019 |
| subject | 7 Ind. Judgements | 85 | 105 | 105 | 140 | 170 | 165 | 0.27402 | 170 | 85 | 0.63432 | 239.9019 |
| | Test Magnitudes | 0.1999 | 0.2517 | 0.3165 | 0.3994 | 0.5027 | 0.6218 | 0.41701 | 0.6218 | 0.1999 | | |
| | Ref Magnitudes | 0.3154 | 0.3151 | 0.3152 | 0.3139 | 0.3157 | 0.3149 | 0.001964 | 0.3157 | 0.3139 | 0.69583 | 304.4532 |
| subject | 8 Ind. Judgements | 90 | 140 | 130 | 160 | 180 | 225 | 0.29895 | 225 | 90 | 0.69583 | 304.4532 |
| | Test Magnitudes | 0.198 | 0.2553 | 0.3176 | 0.4017 | 0.5008 | 0.625 | 0.41703 | 0.625 | 0.198 | | |
| | Ref Magnitudes | 0.3174 | 0.3207 | 0.3177 | 0.3173 | 0.3163 | 0.3207 | 0.005906 | 0.3207 | 0.3163 | 0.2116 | 175.6827 |
| subject | 9 Ind. Judgements | 120 | 110 | 180 | 180 | 160 | 130 | 0.19064 | 180 | 110 | 0.2116 | 175.6827 |
| | Test Magnitudes | 0.1993 | 0.2527 | 0.3178 | 0.4031 | 0.5029 | 0.6216 | 0.41571 | 0.6216 | 0.1993 | | |
| | Ref Magnitudes | 0.3164 | 0.3176 | 0.3177 | 0.3178 | 0.3168 | 0.3153 | 0.003076 | 0.3178 | 0.3153 | 0.41723 | 192.558 |
| subject | 10 Ind. Judgements | 80 | 130 | 110 | 110 | 120 | 180 | 0.27219 | 180 | 80 | 0.41723 | 192.558 |
| | Test Magnitudes | 0.1985 | 0.2515 | 0.3157 | 0.4015 | 0.5033 | 0.6241 | 0.41968 | 0.6241 | 0.1985 | | |
| | Ref Magnitudes | 0.3153 | 0.3156 | 0.3156 | 0.3154 | 0.3158 | 0.3166 | 0.001478 | 0.3166 | 0.3153 | 0.42329 | 159.5877 |
| subject | 11 Ind. Judgements | 75 | 100 | 90 | 110 | 133 | 120 | 0.19965 | 133 | 75 | 0.42329 | 159.5877 |
| | Test Magnitudes | 0.197 | 0.2506 | 0.3174 | 0.4044 | 0.5017 | 0.6229 | 0.41934 | 0.6229 | 0.197 | | |
| | Ref Magnitudes | 0.3152 | 0.3151 | 0.3174 | 0.3167 | 0.3152 | 0.3157 | 0.004722 | 0.3167 | 0.3151 | 1.6302 | 548.894 |
| subject | 12 Ind. Judgements | 40 | 50 | 105 | 115 | 180 | 250 | 0.64848 | 250 | 40 | 1.6302 | 548.894 |
| | Test Magnitudes | 0.1998 | 0.2508 | 0.3158 | 0.4018 | 0.5018 | 0.6259 | 0.4198 | 0.6259 | 0.1998 | | |
| | Ref Magnitudes | 0.3147 | 0.3145 | 0.315 | 0.3157 | 0.3146 | 0.3165 | 0.002488 | 0.3165 | 0.3145 | 1.1307 | 314.1337 |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 1.1307 314.1337 |

| Frequency 0.63 Hz | | | | | | | | | | | | |
|-------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|------------------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 100 | 180 | 400 | 350 | 350 | 500 | 0.46977 | 500 | 100 | 1.2071 | 944.4289 |
| | Test Magnitudes | 0.1934 | 0.2464 | 0.3325 | 0.427 | 0.5073 | 0.6427 | 0.42972 | 0.6427 | 0.1934 | | |
| | Ref Magnitudes | 0.3132 | 0.3133 | 0.3279 | 0.3293 | 0.3236 | 0.3262 | 0.022423 | 0.3293 | 0.3132 | 2.4632 | 817.7786 |
| subject | 2 Ind. Judgements | 20 | 25 | 50 | 75 | 175 | 300 | 1.0227 | 300 | 20 | 2.4632 | 817.7786 |
| | Test Magnitudes | 0.2047 | 0.2533 | 0.3302 | 0.4275 | 0.504 | 0.6329 | 0.4112 | 0.6329 | 0.2047 | | |
| | Ref Magnitudes | 0.3292 | 0.3223 | 0.3277 | 0.3277 | 0.3222 | 0.3197 | 0.01194 | 0.3292 | 0.3197 | 1.0103 | 312.2562 |
| subject | 3 Ind. Judgements | 100 | 50 | 75 | 150 | 200 | 200 | 0.49598 | 200 | 50 | 1.0103 | 312.2562 |
| | Test Magnitudes | 0.2031 | 0.258 | 0.3382 | 0.4351 | 0.5155 | 0.6495 | 0.41478 | 0.6495 | 0.2031 | | |
| | Ref Magnitudes | 0.3252 | 0.323 | 0.3285 | 0.3289 | 0.3291 | 0.3304 | 0.008957 | 0.3304 | 0.323 | 0.27996 | 151.5073 |
| subject | 4 Ind. Judgements | 100 | 100 | 100 | 130 | 140 | 120 | 0.1531 | 140 | 100 | 0.27996 | 151.5073 |
| | Test Magnitudes | 0.2033 | 0.2562 | 0.3261 | 0.4214 | 0.495 | 0.6244 | 0.40577 | 0.6244 | 0.2033 | | |
| | Ref Magnitudes | 0.3205 | 0.3205 | 0.3194 | 0.3198 | 0.3124 | 0.3123 | 0.012595 | 0.3205 | 0.3123 | 1.5764 | 707.0717 |
| subject | 5 Ind. Judgements | 50 | 110 | 125 | 200 | 175 | 425 | 0.72217 | 425 | 50 | 1.5764 | 707.0717 |
| | Test Magnitudes | 0.2056 | 0.2622 | 0.3318 | 0.4299 | 0.5154 | 0.6447 | 0.41335 | 0.6447 | 0.2056 | | |
| | Ref Magnitudes | 0.3284 | 0.3287 | 0.3276 | 0.3285 | 0.328 | 0.3291 | 0.001605 | 0.3291 | 0.3276 | 1.013 | 327.1472 |
| subject | 6 Ind. Judgements | 60 | 80 | 130 | 140 | 160 | 200 | 0.40163 | 200 | 60 | 1.013 | 327.1472 |
| | Test Magnitudes | 0.2025 | 0.2582 | 0.3314 | 0.4287 | 0.5154 | 0.644 | 0.41792 | 0.644 | 0.2025 | | |
| | Ref Magnitudes | 0.3273 | 0.328 | 0.329 | 0.3246 | 0.327 | 0.3265 | 0.004455 | 0.329 | 0.3246 | 0.55891 | 255.2412 |
| subject | 7 Ind. Judgements | 95 | 130 | 130 | 155 | 190 | 175 | 0.23696 | 190 | 95 | 0.55891 | 255.2412 |
| | Test Magnitudes | 0.1947 | 0.2581 | 0.3173 | 0.3951 | 0.4842 | 0.6151 | 0.40952 | 0.6151 | 0.1947 | | |
| | Ref Magnitudes | 0.3149 | 0.3202 | 0.3164 | 0.3142 | 0.3156 | 0.316 | 0.006653 | 0.3202 | 0.3142 | 0.36281 | 218.8292 |
| subject | 8 Ind. Judgements | 130 | 120 | 135 | 175 | 170 | 180 | 0.17278 | 180 | 120 | 0.36281 | 218.8292 |
| | Test Magnitudes | 0.1929 | 0.2532 | 0.3164 | 0.404 | 0.4888 | 0.6182 | 0.41607 | 0.6182 | 0.1929 | | |
| | Ref Magnitudes | 0.3172 | 0.3204 | 0.3196 | 0.3197 | 0.3169 | 0.3167 | 0.0052 | 0.3204 | 0.3167 | 0.45847 | 234.8324 |
| subject | 9 Ind. Judgements | 120 | 130 | 120 | 140 | 180 | 200 | 0.22729 | 200 | 120 | 0.45847 | 234.8324 |
| | Test Magnitudes | 0.1944 | 0.2549 | 0.3159 | 0.3945 | 0.4918 | 0.6187 | 0.416 | 0.6187 | 0.1944 | | |
| | Ref Magnitudes | 0.3172 | 0.3165 | 0.3154 | 0.3097 | 0.3164 | 0.3167 | 0.008924 | 0.3172 | 0.3097 | 0.71697 | 253.2331 |
| subject | 10 Ind. Judgements | 70 | 110 | 110 | 120 | 180 | 160 | 0.31496 | 180 | 70 | 0.71697 | 253.2331 |
| | Test Magnitudes | 0.1941 | 0.254 | 0.3165 | 0.3998 | 0.488 | 0.6169 | 0.41406 | 0.6169 | 0.1941 | | |
| | Ref Magnitudes | 0.3152 | 0.3153 | 0.3153 | 0.316 | 0.3154 | 0.3151 | 0.001011 | 0.316 | 0.3151 | 0.72901 | 217.161 |
| subject | 11 Ind. Judgements | 65 | 75 | 90 | 125 | 160 | 125 | 0.33689 | 160 | 65 | 0.72901 | 217.161 |
| | Test Magnitudes | 0.1951 | 0.2526 | 0.3173 | 0.4014 | 0.4904 | 0.6237 | 0.4183 | 0.6237 | 0.1951 | | |
| | Ref Magnitudes | 0.3193 | 0.317 | 0.3186 | 0.317 | 0.3157 | 0.3181 | 0.004067 | 0.3193 | 0.3157 | 1.6743 | 561.5911 |
| subject | 12 Ind. Judgements | 30 | 50 | 110 | 150 | 200 | 175 | 0.57433 | 200 | 30 | 1.6743 | 561.5911 |
| | Test Magnitudes | 0.1949 | 0.253 | 0.3158 | 0.4016 | 0.4909 | 0.6166 | 0.41447 | 0.6166 | 0.1949 | | |
| | Ref Magnitudes | 0.315 | 0.3152 | 0.3142 | 0.3165 | 0.3171 | 0.3144 | 0.003881 | 0.3171 | 0.3142 | 0.86968 | 283.7487 |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.86968 283.7487 |

| Frequency 0.8 Hz | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|------------------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 80 | 130 | 90 | 230 | 300 | 550 | 0.7763 | 550 | 80 | 1,4819 | 839.7913 |
| | Test Magnitudes | 0.1975 | 0.2284 | 0.3329 | 0.4126 | 0.5098 | 0.6378 | 0.43691 | 0.6378 | 0.1975 | | |
| | Ref Magnitudes | 0.3141 | 0.2547 | 0.3267 | 0.33 | 0.3299 | 0.3307 | 0.095061 | 0.3307 | 0.2547 | | |
| subject | 2 Ind. Judgements | 75 | 50 | 100 | 175 | 200 | 300 | 0.62361 | 300 | 50 | 1.4921 | 589.6791 |
| | Test Magnitudes | 0.2036 | 0.2485 | 0.3205 | 0.401 | 0.4926 | 0.6231 | 0.41299 | 0.6231 | 0.2036 | | |
| | Ref Magnitudes | 0.3229 | 0.325 | 0.3191 | 0.3232 | 0.3244 | 0.3258 | 0.00733 | 0.3258 | 0.3191 | | |
| subject | 3 Ind. Judgements | 20 | 75 | 200 | 250 | 150 | 175 | 0.58111 | 250 | 20 | 1.6772 | 606.3551 |
| | Test Magnitudes | 0.2108 | 0.2559 | 0.33 | 0.4059 | 0.5084 | 0.6384 | 0.41125 | 0.6384 | 0.2108 | | |
| | Ref Magnitudes | 0.3269 | 0.3275 | 0.3275 | 0.3245 | 0.3254 | 0.3283 | 0.004417 | 0.3283 | 0.3245 | | |
| subject | 4 Ind. Judgements | 60 | 75 | 80 | 140 | 120 | 120 | 0.31955 | 140 | 60 | 0.67905 | 191.8358 |
| | Test Magnitudes | 0.2057 | 0.2417 | 0.3233 | 0.3937 | 0.5024 | 0.6205 | 0.41596 | 0.6205 | 0.2057 | | |
| | Ref Magnitudes | 0.3163 | 0.3164 | 0.3127 | 0.3118 | 0.3198 | 0.3129 | 0.009695 | 0.3198 | 0.3118 | | |
| subject | 5 Ind. Judgements | 75 | 175 | 133 | 150 | 200 | 400 | 0.59203 | 400 | 75 | 1.1354 | 515.734 |
| | Test Magnitudes | 0.2134 | 0.2592 | 0.335 | 0.414 | 0.5092 | 0.6412 | 0.40636 | 0.6412 | 0.2134 | | |
| | Ref Magnitudes | 0.3267 | 0.3293 | 0.3265 | 0.3291 | 0.3279 | 0.3269 | 0.003766 | 0.3293 | 0.3265 | | |
| subject | 6 Ind. Judgements | 80 | 80 | 90 | 120 | 120 | 170 | 0.36339 | 170 | 80 | 0.79119 | 225.5332 |
| | Test Magnitudes | 0.2106 | 0.247 | 0.3285 | 0.4071 | 0.5072 | 0.6376 | 0.41659 | 0.6376 | 0.2106 | | |
| | Ref Magnitudes | 0.3252 | 0.3287 | 0.3297 | 0.3266 | 0.3269 | 0.3275 | 0.00487 | 0.3297 | 0.3252 | | |
| subject | 7 Ind. Judgements | 105 | 95 | 130 | 155 | 140 | 160 | 0.20138 | 160 | 95 | 0.44635 | 203.1889 |
| | Test Magnitudes | 0.2046 | 0.2533 | 0.33 | 0.4007 | 0.4878 | 0.6323 | 0.41073 | 0.6323 | 0.2046 | | |
| | Ref Magnitudes | 0.3144 | 0.316 | 0.3158 | 0.3166 | 0.3151 | 0.3206 | 0.006908 | 0.3206 | 0.3144 | | |
| subject | 8 Ind. Judgements | 140 | 160 | 150 | 160 | 250 | 180 | 0.22981 | 250 | 140 | 0.32804 | 238.4908 |
| | Test Magnitudes | 0.2066 | 0.2496 | 0.3237 | 0.4004 | 0.4881 | 0.6315 | 0.41336 | 0.6315 | 0.2066 | | |
| | Ref Magnitudes | 0.3188 | 0.3169 | 0.3182 | 0.3172 | 0.3163 | 0.3181 | 0.00295 | 0.3188 | 0.3163 | | |
| subject | 9 Ind. Judgements | 120 | 130 | 150 | 150 | 180 | 190 | 0.17821 | 190 | 120 | 0.41617 | 232.9628 |
| | Test Magnitudes | 0.2036 | 0.2483 | 0.3224 | 0.4017 | 0.4854 | 0.6253 | 0.41241 | 0.6253 | 0.2036 | | |
| | Ref Magnitudes | 0.3152 | 0.3151 | 0.3166 | 0.3162 | 0.3175 | 0.3174 | 0.003283 | 0.3175 | 0.3151 | | |
| subject | 10 Ind. Judgements | 80 | 110 | 140 | 120 | 140 | 140 | 0.19737 | 140 | 80 | 0.43299 | 186.3577 |
| | Test Magnitudes | 0.2037 | 0.2523 | 0.3273 | 0.4042 | 0.4892 | 0.6289 | 0.41068 | 0.6289 | 0.2037 | | |
| | Ref Magnitudes | 0.3146 | 0.3152 | 0.3158 | 0.3162 | 0.3162 | 0.3153 | 0.002002 | 0.3162 | 0.3146 | | |
| subject | 11 Ind. Judgements | 75 | 110 | 140 | 133 | 160 | 180 | 0.27891 | 180 | 75 | 0.70279 | 263.9129 |
| | Test Magnitudes | 0.2042 | 0.2531 | 0.3287 | 0.4032 | 0.4857 | 0.6291 | 0.40896 | 0.6291 | 0.2042 | | |
| | Ref Magnitudes | 0.3167 | 0.318 | 0.3188 | 0.3169 | 0.3156 | 0.3168 | 0.003521 | 0.3188 | 0.3156 | | |
| subject | 12 Ind. Judgements | 65 | 150 | 210 | 150 | 150 | 190 | 0.32639 | 210 | 65 | 0.65343 | 281.584 |
| | Test Magnitudes | 0.2043 | 0.2519 | 0.3256 | 0.4018 | 0.486 | 0.6289 | 0.41083 | 0.6289 | 0.2043 | | |
| | Ref Magnitudes | 0.3173 | 0.3152 | 0.3152 | 0.3156 | 0.3165 | 0.3155 | 0.002667 | 0.3173 | 0.3152 | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.69092 251.2019 |

| Frequency 1 Hz | | | | | | | | | | | | |
|----------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|----------|------------------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 80 | 100 | 280 | 270 | 220 | 300 | 0.45881 | 300 | 80 | 1.1508 | 600.5558 |
| | Test Magnitudes | 0.2081 | 0.2491 | 0.3253 | 0.4041 | 0.498 | 0.6331 | 0.41421 | 0.6331 | 0.2081 | | |
| | Ref Magnitudes | 0.3217 | 0.3262 | 0.3242 | 0.3296 | 0.3221 | 0.3224 | 0.009441 | 0.3296 | 0.3217 | | |
| subject | 2 Ind. Judgements | 75 | 75 | 125 | 125 | 250 | 275 | 0.56563 | 275 | 75 | 1.2983 | 533.2832 |
| | Test Magnitudes | 0.206 | 0.2338 | 0.3164 | 0.3898 | 0.4792 | 0.6136 | 0.41504 | 0.6136 | 0.206 | | |
| | Ref Magnitudes | 0.3237 | 0.3255 | 0.3275 | 0.3276 | 0.3284 | 0.3286 | 0.005835 | 0.3286 | 0.3237 | | |
| subject | 3 Ind. Judgements | 125 | 75 | 200 | 125 | 150 | 300 | 0.48407 | 300 | 75 | 0.81135 | 342.1188 |
| | Test Magnitudes | 0.2132 | 0.2405 | 0.3226 | 0.3978 | 0.5022 | 0.6189 | 0.40978 | 0.6189 | 0.2132 | | |
| | Ref Magnitudes | 0.3272 | 0.3264 | 0.3276 | 0.3232 | 0.3297 | 0.3295 | 0.007271 | 0.3297 | 0.3232 | | |
| subject | 4 Ind. Judgements | 30 | 50 | 80 | 120 | 80 | 135 | 0.48447 | 135 | 30 | 1.1755 | 248.4651 |
| | Test Magnitudes | 0.2099 | 0.2366 | 0.3263 | 0.3943 | 0.4964 | 0.6217 | 0.41439 | 0.6217 | 0.2099 | | |
| | Ref Magnitudes | 0.3198 | 0.3125 | 0.3183 | 0.3142 | 0.316 | 0.3135 | 0.009699 | 0.3198 | 0.3125 | | |
| subject | 5 Ind. Judgements | 133 | 150 | 133 | 200 | 100 | 200 | 0.26259 | 200 | 100 | 0.15167 | 173.0285 |
| | Test Magnitudes | 0.2114 | 0.2474 | 0.3319 | 0.4016 | 0.5023 | 0.6305 | 0.4099 | 0.6305 | 0.2114 | | |
| | Ref Magnitudes | 0.3262 | 0.3284 | 0.3285 | 0.3286 | 0.3274 | 0.3212 | 0.008736 | 0.3286 | 0.3212 | | |
| subject | 6 Ind. Judgements | 80 | 80 | 80 | 130 | 170 | 180 | 0.39087 | 180 | 80 | 0.72101 | 249.4712 |
| | Test Magnitudes | 0.1734 | 0.2083 | 0.3052 | 0.3791 | 0.5047 | 0.6317 | 0.48068 | 0.6317 | 0.1734 | | |
| | Ref Magnitudes | 0.3267 | 0.3269 | 0.3266 | 0.3276 | 0.3244 | 0.3269 | 0.003352 | 0.3276 | 0.3244 | | |
| subject | 7 Ind. Judgements | 105 | 130 | 110 | 150 | 135 | 160 | 0.16407 | 160 | 105 | 0.31042 | 180.6209 |
| | Test Magnitudes | 0.2031 | 0.2367 | 0.3168 | 0.3909 | 0.478 | 0.6255 | 0.42259 | 0.6255 | 0.2031 | | |
| | Ref Magnitudes | 0.3171 | 0.3146 | 0.3161 | 0.3149 | 0.315 | 0.3153 | 0.002967 | 0.3171 | 0.3146 | | |
| subject | 8 Ind. Judgements | 150 | 160 | 210 | 170 | 250 | 225 | 0.20628 | 250 | 150 | 0.40568 | 291.6933 |
| | Test Magnitudes | 0.2033 | 0.2551 | 0.3138 | 0.3934 | 0.4747 | 0.616 | 0.40496 | 0.616 | 0.2033 | | |
| | Ref Magnitudes | 0.3184 | 0.3188 | 0.3188 | 0.3175 | 0.3172 | 0.3172 | 0.002453 | 0.3188 | 0.3168 | | |
| subject | 9 Ind. Judgements | 150 | 180 | 150 | 150 | 150 | 190 | 0.1135 | 190 | 150 | 0.081128 | 174.9554 |
| | Test Magnitudes | 0.2033 | 0.251 | 0.3235 | 0.3966 | 0.4868 | 0.6238 | 0.41046 | 0.6238 | 0.2033 | | |
| | Ref Magnitudes | 0.3172 | 0.3166 | 0.3193 | 0.3155 | 0.3172 | 0.3177 | 0.003961 | 0.3193 | 0.3155 | | |
| subject | 10 Ind. Judgements | 30 | 130 | 120 | 110 | 140 | 130 | 0.36815 | 140 | 30 | 0.9464 | 263.1254 |
| | Test Magnitudes | 0.2057 | 0.2555 | 0.317 | 0.402 | 0.4864 | 0.6264 | 0.41051 | 0.6264 | 0.2057 | | |
| | Ref Magnitudes | 0.3164 | 0.3146 | 0.3153 | 0.316 | 0.3145 | 0.3164 | 0.002731 | 0.3164 | 0.3145 | | |
| subject | 11 Ind. Judgements | 120 | 125 | 140 | 150 | 130 | 140 | 0.083053 | 150 | 120 | 0.12694 | 152.5761 |
| | Test Magnitudes | 0.2069 | 0.253 | 0.3164 | 0.4019 | 0.4834 | 0.6224 | 0.40708 | 0.6224 | 0.2069 | | |
| | Ref Magnitudes | 0.3175 | 0.3155 | 0.3153 | 0.3192 | 0.3182 | 0.3158 | 0.004742 | 0.3192 | 0.3153 | | |
| subject | 12 Ind. Judgements | 95 | 90 | 175 | 190 | 220 | 250 | 0.38438 | 250 | 90 | 0.97784 | 435.3086 |
| | Test Magnitudes | 0.2046 | 0.2532 | 0.3171 | 0.4023 | 0.484 | 0.626 | 0.41081 | 0.626 | 0.2046 | | |
| | Ref Magnitudes | 0.3153 | 0.3145 | 0.3148 | 0.3142 | 0.3144 | 0.3147 | 0.001219 | 0.3153 | 0.3142 | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.76618 256.2983 |

| Frequency 1.25 Hz | | | | | | | | | | | | | |
|-------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|----------|----------|----------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 80 | 180 | 180 | 260 | 380 | 270 | 0.45477 | 380 | 80 | 1.1063 | 639.2398 | |
| | Test Magnitudes | 0.2128 | 0.2495 | 0.3163 | 0.3986 | 0.4695 | 0.6255 | 0.40507 | 0.6255 | 0.2128 | | | |
| | Ref Magnitudes | 0.3245 | 0.3141 | 0.3266 | 0.3225 | 0.3305 | 0.3245 | 0.016887 | 0.3305 | 0.3141 | | | |
| subject | 2 Ind. Judgements | 20 | 25 | 90 | 110 | 125 | 75 | 0.58681 | 125 | 20 | 1.524 | 286.6364 | |
| | Test Magnitudes | 0.2119 | 0.2585 | 0.3176 | 0.4003 | 0.488 | 0.6212 | 0.39969 | 0.6212 | 0.2119 | | | |
| | Ref Magnitudes | 0.321 | 0.3293 | 0.3284 | 0.3182 | 0.3217 | 0.3208 | 0.01398 | 0.3293 | 0.3182 | | | |
| subject | 3 Ind. Judgements | 25 | 115 | 120 | 150 | 160 | 200 | 0.46143 | 200 | 25 | 1.5575 | 542.5366 | |
| | Test Magnitudes | 0.2142 | 0.2598 | 0.3177 | 0.3898 | 0.4852 | 0.6125 | 0.3923 | 0.6125 | 0.2142 | | | |
| | Ref Magnitudes | 0.3247 | 0.327 | 0.329 | 0.329 | 0.3295 | 0.3279 | 0.005459 | 0.3295 | 0.3247 | | | |
| subject | 4 Ind. Judgements | 30 | 100 | 60 | 130 | 130 | 110 | 0.43213 | 130 | 30 | 1.0455 | 248.1475 | |
| | Test Magnitudes | 0.2062 | 0.2529 | 0.3156 | 0.3916 | 0.4821 | 0.6133 | 0.4031 | 0.6133 | 0.2062 | | | |
| | Ref Magnitudes | 0.3121 | 0.314 | 0.3154 | 0.3137 | 0.3126 | 0.3174 | 0.006194 | 0.3174 | 0.3121 | | | |
| subject | 5 Ind. Judgements | 75 | 125 | 150 | 200 | 250 | 200 | 0.3755 | 250 | 75 | 0.96475 | 419.6016 | |
| | Test Magnitudes | 0.2128 | 0.258 | 0.3157 | 0.3963 | 0.4915 | 0.6138 | 0.39651 | 0.6138 | 0.2128 | | | |
| | Ref Magnitudes | 0.3268 | 0.3269 | 0.3281 | 0.3282 | 0.3257 | 0.3281 | 0.003074 | 0.3282 | 0.3257 | | | |
| subject | 6 Ind. Judgements | 30 | 40 | 50 | 110 | 120 | 140 | 0.57651 | 140 | 30 | 1.1139 | 265.3354 | |
| | Test Magnitudes | 0.1399 | 0.1776 | 0.2779 | 0.3665 | 0.4697 | 0.6093 | 0.52642 | 0.6093 | 0.1399 | | | |
| | Ref Magnitudes | 0.3274 | 0.3276 | 0.328 | 0.3291 | 0.3283 | 0.3281 | 0.003068 | 0.3291 | 0.3251 | | | |
| subject | 7 Ind. Judgements | 105 | 120 | 125 | 175 | 165 | 175 | 0.21538 | 175 | 105 | 0.49275 | 236.7768 | |
| | Test Magnitudes | 0.2059 | 0.2592 | 0.3081 | 0.3745 | 0.4833 | 0.6257 | 0.41369 | 0.6257 | 0.2059 | | | |
| | Ref Magnitudes | 0.3147 | 0.3149 | 0.315 | 0.3151 | 0.3141 | 0.3156 | 0.001569 | 0.3156 | 0.3141 | | | |
| subject | 8 Ind. Judgements | 160 | 150 | 190 | 170 | 160 | 200 | 0.11306 | 200 | 150 | 0.15648 | 200.4899 | |
| | Test Magnitudes | 0.2053 | 0.2613 | 0.3198 | 0.4034 | 0.4895 | 0.6293 | 0.40728 | 0.6293 | 0.2053 | | | |
| | Ref Magnitudes | 0.3177 | 0.3172 | 0.319 | 0.3175 | 0.3181 | 0.3206 | 0.003977 | 0.3206 | 0.3172 | | | |
| subject | 9 Ind. Judgements | 130 | 180 | 120 | 120 | 170 | 150 | 0.17851 | 180 | 120 | 0.062498 | 152.7156 | |
| | Test Magnitudes | 0.2051 | 0.2573 | 0.3176 | 0.4073 | 0.4775 | 0.6023 | 0.39108 | 0.6023 | 0.2051 | | | |
| | Ref Magnitudes | 0.3158 | 0.3203 | 0.3174 | 0.3155 | 0.3148 | 0.3145 | 0.006859 | 0.3203 | 0.3145 | | | |
| subject | 10 Ind. Judgements | 120 | 50 | 90 | 120 | 80 | 170 | 0.39383 | 170 | 50 | 0.4802 | 159.9523 | |
| | Test Magnitudes | 0.212 | 0.2595 | 0.3163 | 0.4102 | 0.4877 | 0.624 | 0.40026 | 0.624 | 0.212 | | | |
| | Ref Magnitudes | 0.3156 | 0.3154 | 0.3156 | 0.3153 | 0.3169 | 0.3147 | 0.002297 | 0.3169 | 0.3147 | | | |
| subject | 11 Ind. Judgements | 70 | 140 | 133 | 150 | 175 | 220 | 0.33499 | 220 | 70 | 0.86549 | 339.4432 | |
| | Test Magnitudes | 0.2104 | 0.2641 | 0.3112 | 0.414 | 0.4836 | 0.6223 | 0.3988 | 0.6223 | 0.2104 | | | |
| | Ref Magnitudes | 0.3198 | 0.3178 | 0.3169 | 0.3186 | 0.3157 | 0.3153 | 0.005439 | 0.3198 | 0.3153 | | | |
| subject | 12 Ind. Judgements | 105 | 75 | 175 | 120 | 190 | 200 | 0.35465 | 200 | 75 | 0.70328 | 279.2533 | |
| | Test Magnitudes | 0.2065 | 0.2657 | 0.3141 | 0.4124 | 0.4791 | 0.6279 | 0.40268 | 0.6279 | 0.2065 | | | |
| | Ref Magnitudes | 0.3159 | 0.3145 | 0.3154 | 0.314 | 0.3145 | 0.3153 | 0.00226 | 0.3159 | 0.314 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.91512 | 272.2943 |

| Frequency 1.6 Hz | | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|----------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 100 | 280 | 160 | 180 | 150 | 250 | 0.35803 | 280 | 100 | 0.36595 | 260.0383 | |
| | Test Magnitudes | 0.1981 | 0.2471 | 0.3169 | 0.3968 | 0.4759 | 0.5947 | 0.39895 | 0.5947 | 0.1981 | | | |
| | Ref Magnitudes | 0.324 | 0.3311 | 0.323 | 0.3276 | 0.3154 | 0.3295 | 0.017472 | 0.3311 | 0.3154 | | | |
| subject | 2 Ind. Judgements | 25 | 125 | 110 | 125 | 150 | 110 | 0.39984 | 150 | 25 | 1.0709 | 290.6957 | |
| | Test Magnitudes | 0.1949 | 0.2541 | 0.3158 | 0.4021 | 0.4805 | 0.6077 | 0.40825 | 0.6077 | 0.1949 | | | |
| | Ref Magnitudes | 0.3242 | 0.3212 | 0.3295 | 0.3168 | 0.3262 | 0.3198 | 0.014334 | 0.3295 | 0.3168 | | | |
| subject | 3 Ind. Judgements | 33 | 80 | 150 | 125 | 125 | 200 | 0.48357 | 200 | 33 | 1.2997 | 424.3289 | |
| | Test Magnitudes | 0.1869 | 0.2415 | 0.3085 | 0.3839 | 0.4735 | 0.5889 | 0.41209 | 0.5889 | 0.1869 | | | |
| | Ref Magnitudes | 0.3266 | 0.3297 | 0.3284 | 0.3285 | 0.3291 | 0.3295 | 0.003419 | 0.3297 | 0.3266 | | | |
| subject | 4 Ind. Judgements | 40 | 40 | 120 | 110 | 120 | 160 | 0.49158 | 160 | 40 | 1.3284 | 358.9893 | |
| | Test Magnitudes | 0.1903 | 0.2477 | 0.3134 | 0.3903 | 0.4746 | 0.5762 | 0.39506 | 0.5762 | 0.1903 | | | |
| | Ref Magnitudes | 0.3137 | 0.3131 | 0.3168 | 0.3141 | 0.3134 | 0.3195 | 0.008041 | 0.3195 | 0.3131 | | | |
| subject | 5 Ind. Judgements | 150 | 50 | 150 | 200 | 125 | 300 | 0.51256 | 300 | 50 | 0.81056 | 342.2674 | |
| | Test Magnitudes | 0.188 | 0.2423 | 0.3139 | 0.3852 | 0.4726 | 0.5911 | 0.40965 | 0.5911 | 0.188 | | | |
| | Ref Magnitudes | 0.3282 | 0.327 | 0.3238 | 0.3275 | 0.3273 | 0.3276 | 0.004802 | 0.3282 | 0.3238 | | | |
| subject | 6 Ind. Judgements | 10 | 50 | 30 | 70 | 140 | 110 | 0.71941 | 140 | 10 | 0.95342 | 215.737 | |
| | Test Magnitudes | 0.0456 | 0.129 | 0.2395 | 0.3257 | 0.4012 | 0.5685 | 0.66455 | 0.5685 | 0.0456 | | | |
| | Ref Magnitudes | 0.3283 | 0.3268 | 0.3285 | 0.3292 | 0.3275 | 0.3291 | 0.002843 | 0.3292 | 0.3268 | | | |
| subject | 7 Ind. Judgements | 135 | 130 | 160 | 150 | 145 | 200 | 0.16456 | 200 | 130 | 0.29215 | 206.2789 | |
| | Test Magnitudes | 0.1982 | 0.2463 | 0.3286 | 0.4001 | 0.4796 | 0.5942 | 0.39533 | 0.5942 | 0.1982 | | | |
| | Ref Magnitudes | 0.3151 | 0.3148 | 0.316 | 0.3151 | 0.3169 | 0.3141 | 0.003112 | 0.3169 | 0.3141 | | | |
| subject | 8 Ind. Judgements | 140 | 150 | 220 | 170 | 200 | 250 | 0.22631 | 250 | 140 | 0.46538 | 298.2902 | |
| | Test Magnitudes | 0.1976 | 0.2525 | 0.3399 | 0.4026 | 0.4838 | 0.6123 | 0.39994 | 0.6123 | 0.1976 | | | |
| | Ref Magnitudes | 0.3165 | 0.3161 | 0.3185 | 0.3171 | 0.317 | 0.3184 | 0.003105 | 0.3185 | 0.3161 | | | |
| subject | 9 Ind. Judgements | 120 | 180 | 200 | 150 | 190 | 200 | 0.18486 | 200 | 120 | 0.3502 | 247.6921 | |
| | Test Magnitudes | 0.1962 | 0.2499 | 0.3332 | 0.3865 | 0.4627 | 0.5735 | 0.37797 | 0.5735 | 0.1962 | | | |
| | Ref Magnitudes | 0.315 | 0.3208 | 0.3164 | 0.3169 | 0.3159 | 0.3156 | 0.00657 | 0.3208 | 0.315 | | | |
| subject | 10 Ind. Judgements | 30 | 40 | 60 | 130 | 140 | 140 | 0.57948 | 140 | 30 | 1.5716 | 379.6423 | |
| | Test Magnitudes | 0.2033 | 0.2482 | 0.3374 | 0.4043 | 0.4912 | 0.6172 | 0.4031 | 0.6172 | 0.2033 | | | |
| | Ref Magnitudes | 0.3154 | 0.3155 | 0.3152 | 0.3154 | 0.3155 | 0.3157 | 0.000521 | 0.3157 | 0.3152 | | | |
| subject | 11 Ind. Judgements | 80 | 160 | 160 | 170 | 160 | 225 | 0.29092 | 225 | 80 | 0.66968 | 305.0625 | |
| | Test Magnitudes | 0.1986 | 0.2503 | 0.3267 | 0.4058 | 0.4916 | 0.6156 | 0.40815 | 0.6156 | 0.1986 | | | |
| | Ref Magnitudes | 0.3157 | 0.3163 | 0.3172 | 0.317 | 0.3157 | 0.3198 | 0.004834 | 0.3198 | 0.3157 | | | |
| subject | 12 Ind. Judgements | 125 | 120 | 140 | 180 | 160 | 215 | 0.23161 | 215 | 120 | 0.49106 | 251.5524 | |
| | Test Magnitudes | 0.2063 | 0.2566 | 0.3436 | 0.4115 | 0.5029 | 0.628 | 0.40151 | 0.628 | 0.2063 | | | |
| | Ref Magnitudes | 0.3163 | 0.3154 | 0.3155 | 0.3167 | 0.3174 | 0.3155 | 0.002567 | 0.3174 | 0.3154 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.74012 | 294.4929 |

Condition T

| Frequency 0.2 Hz | | | | | | | | | | | | | | | |
|-------------------|--------------------|--------|--------|--------|--------|--------|----------|----------|--------|-----------|----------|----------|----------|--|--|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | Coef.Var | Max | Min | Ind. n | Ind. k | | | | |
| subject | 1 Ind. Judgements | 30 | 60 | 80 | 70 | 60 | 0.3118 | 80 | 30 | 0.88048 | 175.5659 | | | | |
| | Test Magnitudes | 0.1833 | 0.2295 | 0.2874 | 0.3662 | 0.3819 | 0.29549 | 0.3819 | 0.1833 | | | | | | |
| | Ref Magnitudes | 0.3279 | 0.3283 | 0.3208 | 0.3222 | 0.3287 | 0.011573 | 0.3287 | 0.3208 | | | | | | |
| subject | 2 Ind. Judgements | 10 | 20 | 50 | 90 | 90 | 0.72467 | 90 | 10 | 3.1086 | 2048.565 | | | | |
| | Test Magnitudes | 0.1826 | 0.2284 | 0.287 | 0.3657 | 0.3772 | 0.29371 | 0.3772 | 0.1826 | | | | | | |
| | Ref Magnitudes | 0.3284 | 0.3261 | 0.3226 | 0.3216 | 0.3129 | 0.016976 | 0.3284 | 0.3129 | | | | | | |
| subject | 3 Ind. Judgements | 90 | 70 | 120 | 180 | 180 | 0.39606 | 180 | 70 | 1.1921 | 543.9179 | | | | |
| | Test Magnitudes | 0.1841 | 0.2305 | 0.2903 | 0.3691 | 0.3834 | 0.29575 | 0.3834 | 0.1841 | | | | | | |
| | Ref Magnitudes | 0.3306 | 0.3308 | 0.3294 | 0.3302 | 0.3303 | 0.001625 | 0.3308 | 0.3294 | | | | | | |
| subject | 4 Ind. Judgements | 75 | 80 | 130 | 150 | 100 | 0.30212 | 150 | 75 | 0.72635 | 260.641 | | | | |
| | Test Magnitudes | 0.1826 | 0.2299 | 0.2882 | 0.3675 | 0.3819 | 0.29662 | 0.3819 | 0.1826 | | | | | | |
| | Ref Magnitudes | 0.3223 | 0.3276 | 0.3254 | 0.3249 | 0.328 | 0.007065 | 0.328 | 0.3223 | | | | | | |
| subject | 5 Ind. Judgements | 75 | 50 | 66 | 50 | 80 | 0.21651 | 80 | 50 | -0.037236 | 60.0098 | | | | |
| | Test Magnitudes | 0.1805 | 0.225 | 0.2941 | 0.3608 | 0.3746 | 0.29511 | 0.3746 | 0.1805 | | | | | | |
| | Ref Magnitudes | 0.3221 | 0.321 | 0.3232 | 0.3221 | 0.3224 | 0.00245 | 0.3232 | 0.321 | | | | | | |
| subject | 6 Ind. Judgements | 20 | 10 | 30 | 40 | 30 | 0.43853 | 40 | 10 | 1.2032 | 111.7647 | | | | |
| | Test Magnitudes | 0.18 | 0.2248 | 0.283 | 0.3602 | 0.3732 | 0.29479 | 0.3732 | 0.18 | | | | | | |
| | Ref Magnitudes | 0.3222 | 0.3212 | 0.3221 | 0.3222 | 0.3175 | 0.006302 | 0.3222 | 0.3175 | | | | | | |
| subject | 7 Ind. Judgements | 150 | 140 | 170 | 40 | 130 | 0.3992 | 170 | 40 | 1.2884 | 357.8711 | | | | |
| | Test Magnitudes | 0.5065 | 0.4266 | 0.651 | 0.1991 | 0.4096 | 0.37479 | 0.651 | 0.1991 | | | | | | |
| | Ref Magnitudes | 0.3282 | 0.3282 | 0.3281 | 0.3282 | 0.3291 | 0.001267 | 0.3291 | 0.3281 | | | | | | |
| subject | 8 Ind. Judgements | 100 | 50 | 150 | 200 | 175 | 0.44598 | 200 | 50 | 1.1507 | 461.176 | | | | |
| | Test Magnitudes | 0.199 | 0.2502 | 0.3163 | 0.4035 | 0.4748 | 0.34034 | 0.4748 | 0.199 | | | | | | |
| | Ref Magnitudes | 0.3261 | 0.326 | 0.3258 | 0.3274 | 0.3255 | 0.002238 | 0.3274 | 0.3255 | | | | | | |
| subject | 9 Ind. Judgements | 70 | 100 | 90 | 110 | 70 | 0.20328 | 110 | 70 | 0.075083 | 94.6794 | | | | |
| | Test Magnitudes | 0.192 | 0.2405 | 0.3071 | 0.3869 | 0.4546 | 0.33688 | 0.4546 | 0.192 | | | | | | |
| | Ref Magnitudes | 0.3159 | 0.316 | 0.3158 | 0.3161 | 0.3157 | 0.000501 | 0.3161 | 0.3157 | | | | | | |
| subject | 10 Ind. Judgements | 40 | 70 | 50 | 80 | 135 | 0.49441 | 135 | 40 | 1.1265 | 261.8924 | | | | |
| | Test Magnitudes | 0.1941 | 0.2419 | 0.3071 | 0.395 | 0.4575 | 0.33839 | 0.4575 | 0.1941 | | | | | | |
| | Ref Magnitudes | 0.3164 | 0.3148 | 0.3148 | 0.3181 | 0.3159 | 0.004322 | 0.3181 | 0.3148 | | | | | | |
| subject | 11 Ind. Judgements | 30 | 100 | 40 | 25 | 40 | 0.64535 | 100 | 25 | -0.46621 | 23.9075 | | | | |
| | Test Magnitudes | 0.1996 | 0.2424 | 0.3172 | 0.4046 | 0.4591 | 0.3337 | 0.4591 | 0.1996 | | | | | | |
| | Ref Magnitudes | 0.328 | 0.3178 | 0.328 | 0.3281 | 0.3181 | 0.01705 | 0.3281 | 0.3178 | | | | | | |
| subject | 12 Ind. Judgements | 70 | 35 | 65 | 70 | 90 | 0.30018 | 90 | 35 | 0.55268 | 122.1724 | | | | |
| | Test Magnitudes | 0.1958 | 0.2411 | 0.3053 | 0.3882 | 0.4556 | 0.33389 | 0.4556 | 0.1958 | | | | | | |
| | Ref Magnitudes | 0.3201 | 0.3145 | 0.3149 | 0.3144 | 0.3143 | 0.007932 | 0.3201 | 0.3143 | | | | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | +++ | +++ | Median | 1.0035 | 218.1034 | | | |
| Frequency 0.25 Hz | | | | | | | | | | | | | | | |
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | | | |
| subject | 1 Ind. Judgements | 40 | 100 | 60 | 130 | 130 | 230 | 0.58397 | 230 | 40 | 1.2742 | 392.9394 | | | |
| | Test Magnitudes | 0.1924 | 0.2372 | 0.2996 | 0.3813 | 0.4772 | 0.6052 | 0.42555 | 0.6052 | 0.1924 | | | | | |
| | Ref Magnitudes | 0.3246 | 0.3205 | 0.3267 | 0.3285 | 0.3263 | 0.3265 | 0.008457 | 0.3285 | 0.3205 | | | | | |
| subject | 2 Ind. Judgements | 25 | 25 | 75 | 150 | 110 | 75 | 0.63454 | 150 | 25 | 1.3081 | 259.3339 | | | |
| | Test Magnitudes | 0.1889 | 0.2384 | 0.2977 | 0.3769 | 0.4716 | 0.6016 | 0.42559 | 0.6016 | 0.1889 | | | | | |
| | Ref Magnitudes | 0.3189 | 0.3248 | 0.3238 | 0.3203 | 0.3151 | 0.3224 | 0.011138 | 0.3248 | 0.3151 | | | | | |
| subject | 3 Ind. Judgements | 40 | 70 | 90 | 40 | 150 | 175 | 0.60299 | 175 | 40 | 1.1023 | 262.2588 | | | |
| | Test Magnitudes | 0.1934 | 0.2417 | 0.3019 | 0.3823 | 0.4801 | 0.6076 | 0.42289 | 0.6076 | 0.1934 | | | | | |
| | Ref Magnitudes | 0.3291 | 0.3313 | 0.3317 | 0.33 | 0.3263 | 0.3283 | 0.006094 | 0.3317 | 0.3263 | | | | | |
| subject | 4 Ind. Judgements | 30 | 140 | 70 | 120 | 90 | 170 | 0.48837 | 170 | 30 | 0.97958 | 260.8556 | | | |
| | Test Magnitudes | 0.1914 | 0.2398 | 0.2984 | 0.3801 | 0.4769 | 0.6043 | 0.42472 | 0.6043 | 0.1914 | | | | | |
| | Ref Magnitudes | 0.3247 | 0.3273 | 0.3209 | 0.328 | 0.3226 | 0.3274 | 0.008975 | 0.328 | 0.3209 | | | | | |
| subject | 5 Ind. Judgements | 75 | 150 | 90 | 200 | 250 | 300 | 0.50193 | 300 | 75 | 1.1613 | 562.7759 | | | |
| | Test Magnitudes | 0.1903 | 0.2364 | 0.2947 | 0.3735 | 0.4696 | 0.5946 | 0.42249 | 0.5946 | 0.1903 | | | | | |
| | Ref Magnitudes | 0.3227 | 0.3239 | 0.3198 | 0.3216 | 0.3216 | 0.3225 | 0.004282 | 0.3239 | 0.3198 | | | | | |
| subject | 6 Ind. Judgements | 5 | 50 | 70 | 40 | 150 | 180 | 0.82366 | 180 | 5 | 2.5686 | 868.2642 | | | |
| | Test Magnitudes | 0.1897 | 0.236 | 0.2949 | 0.3728 | 0.4691 | 0.5929 | 0.42203 | 0.5929 | 0.1897 | | | | | |
| | Ref Magnitudes | 0.3225 | 0.3228 | 0.3228 | 0.3199 | 0.3218 | 0.3229 | 0.003596 | 0.3229 | 0.3199 | | | | | |
| subject | 7 Ind. Judgements | 130 | 140 | 160 | 100 | 150 | 110 | 0.17594 | 160 | 100 | 0.36819 | 173.9624 | | | |
| | Test Magnitudes | 0.329 | 0.5048 | 0.5222 | 0.4766 | 0.5122 | 0.4048 | 0.16638 | 0.5222 | 0.329 | | | | | |
| | Ref Magnitudes | 0.3295 | 0.3295 | 0.3304 | 0.3301 | 0.3302 | 0.3307 | 0.001468 | 0.3307 | 0.3295 | | | | | |
| subject | 8 Ind. Judgements | 125 | 125 | 150 | 150 | 175 | 175 | 0.14907 | 175 | 125 | 0.33187 | 209.3498 | | | |
| | Test Magnitudes | 0.1998 | 0.2499 | 0.3168 | 0.4042 | 0.5027 | 0.6334 | 0.42441 | 0.6334 | 0.1998 | | | | | |
| | Ref Magnitudes | 0.3275 | 0.3265 | 0.3263 | 0.327 | 0.3281 | 0.3245 | 0.003803 | 0.3281 | 0.3245 | | | | | |
| subject | 9 Ind. Judgements | 100 | 90 | 80 | 90 | 130 | 120 | 0.1909 | 130 | 80 | 0.25953 | 132.1491 | | | |
| | Test Magnitudes | 0.1933 | 0.2405 | 0.3066 | 0.3906 | 0.4826 | 0.6166 | 0.42693 | 0.6166 | 0.1933 | | | | | |
| | Ref Magnitudes | 0.3167 | 0.3147 | 0.3151 | 0.316 | 0.3152 | 0.3164 | 0.00253 | 0.3167 | 0.3147 | | | | | |
| subject | 10 Ind. Judgements | 25 | 30 | 50 | 115 | 60 | 180 | 0.78225 | 180 | 25 | 1.5841 | 324.5088 | | | |
| | Test Magnitudes | 0.1935 | 0.2426 | 0.3051 | 0.3906 | 0.4853 | 0.6153 | 0.42574 | 0.6153 | 0.1935 | | | | | |
| | Ref Magnitudes | 0.3165 | 0.3154 | 0.3145 | 0.3157 | 0.3156 | 0.317 | 0.002771 | 0.317 | 0.3145 | | | | | |
| subject | 11 Ind. Judgements | 50 | 25 | 30 | 50 | 60 | 80 | 0.40889 | 80 | 25 | 0.68562 | 92.7984 | | | |
| | Test Magnitudes | 0.2002 | 0.25 | 0.3166 | 0.4054 | 0.4874 | 0.6376 | 0.42395 | 0.6376 | 0.2002 | | | | | |
| | Ref Magnitudes | 0.3283 | 0.3256 | 0.3255 | 0.3276 | 0.3182 | 0.3276 | 0.011492 | 0.3283 | 0.3182 | | | | | |
| subject | 12 Ind. Judgements | 90 | 90 | 50 | 60 | 105 | 115 | 0.29763 | 115 | 50 | 0.22938 | 104.0757 | | | |
| | Test Magnitudes | 0.1924 | 0.2452 | 0.3061 | 0.3895 | 0.4869 | 0.6126 | 0.42333 | 0.6126 | 0.1924 | | | | | |
| | Ref Magnitudes | 0.3155 | 0.3192 | 0.3147 | 0.315 | 0.3166 | 0.3153 | 0.005297 | 0.3192 | 0.3147 | | | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 1.0409 | 260.0948 | | |

| Frequency 0.315 Hz | | | | | | | | | | | | | |
|--------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|----------|----------|----------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 50 | 100 | 120 | 60 | 100 | 280 | 0.70586 | 280 | 50 | 0.99132 | 282.9915 | |
| | Test Magnitudes | 0.1995 | 0.2486 | 0.3117 | 0.3943 | 0.4926 | 0.6189 | 0.41778 | 0.6189 | 0.1995 | | | |
| | Ref Magnitudes | 0.3289 | 0.3272 | 0.3257 | 0.3273 | 0.3289 | 0.3283 | 0.003774 | 0.3289 | 0.3257 | | | |
| subject | 2 Ind. Judgements | 75 | 50 | 75 | 150 | 125 | 150 | 0.41338 | 150 | 50 | 0.87098 | 242.5297 | |
| | Test Magnitudes | 0.1968 | 0.2431 | 0.306 | 0.3901 | 0.4878 | 0.6132 | 0.42167 | 0.6132 | 0.1968 | | | |
| | Ref Magnitudes | 0.3241 | 0.3192 | 0.3187 | 0.3227 | 0.3253 | 0.323 | 0.008254 | 0.3253 | 0.3187 | | | |
| subject | 3 Ind. Judgements | 430 | 125 | 110 | 115 | 160 | 250 | 0.62948 | 430 | 110 | -0.24191 | 134.7703 | |
| | Test Magnitudes | 0.2002 | 0.2503 | 0.3146 | 0.3968 | 0.4945 | 0.622 | 0.41702 | 0.622 | 0.2002 | | | |
| | Ref Magnitudes | 0.33 | 0.3307 | 0.3315 | 0.3304 | 0.3299 | 0.3316 | 0.002209 | 0.3316 | 0.3299 | | | |
| subject | 4 Ind. Judgements | 90 | 80 | 75 | 100 | 110 | 140 | 0.23952 | 140 | 75 | 0.43485 | 153.6682 | |
| | Test Magnitudes | 0.1966 | 0.2472 | 0.3066 | 0.3895 | 0.4903 | 0.6126 | 0.41923 | 0.6126 | 0.1966 | | | |
| | Ref Magnitudes | 0.3225 | 0.3276 | 0.3201 | 0.3203 | 0.3274 | 0.3186 | 0.012036 | 0.3276 | 0.3186 | | | |
| subject | 5 Ind. Judgements | 80 | 125 | 200 | 80 | 265 | 300 | 0.54208 | 300 | 80 | 0.99662 | 441.3025 | |
| | Test Magnitudes | 0.1952 | 0.2457 | 0.3084 | 0.3891 | 0.4842 | 0.6071 | 0.41585 | 0.6071 | 0.1952 | | | |
| | Ref Magnitudes | 0.3226 | 0.3223 | 0.3219 | 0.3231 | 0.3221 | 0.3207 | 0.002518 | 0.3231 | 0.3207 | | | |
| subject | 6 Ind. Judgements | 50 | 70 | 90 | 90 | 140 | 140 | 0.37962 | 140 | 50 | 0.91182 | 239.3506 | |
| | Test Magnitudes | 0.1966 | 0.2444 | 0.3076 | 0.3881 | 0.4836 | 0.6066 | 0.41555 | 0.6066 | 0.1966 | | | |
| | Ref Magnitudes | 0.3231 | 0.3225 | 0.3232 | 0.3235 | 0.3233 | 0.3228 | 0.001119 | 0.3235 | 0.3225 | | | |
| subject | 7 Ind. Judgements | 90 | 105 | 190 | 150 | 140 | 150 | 0.25994 | 190 | 90 | 0.58339 | 254.0788 | |
| | Test Magnitudes | 0.2528 | 0.2627 | 0.6559 | 0.3519 | 0.3345 | 0.26 | 0.43695 | 0.6559 | 0.2528 | | | |
| | Ref Magnitudes | 0.3305 | 0.3311 | 0.3308 | 0.3309 | 0.3308 | 0.331 | 0.006627 | 0.3311 | 0.3305 | | | |
| subject | 8 Ind. Judgements | 75 | 100 | 75 | 125 | 150 | 175 | 0.34993 | 175 | 75 | 0.74646 | 238.624 | |
| | Test Magnitudes | 0.2035 | 0.2526 | 0.3169 | 0.4007 | 0.5031 | 0.637 | 0.42262 | 0.637 | 0.2035 | | | |
| | Ref Magnitudes | 0.326 | 0.3284 | 0.3255 | 0.3224 | 0.3273 | 0.3276 | 0.006572 | 0.3284 | 0.3224 | | | |
| subject | 9 Ind. Judgements | 100 | 100 | 100 | 90 | 120 | 130 | 0.14114 | 130 | 90 | 0.21792 | 133.2792 | |
| | Test Magnitudes | 0.1969 | 0.2443 | 0.3073 | 0.3912 | 0.4883 | 0.617 | 0.42265 | 0.617 | 0.1969 | | | |
| | Ref Magnitudes | 0.3167 | 0.316 | 0.3159 | 0.316 | 0.3164 | 0.3168 | 0.001233 | 0.3168 | 0.3159 | | | |
| subject | 10 Ind. Judgements | 80 | 140 | 40 | 150 | 150 | 120 | 0.39328 | 150 | 40 | 0.44179 | 164.6916 | |
| | Test Magnitudes | 0.1972 | 0.2439 | 0.3077 | 0.3926 | 0.485 | 0.623 | 0.42552 | 0.623 | 0.1972 | | | |
| | Ref Magnitudes | 0.3158 | 0.3161 | 0.3168 | 0.3164 | 0.3149 | 0.3188 | 0.004143 | 0.3188 | 0.3149 | | | |
| subject | 11 Ind. Judgements | 50 | 70 | 50 | 75 | 75 | 65 | 0.18051 | 75 | 50 | 0.24699 | 81.5723 | |
| | Test Magnitudes | 0.2032 | 0.2522 | 0.3179 | 0.4046 | 0.5062 | 0.6189 | 0.41187 | 0.6189 | 0.2032 | | | |
| | Ref Magnitudes | 0.3261 | 0.3247 | 0.3269 | 0.3273 | 0.3275 | 0.3182 | 0.010884 | 0.3275 | 0.3182 | | | |
| subject | 12 Ind. Judgements | 80 | 80 | 55 | 100 | 135 | 105 | 0.29557 | 135 | 55 | 0.46106 | 144.6288 | |
| | Test Magnitudes | 0.2024 | 0.2474 | 0.3062 | 0.3956 | 0.4883 | 0.6139 | 0.41437 | 0.6139 | 0.2024 | | | |
| | Ref Magnitudes | 0.3239 | 0.3206 | 0.3147 | 0.3195 | 0.3167 | 0.3151 | 0.011216 | 0.3239 | 0.3147 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.52222 | 201.6578 |

| Frequency 0.4 Hz | | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|----------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 80 | 90 | 70 | 130 | 200 | 400 | 0.77989 | 400 | 70 | 1.3774 | 534.8732 | |
| | Test Magnitudes | 0.2042 | 0.2558 | 0.3207 | 0.4068 | 0.5114 | 0.6425 | 0.4228 | 0.6425 | 0.2042 | | | |
| | Ref Magnitudes | 0.328 | 0.3283 | 0.3275 | 0.3281 | 0.3289 | 0.3283 | 0.002679 | 0.3283 | 0.3281 | | | |
| subject | 2 Ind. Judgements | 75 | 50 | 50 | 175 | 150 | 125 | 0.51287 | 175 | 50 | 0.88811 | 232.2943 | |
| | Test Magnitudes | 0.1984 | 0.2509 | 0.3137 | 0.3978 | 0.5029 | 0.6235 | 0.42095 | 0.6235 | 0.1984 | | | |
| | Ref Magnitudes | 0.3173 | 0.3225 | 0.3195 | 0.3182 | 0.3199 | 0.3102 | 0.013154 | 0.3225 | 0.3102 | | | |
| subject | 3 Ind. Judgements | 50 | 80 | 80 | 65 | 160 | 160 | 0.48823 | 160 | 50 | 0.95252 | 235.719 | |
| | Test Magnitudes | 0.2059 | 0.257 | 0.3225 | 0.4114 | 0.514 | 0.645 | 0.42152 | 0.645 | 0.2059 | | | |
| | Ref Magnitudes | 0.331 | 0.3304 | 0.3301 | 0.3317 | 0.3307 | 0.331 | 0.001682 | 0.3317 | 0.3301 | | | |
| subject | 4 Ind. Judgements | 70 | 70 | 70 | 100 | 90 | 140 | 0.30631 | 140 | 70 | 0.60525 | 165.3682 | |
| | Test Magnitudes | 0.2048 | 0.2518 | 0.3146 | 0.4003 | 0.5022 | 0.5237 | 0.35865 | 0.5237 | 0.2048 | | | |
| | Ref Magnitudes | 0.3287 | 0.324 | 0.3205 | 0.3215 | 0.3199 | 0.2598 | 0.083124 | 0.3287 | 0.2598 | | | |
| subject | 5 Ind. Judgements | 75 | 100 | 100 | 100 | 325 | 300 | 0.68191 | 325 | 75 | 1.2964 | 531.9055 | |
| | Test Magnitudes | 0.2007 | 0.2506 | 0.3153 | 0.3999 | 0.5051 | 0.6334 | 0.42491 | 0.6334 | 0.2007 | | | |
| | Ref Magnitudes | 0.3237 | 0.3235 | 0.3219 | 0.3207 | 0.3229 | 0.3244 | 0.004173 | 0.3244 | 0.3207 | | | |
| subject | 6 Ind. Judgements | 40 | 90 | 100 | 120 | 140 | 200 | 0.46585 | 200 | 40 | 1.1825 | 350.0268 | |
| | Test Magnitudes | 0.2002 | 0.2509 | 0.3171 | 0.4023 | 0.5037 | 0.6312 | 0.42246 | 0.6312 | 0.2002 | | | |
| | Ref Magnitudes | 0.3229 | 0.3232 | 0.3229 | 0.3212 | 0.3225 | 0.3232 | 0.002342 | 0.3232 | 0.3212 | | | |
| subject | 7 Ind. Judgements | 120 | 110 | 220 | 190 | 95 | 110 | 0.36374 | 220 | 95 | 0.72117 | 291.1509 | |
| | Test Magnitudes | 0.2189 | 0.264 | 0.6474 | 0.5111 | 0.2505 | 0.3261 | 0.46405 | 0.6474 | 0.2189 | | | |
| | Ref Magnitudes | 0.3309 | 0.3311 | 0.3312 | 0.3315 | 0.3314 | 0.3314 | 0.000682 | 0.3315 | 0.3309 | | | |
| subject | 8 Ind. Judgements | 75 | 75 | 75 | 150 | 200 | 200 | 0.48063 | 200 | 75 | 1.0653 | 345.2137 | |
| | Test Magnitudes | 0.2023 | 0.2582 | 0.3245 | 0.4084 | 0.5053 | 0.6371 | 0.4167 | 0.6371 | 0.2023 | | | |
| | Ref Magnitudes | 0.3238 | 0.3272 | 0.328 | 0.3265 | 0.328 | 0.3281 | 0.005066 | 0.3281 | 0.3238 | | | |
| subject | 9 Ind. Judgements | 110 | 90 | 110 | 110 | 105 | 210 | 0.35559 | 210 | 90 | 0.46139 | 191.0675 | |
| | Test Magnitudes | 0.1957 | 0.2491 | 0.3125 | 0.3978 | 0.4853 | 0.6154 | 0.41612 | 0.6154 | 0.1957 | | | |
| | Ref Magnitudes | 0.3149 | 0.316 | 0.3146 | 0.3166 | 0.3144 | 0.3166 | 0.003185 | 0.3166 | 0.3144 | | | |
| subject | 10 Ind. Judgements | 60 | 70 | 115 | 120 | 160 | 180 | 0.40437 | 180 | 60 | 1.0016 | 312.2969 | |
| | Test Magnitudes | 0.1966 | 0.2464 | 0.3113 | 0.3955 | 0.4895 | 0.6175 | 0.41871 | 0.6175 | 0.1966 | | | |
| | Ref Magnitudes | 0.3151 | 0.3148 | 0.3149 | 0.3158 | 0.3165 | 0.3168 | 0.002709 | 0.3168 | 0.3148 | | | |
| subject | 11 Ind. Judgements | 80 | 40 | 80 | 85 | 190 | 160 | 0.53652 | 190 | 40 | 1.0254 | 267.0624 | |
| | Test Magnitudes | 0.2039 | 0.2504 | 0.3253 | 0.411 | 0.4909 | 0.636 | 0.41644 | 0.636 | 0.2039 | | | |
| | Ref Magnitudes | 0.3287 | 0.3183 | 0.3283 | 0.3271 | 0.3179 | 0.3256 | 0.015221 | 0.3287 | 0.3179 | | | |
| subject | 12 Ind. Judgements | 40 | 105 | 110 | 110 | 110 | 130 | 0.30794 | 130 | 40 | 0.7615 | 210.736 | |
| | Test Magnitudes | 0.1965 | 0.2482 | 0.3171 | 0.3949 | 0.4873 | 0.6216 | 0.41885 | 0.6216 | 0.1965 | | | |
| | Ref Magnitudes | 0.315 | 0.3152 | 0.3196 | 0.315 | 0.3144 | 0.3185 | 0.006917 | 0.3196 | 0.3144 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.97705 | 279.1067 |

| Frequency 0.5 Hz | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|
| | Ind. Data-> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k |
| subject | 1 Ind. Judgements | 40 | 100 | 150 | 160 | 300 | 350 | 0.64784 | 350 | 40 | 1,7122 | 801.656 |
| | Test Magnitudes | 0.2077 | 0.2594 | 0.3254 | 0.4209 | 0.5298 | 0.6701 | 0.43423 | 0.6701 | 0.2077 | | |
| | Ref Magnitudes | 0.3281 | 0.3277 | 0.3246 | 0.329 | 0.3287 | 0.3267 | 0.004949 | 0.329 | 0.3246 | | |
| subject | 2 Ind. Judgements | 100 | 50 | 75 | 110 | 250 | 175 | 0.58104 | 250 | 50 | 0.95975 | 290.5746 |
| | Test Magnitudes | 0.2012 | 0.2548 | 0.3249 | 0.4139 | 0.5166 | 0.6598 | 0.43444 | 0.6598 | 0.2012 | | |
| | Ref Magnitudes | 0.3232 | 0.3237 | 0.3246 | 0.3242 | 0.3186 | 0.3218 | 0.006892 | 0.3246 | 0.3186 | | |
| subject | 3 Ind. Judgements | 30 | 70 | 95 | 120 | 150 | 180 | 0.50589 | 180 | 30 | 1.4036 | 369.7703 |
| | Test Magnitudes | 0.2106 | 0.2629 | 0.3289 | 0.4237 | 0.5284 | 0.6714 | 0.42884 | 0.6714 | 0.2106 | | |
| | Ref Magnitudes | 0.3309 | 0.3323 | 0.3285 | 0.3306 | 0.3281 | 0.3254 | 0.007505 | 0.3323 | 0.3254 | | |
| subject | 4 Ind. Judgements | 50 | 70 | 100 | 90 | 100 | 130 | 0.30631 | 130 | 50 | 0.68941 | 171.9305 |
| | Test Magnitudes | 0.2001 | 0.2591 | 0.3272 | 0.4177 | 0.5234 | 0.6533 | 0.43522 | 0.6533 | 0.2001 | | |
| | Ref Magnitudes | 0.3212 | 0.3281 | 0.3273 | 0.3272 | 0.3248 | 0.3235 | 0.008217 | 0.3281 | 0.3212 | | |
| subject | 5 Ind. Judgements | 100 | 100 | 110 | 250 | 300 | 275 | 0.53044 | 300 | 100 | 1.1135 | 517.4123 |
| | Test Magnitudes | 0.2029 | 0.2551 | 0.3197 | 0.4135 | 0.5213 | 0.6591 | 0.43554 | 0.6591 | 0.2029 | | |
| | Ref Magnitudes | 0.3211 | 0.322 | 0.3192 | 0.3232 | 0.3232 | 0.321 | 0.004746 | 0.3232 | 0.3192 | | |
| subject | 6 Ind. Judgements | 30 | 40 | 110 | 150 | 140 | 150 | 0.5324 | 150 | 30 | 1.4696 | 379.0861 |
| | Test Magnitudes | 0.2044 | 0.2547 | 0.3234 | 0.413 | 0.5209 | 0.6589 | 0.43305 | 0.6589 | 0.2044 | | |
| | Ref Magnitudes | 0.3231 | 0.3221 | 0.3234 | 0.3231 | 0.3232 | 0.3207 | 0.00321 | 0.3234 | 0.3207 | | |
| subject | 7 Ind. Judgements | 230 | 115 | 110 | 105 | 105 | 70 | 0.44917 | 230 | 70 | 0.86107 | 262.4852 |
| | Test Magnitudes | 0.6486 | 0.3427 | 0.5034 | 0.3319 | 0.4043 | 0.2047 | 0.37903 | 0.6486 | 0.2047 | | |
| | Ref Magnitudes | 0.3314 | 0.3317 | 0.3312 | 0.3315 | 0.3314 | 0.3316 | 0.000528 | 0.3317 | 0.3312 | | |
| subject | 8 Ind. Judgements | 100 | 125 | 125 | 140 | 150 | 175 | 0.18829 | 175 | 100 | 0.43559 | 207.9592 |
| | Test Magnitudes | 0.2056 | 0.2571 | 0.3273 | 0.4112 | 0.511 | 0.6341 | 0.41276 | 0.6341 | 0.2056 | | |
| | Ref Magnitudes | 0.3272 | 0.3244 | 0.3272 | 0.3234 | 0.3204 | 0.3209 | 0.009109 | 0.3272 | 0.3204 | | |
| subject | 9 Ind. Judgements | 120 | 110 | 140 | 130 | 140 | 130 | 0.091094 | 140 | 110 | 0.13159 | 146.5708 |
| | Test Magnitudes | 0.1984 | 0.2513 | 0.3165 | 0.4007 | 0.5043 | 0.6226 | 0.41897 | 0.6226 | 0.1984 | | |
| | Ref Magnitudes | 0.3145 | 0.3156 | 0.3161 | 0.3151 | 0.3167 | 0.3157 | 0.002425 | 0.3167 | 0.3145 | | |
| subject | 10 Ind. Judgements | 50 | 60 | 100 | 110 | 150 | 130 | 0.38987 | 150 | 50 | 0.9574 | 250.7844 |
| | Test Magnitudes | 0.1993 | 0.2517 | 0.3154 | 0.4017 | 0.5036 | 0.62 | 0.41662 | 0.62 | 0.1993 | | |
| | Ref Magnitudes | 0.3167 | 0.3167 | 0.3153 | 0.3161 | 0.3164 | 0.315 | 0.002296 | 0.3167 | 0.315 | | |
| subject | 11 Ind. Judgements | 100 | 110 | 100 | 100 | 230 | 125 | 0.40127 | 230 | 100 | 0.43209 | 187.8958 |
| | Test Magnitudes | 0.2069 | 0.2533 | 0.326 | 0.4048 | 0.5188 | 0.6292 | 0.41416 | 0.6292 | 0.2069 | | |
| | Ref Magnitudes | 0.3283 | 0.3181 | 0.3259 | 0.3188 | 0.3251 | 0.318 | 0.014226 | 0.3283 | 0.318 | | |
| subject | 12 Ind. Judgements | 110 | 105 | 105 | 110 | 125 | 170 | 0.20841 | 170 | 105 | 0.33398 | 167.8367 |
| | Test Magnitudes | 0.1992 | 0.2511 | 0.3203 | 0.4068 | 0.5062 | 0.6258 | 0.41858 | 0.6258 | 0.1992 | | |
| | Ref Magnitudes | 0.3152 | 0.315 | 0.3201 | 0.3201 | 0.3169 | 0.3171 | 0.007118 | 0.3201 | 0.315 | | |
| +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.90924 | 256.6348 |

| Frequency 0.63 Hz | | | | | | | | | | | | | |
|-------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|----------|
| | Ind. Data-> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 100 | 100 | 130 | 170 | 300 | 500 | 0.72722 | 500 | 100 | 1.4048 | 722.5418 | |
| | Test Magnitudes | 0.2016 | 0.2649 | 0.3368 | 0.4262 | 0.5177 | 0.6538 | 0.419 | 0.6538 | 0.2016 | | | |
| | Ref Magnitudes | 0.3281 | 0.3277 | 0.3281 | 0.322 | 0.3267 | 0.3283 | 0.007431 | 0.3283 | 0.322 | | | |
| subject | 2 Ind. Judgements | 90 | 50 | 50 | 150 | 75 | 125 | 0.45134 | 150 | 50 | 0.48663 | 135.2724 | |
| | Test Magnitudes | 0.2 | 0.2571 | 0.3265 | 0.4167 | 0.514 | 0.6302 | 0.41515 | 0.6302 | 0.2 | | | |
| | Ref Magnitudes | 0.3207 | 0.3259 | 0.323 | 0.316 | 0.3264 | 0.3141 | 0.015876 | 0.3264 | 0.3141 | | | |
| subject | 3 Ind. Judgements | 105 | 80 | 60 | 120 | 125 | 130 | 0.2697 | 130 | 60 | 0.37381 | 143.7728 | |
| | Test Magnitudes | 0.2078 | 0.2636 | 0.3411 | 0.438 | 0.5231 | 0.6568 | 0.41516 | 0.6568 | 0.2078 | | | |
| | Ref Magnitudes | 0.3295 | 0.3289 | 0.331 | 0.3313 | 0.3311 | 0.331 | 0.003042 | 0.3313 | 0.3289 | | | |
| subject | 4 Ind. Judgements | 50 | 70 | 100 | 90 | 120 | 120 | 0.30402 | 120 | 50 | 0.72681 | 181.4065 | |
| | Test Magnitudes | 0.2028 | 0.26 | 0.3292 | 0.4308 | 0.5099 | 0.6473 | 0.41824 | 0.6473 | 0.2028 | | | |
| | Ref Magnitudes | 0.3282 | 0.3277 | 0.3247 | 0.3286 | 0.3216 | 0.3272 | 0.008258 | 0.3286 | 0.3216 | | | |
| subject | 5 Ind. Judgements | 66 | 66 | 110 | 150 | 225 | 250 | 0.54628 | 250 | 66 | 1.3312 | 476.4049 | |
| | Test Magnitudes | 0.2056 | 0.2612 | 0.3326 | 0.4262 | 0.5119 | 0.6444 | 0.41312 | 0.6444 | 0.2056 | | | |
| | Ref Magnitudes | 0.3218 | 0.3233 | 0.3226 | 0.3212 | 0.3225 | 0.3245 | 0.003586 | 0.3245 | 0.3212 | | | |
| subject | 6 Ind. Judgements | 60 | 90 | 110 | 110 | 150 | 180 | 0.36634 | 180 | 60 | 0.87775 | 264.1848 | |
| | Test Magnitudes | 0.2061 | 0.2604 | 0.3309 | 0.4275 | 0.5108 | 0.6429 | 0.41266 | 0.6429 | 0.2061 | | | |
| | Ref Magnitudes | 0.323 | 0.3231 | 0.3217 | 0.3232 | 0.3232 | 0.3234 | 0.001916 | 0.3234 | 0.3217 | | | |
| subject | 7 Ind. Judgements | 160 | 90 | 100 | 130 | 100 | 200 | 0.32996 | 200 | 90 | 0.74426 | 284.3943 | |
| | Test Magnitudes | 0.4246 | 0.2156 | 0.2073 | 0.4198 | 0.3171 | 0.5111 | 0.35277 | 0.5111 | 0.2073 | | | |
| | Ref Magnitudes | 0.3319 | 0.3307 | 0.3306 | 0.3307 | 0.3306 | 0.3316 | 0.001745 | 0.3319 | 0.3306 | | | |
| subject | 8 Ind. Judgements | 125 | 125 | 175 | 150 | 150 | 200 | 0.18957 | 200 | 125 | 0.32888 | 212.2469 | |
| | Test Magnitudes | 0.1907 | 0.2641 | 0.328 | 0.4169 | 0.5104 | 0.6394 | 0.42244 | 0.6394 | 0.1907 | | | |
| | Ref Magnitudes | 0.319 | 0.3277 | 0.328 | 0.3285 | 0.3283 | 0.327 | 0.11247 | 0.3285 | 0.319 | | | |
| subject | 9 Ind. Judgements | 120 | 150 | 120 | 140 | 150 | 200 | 0.20072 | 200 | 120 | 0.34294 | 206.6169 | |
| | Test Magnitudes | 0.1943 | 0.2559 | 0.3191 | 0.4001 | 0.4806 | 0.6225 | 0.41397 | 0.6225 | 0.1943 | | | |
| | Ref Magnitudes | 0.3149 | 0.3165 | 0.3168 | 0.314 | 0.3098 | 0.3161 | 0.008305 | 0.3168 | 0.3098 | | | |
| subject | 10 Ind. Judgements | 30 | 110 | 110 | 120 | 130 | 180 | 0.42743 | 180 | 30 | 1.2155 | 356.4067 | |
| | Test Magnitudes | 0.1935 | 0.2543 | 0.3178 | 0.4009 | 0.4923 | 0.6207 | 0.41691 | 0.6207 | 0.1935 | | | |
| | Ref Magnitudes | 0.3149 | 0.3148 | 0.3171 | 0.3154 | 0.3169 | 0.3162 | 0.003162 | 0.3171 | 0.3148 | | | |
| subject | 11 Ind. Judgements | 125 | 180 | 225 | 150 | 150 | 300 | 0.34274 | 300 | 125 | 0.41846 | 275.2652 | |
| | Test Magnitudes | 0.2017 | 0.26 | 0.3207 | 0.4158 | 0.5115 | 0.6401 | 0.41976 | 0.6401 | 0.2017 | | | |
| | Ref Magnitudes | 0.3271 | 0.3241 | 0.3178 | 0.3267 | 0.3286 | 0.3258 | 0.0118 | 0.3286 | 0.3178 | | | |
| subject | 12 Ind. Judgements | 90 | 110 | 110 | 200 | 160 | 160 | 0.30125 | 200 | 90 | 0.5827 | 244.2115 | |
| | Test Magnitudes | 0.1932 | 0.2541 | 0.3189 | 0.4068 | 0.4931 | 0.618 | 0.41473 | 0.618 | 0.1932 | | | |
| | Ref Magnitudes | 0.3146 | 0.3149 | 0.3169 | 0.3195 | 0.317 | 0.3148 | 0.00603 | 0.3195 | 0.3146 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.65475 | 254.1882 |

| Frequency 0.8 Hz | | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|----------|----------|----------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 150 | 240 | 250 | 350 | 550 | 300 | 0.44552 | 550 | 150 | | | |
| | Test Magnitudes | 0.2165 | 0.2528 | 0.3347 | 0.412 | 0.5189 | 0.6432 | 0.41142 | 0.6432 | 0.2165 | | | |
| | Ref Magnitudes | 0.3292 | 0.3287 | 0.32 | 0.322 | 0.3272 | 0.3216 | 0.012427 | 0.3292 | 0.32 | | | |
| subject | 2 Ind. Judgements | 50 | 50 | 110 | 110 | 150 | 150 | 0.43566 | 150 | 50 | 1.1065 | 288.4208 | |
| | Test Magnitudes | 0.2071 | 0.2476 | 0.3294 | 0.41 | 0.5081 | 0.6429 | 0.4215 | 0.6429 | 0.2071 | | | |
| | Ref Magnitudes | 0.3212 | 0.3258 | 0.3261 | 0.323 | 0.3244 | 0.3261 | 0.006154 | 0.3261 | 0.3212 | | | |
| subject | 3 Ind. Judgements | 30 | 60 | 130 | 130 | 210 | 150 | 0.54614 | 210 | 30 | 1.5202 | 438.999 | |
| | Test Magnitudes | 0.2163 | 0.2637 | 0.3442 | 0.4207 | 0.5225 | 0.6562 | 0.40892 | 0.6562 | 0.2163 | | | |
| | Ref Magnitudes | 0.3303 | 0.3302 | 0.3298 | 0.3299 | 0.3294 | 0.3307 | 0.001365 | 0.3307 | 0.3294 | | | |
| subject | 4 Ind. Judgements | 40 | 60 | 120 | 100 | 120 | 130 | 0.38676 | 130 | 40 | 1.002 | 238.8924 | |
| | Test Magnitudes | 0.211 | 0.256 | 0.3345 | 0.4125 | 0.5127 | 0.6401 | 0.41044 | 0.6401 | 0.211 | | | |
| | Ref Magnitudes | 0.3249 | 0.3244 | 0.3249 | 0.3246 | 0.3279 | 0.322 | 0.005788 | 0.3279 | 0.322 | | | |
| subject | 5 Ind. Judgements | 66 | 100 | 133 | 150 | 200 | 200 | 0.37941 | 200 | 66 | 1.0069 | 358.531 | |
| | Test Magnitudes | 0.2152 | 0.2616 | 0.3376 | 0.4131 | 0.513 | 0.6414 | 0.4036 | 0.6414 | 0.2152 | | | |
| | Ref Magnitudes | 0.3231 | 0.323 | 0.3207 | 0.321 | 0.3242 | 0.3214 | 0.004339 | 0.3242 | 0.3207 | | | |
| subject | 6 Ind. Judgements | 30 | 110 | 110 | 130 | 60 | 200 | 0.55199 | 200 | 30 | 0.99729 | 246.0467 | |
| | Test Magnitudes | 0.2132 | 0.26 | 0.331 | 0.4147 | 0.5128 | 0.6436 | 0.40955 | 0.6436 | 0.2132 | | | |
| | Ref Magnitudes | 0.3221 | 0.3225 | 0.3161 | 0.3232 | 0.3236 | 0.324 | 0.009113 | 0.324 | 0.3161 | | | |
| subject | 7 Ind. Judgements | 120 | 90 | 95 | 160 | 90 | 115 | 0.2414 | 160 | 90 | 0.1558 | 131.0428 | |
| | Test Magnitudes | 0.3184 | 0.251 | 0.3182 | 0.2781 | 0.1999 | 0.639 | 0.46661 | 0.639 | 0.1999 | | | |
| | Ref Magnitudes | 0.3317 | 0.3317 | 0.3318 | 0.332 | 0.3319 | 0.3321 | 0.000492 | 0.3321 | 0.3317 | | | |
| subject | 8 Ind. Judgements | 125 | 150 | 150 | 200 | 200 | 200 | 0.19451 | 200 | 125 | 0.44481 | 261.5635 | |
| | Test Magnitudes | 0.214 | 0.2584 | 0.3329 | 0.4209 | 0.5033 | 0.655 | 0.41383 | 0.655 | 0.214 | | | |
| | Ref Magnitudes | 0.3284 | 0.3267 | 0.3243 | 0.3279 | 0.3253 | 0.3276 | 0.004909 | 0.3284 | 0.3243 | | | |
| subject | 9 Ind. Judgements | 130 | 180 | 190 | 140 | 110 | 150 | 0.20221 | 190 | 110 | -0.12846 | 129.3432 | |
| | Test Magnitudes | 0.2066 | 0.2538 | 0.328 | 0.4099 | 0.4936 | 0.6354 | 0.41145 | 0.6354 | 0.2066 | | | |
| | Ref Magnitudes | 0.3165 | 0.317 | 0.3143 | 0.3167 | 0.3161 | 0.316 | 0.003028 | 0.317 | 0.3143 | | | |
| subject | 10 Ind. Judgements | 90 | 80 | 120 | 125 | 150 | 190 | 0.32027 | 190 | 80 | 0.72955 | 254.4359 | |
| | Test Magnitudes | 0.206 | 0.2529 | 0.328 | 0.4064 | 0.492 | 0.6311 | 0.40989 | 0.6311 | 0.206 | | | |
| | Ref Magnitudes | 0.3162 | 0.3165 | 0.317 | 0.3153 | 0.3177 | 0.3151 | 0.003143 | 0.3177 | 0.3151 | | | |
| subject | 11 Ind. Judgements | 85 | 160 | 135 | 185 | 210 | 220 | 0.30476 | 220 | 85 | 0.74837 | 333.8547 | |
| | Test Magnitudes | 0.2091 | 0.2659 | 0.3339 | 0.4118 | 0.4976 | 0.6605 | 0.41636 | 0.6605 | 0.2091 | | | |
| | Ref Magnitudes | 0.3182 | 0.3289 | 0.3183 | 0.3181 | 0.318 | 0.3285 | 0.016944 | 0.3289 | 0.318 | | | |
| subject | 12 Ind. Judgements | 115 | 130 | 115 | 180 | 155 | 160 | 0.18666 | 180 | 115 | 0.3451 | 199.2201 | |
| | Test Magnitudes | 0.2099 | 0.2582 | 0.3284 | 0.4145 | 0.492 | 0.6317 | 0.40311 | 0.6317 | 0.2099 | | | |
| | Ref Magnitudes | 0.3199 | 0.3199 | 0.3146 | 0.32 | 0.3145 | 0.3156 | 0.00877 | 0.32 | 0.3145 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.77195 | 257.9997 |

| Frequency 1 Hz | | | | | | | | | | | | | |
|----------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|----------|----------|----------|
| | Ind. Data→ | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 70 | 300 | 220 | 500 | 380 | 400 | 0.48635 | 500 | 70 | 1.275 | 953.9111 | |
| | Test Magnitudes | 0.2164 | 0.252 | 0.3414 | 0.4078 | 0.4992 | 0.6432 | 0.40651 | 0.6432 | 0.2164 | | | |
| | Ref Magnitudes | 0.3268 | 0.328 | 0.3292 | 0.3274 | 0.3284 | 0.3247 | 0.00478 | 0.3292 | 0.3247 | | | |
| subject | 2 Ind. Judgements | 150 | 125 | 75 | 125 | 150 | 150 | 0.22627 | 150 | 75 | 0.076889 | 136.3772 | |
| | Test Magnitudes | 0.1806 | 0.2412 | 0.3308 | 0.389 | 0.502 | 0.6348 | 0.44275 | 0.6348 | 0.1806 | | | |
| | Ref Magnitudes | 0.3232 | 0.3188 | 0.3227 | 0.3232 | 0.3227 | 0.3246 | 0.006068 | 0.3246 | 0.3188 | | | |
| subject | 3 Ind. Judgements | 60 | 65 | 130 | 130 | 160 | 210 | 0.45404 | 210 | 60 | 1.175 | 364.4713 | |
| | Test Magnitudes | 0.2205 | 0.2564 | 0.3392 | 0.4148 | 0.5167 | 0.6485 | 0.40708 | 0.6485 | 0.2205 | | | |
| | Ref Magnitudes | 0.3303 | 0.3299 | 0.3295 | 0.329 | 0.3311 | 0.3305 | 0.002265 | 0.3311 | 0.329 | | | |
| subject | 4 Ind. Judgements | 40 | 90 | 140 | 50 | 120 | 150 | 0.47008 | 150 | 40 | 0.76349 | 190.7888 | |
| | Test Magnitudes | 0.2136 | 0.2369 | 0.3296 | 0.4086 | 0.5075 | 0.6407 | 0.42221 | 0.6407 | 0.2136 | | | |
| | Ref Magnitudes | 0.3248 | 0.3157 | 0.3228 | 0.3279 | 0.3276 | 0.3279 | 0.014661 | 0.3279 | 0.3157 | | | |
| subject | 5 Ind. Judgements | 20 | 120 | 120 | 240 | 375 | 400 | 0.71828 | 400 | 20 | 2.4257 | 1684.304 | |
| | Test Magnitudes | 0.2169 | 0.2533 | 0.3343 | 0.4078 | 0.5069 | 0.6394 | 0.40883 | 0.6394 | 0.2169 | | | |
| | Ref Magnitudes | 0.3225 | 0.3228 | 0.3214 | 0.3222 | 0.3232 | 0.3221 | 0.001929 | 0.3232 | 0.3214 | | | |
| subject | 6 Ind. Judgements | 30 | 80 | 40 | 120 | 130 | 160 | 0.55742 | 160 | 30 | 1.3605 | 309.8644 | |
| | Test Magnitudes | 0.2167 | 0.2502 | 0.3351 | 0.4061 | 0.5069 | 0.6382 | 0.4081 | 0.6382 | 0.2167 | | | |
| | Ref Magnitudes | 0.3227 | 0.3195 | 0.3234 | 0.3198 | 0.3233 | 0.3234 | 0.005758 | 0.3234 | 0.3195 | | | |
| subject | 7 Ind. Judgements | 105 | 110 | 115 | 110 | 240 | 280 | 0.49093 | 280 | 105 | 0.84054 | 351.6989 | |
| | Test Magnitudes | 0.2608 | 0.4248 | 0.2651 | 0.202 | 0.5091 | 0.6331 | 0.44028 | 0.6331 | 0.202 | | | |
| | Ref Magnitudes | 0.3321 | 0.3319 | 0.3323 | 0.3318 | 0.3317 | 0.3316 | 0.000786 | 0.3323 | 0.3316 | | | |
| subject | 8 Ind. Judgements | 125 | 125 | 125 | 175 | 225 | 250 | 0.32614 | 250 | 125 | 0.71832 | 334.1632 | |
| | Test Magnitudes | 0.2158 | 0.2623 | 0.3332 | 0.4163 | 0.4996 | 0.6565 | 0.41097 | 0.6565 | 0.2158 | | | |
| | Ref Magnitudes | 0.3284 | 0.3257 | 0.3284 | 0.326 | 0.326 | 0.3279 | 0.003961 | 0.3284 | 0.3257 | | | |
| subject | 9 Ind. Judgements | 150 | 120 | 150 | 180 | 160 | 170 | 0.13378 | 180 | 120 | 0.2164 | 191.9029 | |
| | Test Magnitudes | 0.204 | 0.253 | 0.3238 | 0.4099 | 0.4948 | 0.6342 | 0.41496 | 0.6342 | 0.204 | | | |
| | Ref Magnitudes | 0.3161 | 0.3161 | 0.3166 | 0.3162 | 0.3163 | 0.3149 | 0.001852 | 0.3166 | 0.3149 | | | |
| subject | 10 Ind. Judgements | 60 | 40 | 130 | 140 | 130 | 200 | 0.49881 | 200 | 40 | 1.2469 | 368.4292 | |
| | Test Magnitudes | 0.2074 | 0.2536 | 0.318 | 0.4026 | 0.4903 | 0.6314 | 0.41254 | 0.6314 | 0.2074 | | | |
| | Ref Magnitudes | 0.3168 | 0.316 | 0.3152 | 0.3161 | 0.3166 | 0.3152 | 0.002141 | 0.3188 | 0.3152 | | | |
| subject | 11 Ind. Judgements | 90 | 125 | 150 | 160 | 260 | 250 | 0.39648 | 260 | 90 | 0.93518 | 411.2146 | |
| | Test Magnitudes | 0.2095 | 0.2617 | 0.3264 | 0.4226 | 0.5089 | 0.6389 | 0.40873 | 0.6389 | 0.2095 | | | |
| | Ref Magnitudes | 0.3182 | 0.3186 | 0.3184 | 0.3261 | 0.3262 | 0.3179 | 0.012693 | 0.3262 | 0.3179 | | | |
| subject | 12 Ind. Judgements | 80 | 120 | 150 | 150 | 200 | 160 | 0.29141 | 200 | 80 | 0.70319 | 286.8645 | |
| | Test Magnitudes | 0.2068 | 0.2572 | 0.3276 | 0.4144 | 0.4942 | 0.6443 | 0.41457 | 0.6443 | 0.2068 | | | |
| | Ref Magnitudes | 0.3148 | 0.3153 | 0.324 | 0.3203 | 0.317 | 0.3203 | 0.011126 | 0.324 | 0.3148 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.88786 | 342.9311 |

| Frequency 1.25 Hz | | | | | | | | | | | | | |
|-------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|---------|----------|---------|
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 80 | 160 | 220 | 380 | 500 | 400 | 0.55645 | 500 | 80 | 1.5925 | 1220.165 | |
| | Test Magnitudes | 0.2182 | 0.2629 | 0.3205 | 0.405 | 0.501 | 0.6287 | 0.39789 | 0.6287 | 0.2182 | | | |
| | Ref Magnitudes | 0.3287 | 0.3263 | 0.3219 | 0.3274 | 0.3255 | 0.3242 | 0.007392 | 0.3287 | 0.3219 | | | |
| subject | 2 Ind. Judgements | 110 | 150 | 25 | 75 | 150 | 300 | 0.69488 | 300 | 25 | 0.40792 | 166.2519 | |
| | Test Magnitudes | 0.1277 | 0.2594 | 0.32 | 0.4046 | 0.4916 | 0.6041 | 0.4616 | 0.6041 | 0.1277 | | | |
| | Ref Magnitudes | 0.3253 | 0.3203 | 0.323 | 0.3243 | 0.3152 | 0.3252 | 0.012121 | 0.3253 | 0.3152 | | | |
| subject | 3 Ind. Judgements | 85 | 70 | 80 | 200 | 160 | 220 | 0.48634 | 220 | 70 | 1.1095 | 370.1176 | |
| | Test Magnitudes | 0.2201 | 0.2674 | 0.3246 | 0.4104 | 0.5053 | 0.6339 | 0.39569 | 0.6339 | 0.2201 | | | |
| | Ref Magnitudes | 0.3287 | 0.3303 | 0.331 | 0.3305 | 0.3317 | 0.3306 | 0.003018 | 0.3317 | 0.3287 | | | |
| subject | 4 Ind. Judgements | 75 | 75 | 60 | 100 | 60 | 100 | 0.23073 | 100 | 60 | 0.17553 | 91.5859 | |
| | Test Magnitudes | 0.2107 | 0.2626 | 0.3221 | 0.4055 | 0.4986 | 0.6262 | 0.40097 | 0.6262 | 0.2107 | | | |
| | Ref Magnitudes | 0.3182 | 0.3243 | 0.3236 | 0.3233 | 0.3285 | 0.3205 | 0.010965 | 0.3285 | 0.3182 | | | |
| subject | 5 Ind. Judgements | 100 | 90 | 133 | 150 | 200 | 333 | 0.53681 | 333 | 90 | 1.1619 | 494.0711 | |
| | Test Magnitudes | 0.2164 | 0.2624 | 0.3181 | 0.4003 | 0.4942 | 0.6191 | 0.39365 | 0.6191 | 0.2164 | | | |
| | Ref Magnitudes | 0.3199 | 0.3224 | 0.3225 | 0.3227 | 0.3231 | 0.3228 | 0.003628 | 0.3231 | 0.3199 | | | |
| subject | 6 Ind. Judgements | 80 | 90 | 80 | 160 | 170 | 190 | 0.39246 | 190 | 80 | 0.93826 | 311.5086 | |
| | Test Magnitudes | 0.2158 | 0.262 | 0.3215 | 0.4002 | 0.4949 | 0.6208 | 0.39422 | 0.6208 | 0.2158 | | | |
| | Ref Magnitudes | 0.3229 | 0.323 | 0.3237 | 0.3173 | 0.3234 | 0.3222 | 0.007445 | 0.3237 | 0.3173 | | | |
| subject | 7 Ind. Judgements | 120 | 130 | 115 | 135 | 120 | 135 | 0.06944 | 135 | 115 | 0.12204 | 139.8442 | |
| | Test Magnitudes | 0.4207 | 0.4061 | 0.2173 | 0.6392 | 0.5064 | 0.4209 | 0.31751 | 0.6392 | 0.2173 | | | |
| | Ref Magnitudes | 0.3316 | 0.3321 | 0.3318 | 0.3318 | 0.3321 | 0.3325 | 0.00096 | 0.3325 | 0.3316 | | | |
| subject | 8 Ind. Judgements | 175 | 150 | 200 | 200 | 250 | 175 | 0.17821 | 250 | 150 | 0.18791 | 227.728 | |
| | Test Magnitudes | 0.2152 | 0.2704 | 0.3249 | 0.4272 | 0.5123 | 0.6553 | 0.41006 | 0.6553 | 0.2152 | | | |
| | Ref Magnitudes | 0.3269 | 0.3259 | 0.3264 | 0.3259 | 0.3279 | 0.3275 | 0.002551 | 0.3279 | 0.3259 | | | |
| subject | 9 Ind. Judgements | 120 | 150 | 160 | 150 | 150 | 200 | 0.167 | 200 | 120 | 0.3217 | 212.4896 | |
| | Test Magnitudes | 0.209 | 0.2661 | 0.31 | 0.4163 | 0.4928 | 0.6348 | 0.40628 | 0.6348 | 0.209 | | | |
| | Ref Magnitudes | 0.3165 | 0.3164 | 0.3109 | 0.3167 | 0.3148 | 0.3151 | 0.006944 | 0.3167 | 0.3109 | | | |
| subject | 10 Ind. Judgements | 40 | 160 | 120 | 70 | 120 | 210 | 0.50827 | 210 | 40 | 0.88513 | 258.9294 | |
| | Test Magnitudes | 0.2064 | 0.2617 | 0.32 | 0.4162 | 0.489 | 0.6337 | 0.40755 | 0.6337 | 0.2064 | | | |
| | Ref Magnitudes | 0.3165 | 0.3164 | 0.3151 | 0.3156 | 0.3152 | 0.3158 | 0.001865 | 0.3165 | 0.3151 | | | |
| subject | 11 Ind. Judgements | 70 | 75 | 110 | 225 | 200 | 300 | 0.56898 | 300 | 70 | 1.4166 | 558.5373 | |
| | Test Magnitudes | 0.2139 | 0.2769 | 0.3345 | 0.4345 | 0.5146 | 0.6594 | 0.40583 | 0.6594 | 0.2139 | | | |
| | Ref Magnitudes | 0.3209 | 0.3281 | 0.3285 | 0.3263 | 0.3278 | 0.3278 | 0.008802 | 0.3285 | 0.3209 | | | |
| subject | 12 Ind. Judgements | 120 | 130 | 165 | 170 | 250 | 210 | 0.28153 | 250 | 120 | 0.62279 | 313.9951 | |
| | Test Magnitudes | 0.2145 | 0.2719 | 0.3196 | 0.4252 | 0.498 | 0.6339 | 0.33662 | 0.6339 | 0.2145 | | | |
| | Ref Magnitudes | 0.3166 | 0.3202 | 0.3149 | 0.32 | 0.3189 | 0.3151 | 0.00755 | 0.3202 | 0.3149 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.75396 | 285.219 |

| Frequency 1.6 Hz | | | | | | | | | | | | | |
|------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|--------|--------|-----------|----------|----------|
| | Ind. Data--> | 1 | 2 | 3 | 4 | 5 | 6 | Coef.Var | Max | Min | Ind. n | Ind. k | |
| subject | 1 Ind. Judgements | 140 | 130 | 350 | 220 | 180 | 400 | 0.47705 | 400 | 130 | 0.74817 | 476.7169 | |
| | Test Magnitudes | 0.1928 | 0.2479 | 0.3195 | 0.393 | 0.4829 | 0.5983 | 0.40586 | 0.5983 | 0.1928 | | | |
| | Ref Magnitudes | 0.3288 | 0.3268 | 0.3248 | 0.3273 | 0.3269 | 0.3298 | 0.005308 | 0.3298 | 0.3248 | | | |
| subject | 2 Ind. Judgements | 75 | 90 | 150 | 150 | 200 | 300 | 0.50909 | 300 | 75 | 0.7734 | 374.2854 | |
| | Test Magnitudes | 0.1275 | 0.2463 | 0.1944 | 0.3932 | 0.4212 | 0.6154 | 0.53738 | 0.6154 | 0.1275 | | | |
| | Ref Magnitudes | 0.3237 | 0.3245 | 0.3256 | 0.3227 | 0.3231 | 0.3177 | 0.008494 | 0.3256 | 0.3177 | | | |
| subject | 3 Ind. Judgements | 20 | 50 | 185 | 240 | 230 | 250 | 0.62568 | 250 | 20 | 2.256 | 1285.962 | |
| | Test Magnitudes | 0.1918 | 0.2481 | 0.3171 | 0.3911 | 0.4794 | 0.6007 | 0.40844 | 0.6007 | 0.1918 | | | |
| | Ref Magnitudes | 0.33 | 0.3323 | 0.3298 | 0.3302 | 0.3301 | 0.3312 | 0.00292 | 0.3323 | 0.3298 | | | |
| subject | 4 Ind. Judgements | 25 | 40 | 130 | 130 | 140 | 150 | 0.53592 | 150 | 25 | 1.6299 | 462.4778 | |
| | Test Magnitudes | 0.1963 | 0.2493 | 0.3228 | 0.3968 | 0.4892 | 0.6152 | 0.41229 | 0.6152 | 0.1963 | | | |
| | Ref Magnitudes | 0.3253 | 0.3282 | 0.3171 | 0.3228 | 0.3197 | 0.3197 | 0.012758 | 0.3282 | 0.3171 | | | |
| subject | 5 Ind. Judgements | 50 | 110 | 125 | 150 | 200 | 150 | 0.38248 | 200 | 50 | 0.97673 | 344.3909 | |
| | Test Magnitudes | 0.1881 | 0.2501 | 0.3107 | 0.3909 | 0.4739 | 0.5895 | 0.40457 | 0.5895 | 0.1881 | | | |
| | Ref Magnitudes | 0.3238 | 0.3206 | 0.3233 | 0.3206 | 0.3216 | 0.3222 | 0.004178 | 0.3238 | 0.3206 | | | |
| subject | 6 Ind. Judgements | 70 | 90 | 140 | 140 | 150 | 200 | 0.35107 | 200 | 70 | 0.85924 | 312.1781 | |
| | Test Magnitudes | 0.188 | 0.2495 | 0.3109 | 0.3906 | 0.4764 | 0.597 | 0.41022 | 0.597 | 0.188 | | | |
| | Ref Magnitudes | 0.3236 | 0.3165 | 0.324 | 0.3168 | 0.3193 | 0.321 | 0.010139 | 0.324 | 0.3165 | | | |
| subject | 7 Ind. Judgements | 160 | 140 | 180 | 80 | 120 | 125 | 0.25864 | 180 | 80 | 0.45507 | 211.423 | |
| | Test Magnitudes | 0.639 | 0.3333 | 0.6618 | 0.2066 | 0.2696 | 0.2102 | 0.54174 | 0.6518 | 0.2066 | | | |
| | Ref Magnitudes | 0.3319 | 0.3321 | 0.3322 | 0.3324 | 0.332 | 0.3321 | 0.000519 | 0.3324 | 0.3319 | | | |
| subject | 8 Ind. Judgements | 175 | 200 | 225 | 250 | 250 | 300 | 0.18763 | 300 | 175 | 0.44895 | 357.0699 | |
| | Test Magnitudes | 0.2166 | 0.2557 | 0.3577 | 0.4247 | 0.5121 | 0.646 | 0.40094 | 0.646 | 0.2166 | | | |
| | Ref Magnitudes | 0.3283 | 0.324 | 0.3278 | 0.3272 | 0.3271 | 0.3272 | 0.004617 | 0.3283 | 0.324 | | | |
| subject | 9 Ind. Judgements | 170 | 200 | 170 | 170 | 200 | 170 | 0.086066 | 200 | 170 | -0.008545 | 177.9204 | |
| | Test Magnitudes | 0.2085 | 0.2556 | 0.3447 | 0.4098 | 0.4961 | 0.623 | 0.39595 | 0.623 | 0.2085 | | | |
| | Ref Magnitudes | 0.3163 | 0.3166 | 0.3164 | 0.3158 | 0.3148 | 0.3161 | 0.002051 | 0.3166 | 0.3148 | | | |
| subject | 10 Ind. Judgements | 120 | 120 | 70 | 130 | 170 | 200 | 0.33374 | 200 | 70 | 0.45833 | 205.126 | |
| | Test Magnitudes | 0.193 | 0.2527 | 0.3431 | 0.412 | 0.499 | 0.623 | 0.41081 | 0.623 | 0.193 | | | |
| | Ref Magnitudes | 0.3076 | 0.3165 | 0.3149 | 0.3172 | 0.3165 | 0.3158 | 0.0114 | 0.3172 | 0.3076 | | | |
| subject | 11 Ind. Judgements | 145 | 50 | 250 | 275 | 320 | 350 | 0.49039 | 350 | 50 | 1.3057 | 714.0989 | |
| | Test Magnitudes | 0.2049 | 0.2532 | 0.3566 | 0.421 | 0.5166 | 0.6456 | 0.41245 | 0.6456 | 0.2049 | | | |
| | Ref Magnitudes | 0.3185 | 0.3177 | 0.3265 | 0.3283 | 0.3264 | 0.3282 | 0.014959 | 0.3283 | 0.3177 | | | |
| subject | 12 Ind. Judgements | 100 | 120 | 150 | 190 | 190 | 300 | 0.40688 | 300 | 100 | 0.91247 | 410.1287 | |
| | Test Magnitudes | 0.2034 | 0.2641 | 0.3446 | 0.4111 | 0.4983 | 0.6375 | 0.40392 | 0.6375 | 0.2034 | | | |
| | Ref Magnitudes | 0.3147 | 0.3202 | 0.3153 | 0.3152 | 0.3149 | 0.3197 | 0.008075 | 0.3202 | 0.3147 | | | |
| +++ | +++ | +++ | 1 | 2 | 3 | 4 | 5 | 6 | +++ | +++ | Median | 0.81832 | 365.6776 |