UNIVERSITY OF SOUTHAMPTON

Dizziness and quality of life in clinic and general population samples of dizzy individuals

Rachel L Booth BSc MSc

Doctor of Philosophy

Faculty of Engineering and Applied Science
Institute of Sound and Vibration Research

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ABSTRACT

FACULTY OF ENGINEERING AND APPLIED SCIENCE
INSTITUTE OF SOUND AND VIBRATION RESEARCH

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DIZZINESS AND QUALITY OF LIFE IN CLINIC AND GENERAL POPULATION SAMPLES OF DIZZY INDIVIDUALS

by Rachel L Booth

Information about dizziness in terms of symptoms and its associated effects or presumed consequences in clinic and general population samples is limited. Available evidence is lacking in detail and representativeness and is of questionable validity. To date, questionnaires have predominantly assessed the limitations in lifestyle experienced by dizzy individuals within the handicap domain. The importance to health of general well-being has led to the concept of health-related quality of life. Although some studies have assessed quality of life for dizzy individuals, they are limited in their scope. The focus of quality of life on participation restriction and alteration in behaviour is appropriate for dizzy individuals. Currently available questionnaires do not assess these limitations.

The aims were to characterize dizziness in terms of its severity and nature, to describe the limitations experienced by quantifying and establishing dimensions of quality of life, to model the processes and factors involved in the quality of life of dizzy individuals and to develop and assess a dizziness-specific quality of life questionnaire.

Questionnaire surveys were carried out in clinic (N=405) and general population (N=55) samples of dizzy individuals. In addition two comparison groups were surveyed: clinic population of facial pain patients and individuals without dizziness in the general population.

Characteristics of dizziness in clinic and general population samples are described and compared. Psychometric properties were established for two applied questionnaires: the commonly used Dizziness Handicap Inventory (DHI) and the newly applied quality of life questionnaire, the Functional Limitations Profile (FLP). Both were found to be reliable measures for groups of dizzy individuals. Although there is some support for validity of the DHI, a revised subscale structure is proposed reflecting the intrinsic properties of the items more accurately than the original. The FLP appears to be a valid measure of the quality of life of dizzy individuals.

Quality of life was quantified in the four survey groups and comparisons made. A significant reduction in quality of life was found for dizzy individuals, the greatest reduction being for the psychosocial aspects. The limitations reported by dizzy individuals are shown to be specific and different from the comparison groups.

Factor analysis of FLP responses suggests a three-dimensional model of quality of life consisting of psychological, physical and social well-being, supplemented by a contingent factor representing other health problems. This model underpins the newly developed questionnaire, the Dizziness Impact Profile (DIP), constructed from analysis of item responses on the original FLP. The DIP appears to be valid and reliable based on analysis of the item scores from the FLP, but requires further validation.

Increased understanding of dizziness and the limitations in lifestyle experienced by its sufferers and the development of the Dizziness Impact Profile to quantify these in a convenient way is important to meet the needs of dizzy individuals in terms of service provision and planning.

To Nana and Grandpa without whom none
of this would have been possible

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LIST OF ABBREVIATONS

ADL	Activities of Daily Living
BPPV	Benign paroxysmal positional vertigo
DHI	Dizziness Handicap Inventory
DIP	Dizziness Impact Profile
ENT	Ear, nose and throat
FLP	Functional Limitations Profile
HTA	Health Technology Assessment
ICIDH	International Classification of Impairment, Disability and Handicap
LREC	Local Regional Ethics Committee
MREC	Multi-centre Research Ethics Committee
SIP	Sickness Impact Profile
SIP68	68 item version of the Sickness Impact Profile
VSS	Vertigo Symptom Scale
WHO	World Health Organisation

1.0 OVERVIEW

Dizziness is a common complaint affecting a substantial minority of the population. Problems with balance, dizziness or giddiness are reported by 40% of the UK general population. Of working age people in a general practice community sample, 20% reported symptoms of dizziness in the previous month with 50% reporting some level of handicap. Dizziness accounts for around 2% of consultations at primary care level.

The term dizziness is used here to describe the range of sensations experienced including spinning, giddiness and lightheadedness. This term is also often adopted by patients to describe these sensations collectively. The use of the term dizziness here does not assume any particular underlying cause.

The known consequences of dizziness and the questionnaires developed to assess them have been predominantly in the domain of handicap. There are two main disadvantages with the available questionnaires. Firstly, their properties have been poorly documented. Secondly, the questionnaires tend to assume there has been no alteration in the behaviour of the individual as a result of the dizziness. From changes and limitations in behaviour reported by dizzy individuals, this assumption is not always the case.

There is increased recognition of the importance of measuring the status of the individual in terms of their function, subjective experience and well-being. This has led to development and increased interest in the concept of quality of life; more precisely health-related quality of life. This is clear from the proliferation of research into the health-related quality of life associated with a wide range of health problems. Fundamental to the concept is that quality of life is considered from the patient's perspective. The present study is concerned with health-related quality of life although for ease of reference this will simply be referred to as quality of life.

Information about dizziness, the symptoms experienced and the quality of life of dizzy individuals in either clinic or general population samples is limited. Although studies have previously adopted quality of life questionnaires for dizzy individuals, these studies are restrictive in their scope. A multi-dimensional model of the quality of life of dizzy

individuals is proposed based on current knowledge of dizziness and the concept of quality of life to represent the limitations experienced by dizzy individuals.

The study is divided in to three parts. The first part assesses the psychometric properties of two available questionnaires for assessing the limitations reported by dizzy individuals: the commonly applied Dizziness Handicap Inventory and the newly applied quality of life questionnaire, the Functional Limitations Profile. A revised structure of the DHI is proposed, reflecting the intrinsic properties of the questionnaire items more accurately than the original version.

In the second part, the results of a survey of dizziness and quality of life of dizzy individuals in clinic and general population samples are reported and discussed. The results on quality of life are presented alongside those for the comparison groups who were also surveyed.

The final part of the study refines the theoretical model proposed using the responses of dizzy individuals on the Functional Limitations Profile. A data-driven model of the quality of life of dizzy individuals in a clinic population is presented. Following the model, a dizziness-specific quality of life questionnaire, the Dizziness Impact Profile is developed and is shown to provide a reliable, repeatable and valid measure of the quality of life of dizzy individuals.

The study provides increased understanding of dizziness reported in outpatient clinics and the general population. The severity and nature of the reduction in quality of life of dizzy individuals indicate the significant limitations and restrictions experienced by dizzy individuals in daily life. Development of the Dizziness Impact Profile allows the quality of life and these limitations to be quantified conveniently. Increased understanding of dizziness and the limitations experienced by suffers and the ability to assess these using an established questionnaire specifically for dizzy individuals is important to meet the needs of dizzy individuals both in terms of services provided and resource planning.

2.0 DIZZINESS AND HEALTH OUTCOMES

2.1 IMPAIRMENT, DISABILITY AND HANDICAP

Impairment, disability and handicap as defined by the World Health Organisation (WHO, 1980) have traditionally been used to describe disease and its effects. This classification (ICIDH) is shown in Table 2.1. Although they are conceptually distinct terms, confusion still exists in the literature over their meaning and use. The distinction between disability and handicap may also not be clear in patient descriptions of their complaint. The classification is currently being replaced by a classification for disability and functioning (WHO, 1999). This is discussed in more detail in Section 2.4. Despite this, the original classification is discussed here because of its importance in the traditional approach to the assessment of the consequences of dizziness.

ICIDH Classification Scheme	
Impairment	Any loss or abnormality of psychological, physiological, or anatomical structure or function.
Disability	Any restriction or lack (resulting from impairment) of ability to perform an activity in the manner or within the range considered normal for a human being.
Handicap	A disadvantage for a given individual, resulting from an impairment or a disability that limits or prevents the fulfilment of a role that is normal (depending on age, sex and social and cultural factors) for that individual.

Table 2.1: International classification of impairment, disability and handicap (ICIDH) (WHO, 1980)

The scheme devised by the WHO shown in Figure 2.1 depicts the relationships between the three domains of impairment, disability and handicap and how they relate among disease consequences (Patrick, 1989).

Progression through the scheme can be altered or incomplete depending on the nature of the impairment, the internal and external environment of the individual and the social definition of the situation (Patrick, 1989). Individuals with the same level of impairment may vary considerably in how disabled or handicapped they are. This will depend to a certain extent on their attitudes and their social and cultural situations (Patrick, 1989).

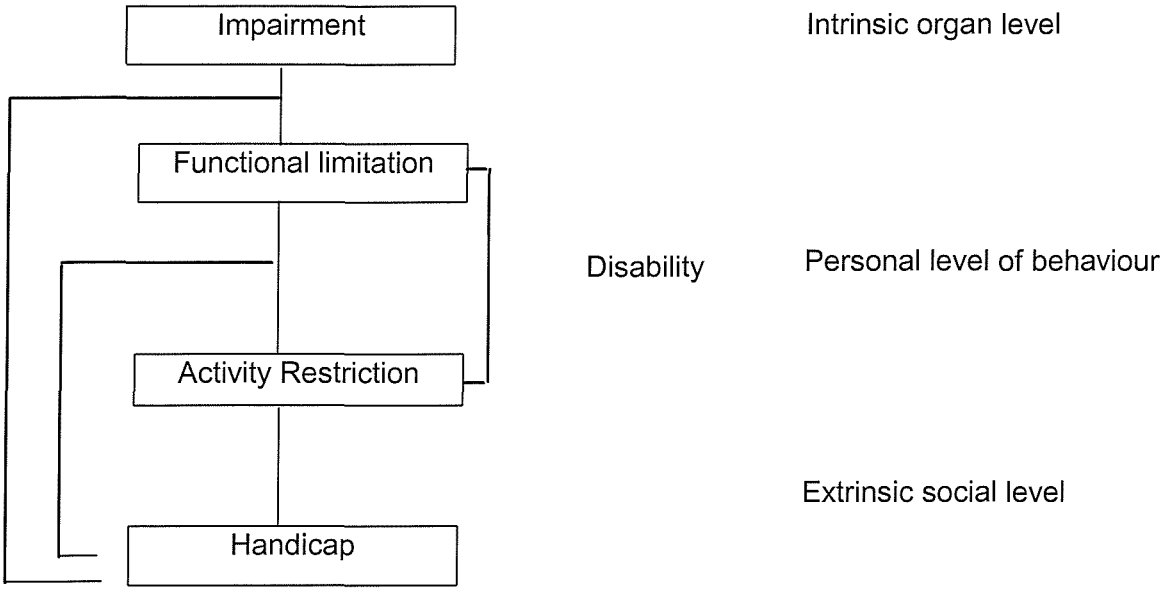

Figure 2.1: Inter-relationships among disease consequences (Patrick, 1989)

What appears to be lacking from this scheme, particular for dizzy individuals, is the involvement of psychosocial and emotional functioning as a result of the underlying impairment and reaction to it. The neurophysiology of the balance system and its links with the autonomic nervous system (Yardley *et al.,* 1998c; Yardley *et al.,* 1999) implies that individuals with chronic dizziness do not necessarily need to have an active pathology or a permanent impairment. The consequences of dizziness can extend beyond the immediate influence of the original impairment.

Such a situation is not possible in the WHO scheme where disability and/or handicap follow directly from impairment. For dizziness, the impairment may be the trigger but the consequences and reactions to this can be due to external influences, emotional reactions and attitudes.

2.2 IMPAIRMENT, DISABILITY AND HANDICAP ASSOCIATED WITH DIZZINESS

Definitions of impairment, disability and handicap have been proposed for dizzy individuals based on the WHO classification (Newman & Jacobson, 1993). These are

shown in Table 2.2. Defining balance rather than dizziness perhaps creates a narrow definition as patients may experience dizziness without any loss of balance *per se*.

Handicap is described as being a social phenomenon which represents the social and environmental consequences for the individual. No recognition is given to the emotional reactions and attitudes that have been identified as influencing the level of handicap encountered (Yardley *et al.,* 1992c).

Definitions of Balance Impairment, Disability and Handicap	
Balance Impairment	The loss of balance function or structures necessary for the maintenance of balance (i.e. the three interrelated systems of vision, vestibular and proprioception).
Balance Disability	The restriction in the ability to perform an activity due to balance impairment in a manner within the range considered normal for a person of the same age and similar circumstances.
Balance Handicap	The disadvantage for a given individual, resulting from balance impairment or balance disability, that limits or prevents the fulfilment of a role that is normal for that individual given the expectations of the group to which they are a member.

Table 2.2: Definitions of balance impairment, balance disability and balance handicap (Newman & Jacobson, 1993).

Assessment of the degree of impairment has been reported to be difficult (Yardley *et al.,* 1992c). Limitations in the diagnostic tests currently available are discussed elsewhere (e.g. Hallam and Stephens, 1985; Yardley *et al.,* 1992c). The tests provide little useful information about the severity of the current symptomology (Yardley *et al.,* 1992c).

Research has shown a distinction between the factors that influence the disability and handicap associated with dizziness (Yardley *et al.,* 1992c). Disability has been found to be associated mainly with physical factors such as severity, duration, age and sex, whereas handicap has been found to be influenced by a combination of both somatic and psychological variables, in particular the severity of autonomic symptoms. There is evidence to suggest that patients' descriptions of their illness may be influenced by personality, attitudes and anxiety that also affect the level of resulting handicap (Yardley *et al.,* 1992c; Yardley *et al.,* 1994).

A discussion of the effects of dizziness upon lifestyle illustrated the difficulty in distinguishing whether a patient's report reflects a disability or a handicap (Yardley *et al.*, 1992c). The report of being unable to travel can be interpreted to refer to the physical inability to travel which would be a disability. The report can also be used to express the psychosocial consequences of the inability to travel in terms of the restriction of mobility and independence and the consequent disruption of lifestyle which would be a handicap.

Additional confusion between disability and handicap for dizzy individuals is found in the work by Cohen and Kimball (2000) who define disability as referring to the reduction in performance within the social environment and handicap as being synonymous with disability. This clearly goes against the classification from the WHO (1980).

A model of the elements involved in the handicap associated with recurrent vertigo has been developed by Yardley *et al.* (1992b). The model hypothesises that a fear of vertigo, concern for the effect of the vertigo on social relationships and its motivating effect to withdraw from roles and activities are variables mediating between vertigo and distress. The level of handicap has been found to be affected by a combination of the somatic and psychological factors including the severity of the autonomic symptoms, anxiety, personality and attitudes (Yardley *et al.*, 1992c).

2.3 CONSEQUENCES OF DIZZINESS

The consequences of dizziness extend beyond the immediate physical symptoms of vertigo, unsteadiness and imbalance. The secondary problems can include fatigue, headache, fear of falling, embarrassment and decreased activity (Cohen, 2000). There is a wide variation in the ability of patients to cope with dizziness (Honrubia *et al.*, 1996) and the presence of these secondary symptoms. The initial dizziness can cause extreme stress which in turn can lead to anxiety and depression (Tusa, 2000). Such problems themselves can also cause dizziness.

Much has been documented about the consequences of dizziness, in particular by Yardley and colleagues, but also by other researchers. This work will be summarised here to describe the known consequences of dizziness. This section is not intended as a review of

studies investigating the consequences but as a qualitative description of these consequences. The nature of the consequences are not in doubt and therefore the discussion here concentrates on the work of Yardley and colleagues since this provides an extensive description of the experiences of dizzy individuals. Recognition of these consequences has led to the development of models to explain the relationships between dizziness and its consequences. These models have been based on the concepts of disability and handicap.

The impact of dizziness on an individual's lifestyle and well-being can be considered to be influenced by the support or demands of the physical and social context, and by personality, beliefs and coping skills (Yardley *et al.,* 1992c). These consequences can be considered to be divided into practical difficulties and emotional reactions. Many of the statements from interviews with patients detailing the consequences of dizziness can be divided into these two areas and related to the concept of quality of life (Yardley *et al.,* 1992b).

The effects of dizziness will be divided here into physical and psychosocial consequences. Although these are considered here separately, much discussion exists in the literature about the associations between the two (Yardley, 1994a). No assumption is made here about the direction of the association although it is likely to be bi-directional.

2.3.1 Physical consequences of dizziness

The physical consequences of dizziness are the effects that dizziness has on the physical activities of the individual. Dizziness can affect and alter many different physical aspects of an individual's lifestyle and only a few attacks of dizziness can cause individuals to make changes to normal daily activities. These can include a change of occupation, restriction of mobility, reduction in leisure activities with friends or family, reduction in carrying out necessary household activities and at the extreme, becoming house-bound. (Cohen, 1992; Yardley *et al.,* 1992b; Cohen *et al.,* 1995). Problem activities have been described as those involving head movement, good postural stability and spatial awareness (Cohen, 1992).

A postal survey of patients registered with GP practices found that of those reporting dizziness and who were working, 40% reported occupational difficulties (Yardley *et al.,*

1998a). As would be expected, the effect of dizziness upon occupation has been shown to be greater in a neuro-otology clinic where two-thirds of employed patients reported occupational difficulties (Yardley *et al.,* 1992c).

The physical consequences are not necessarily due to the physical inability to carry out a particular activity or function. In an interview study, patients reported deliberate restriction of movements and social activities to avoid provoking dizziness, and to avoid the possibility of the dizziness causing embarrassment (Yardley *et al.*, 1992b; Yardley, 1994a). This behaviour has been referred to as 'anticipatory disability' and arises because of the belief of sufferers that they cannot perform a particular activity (Yardley, 1994a). Perhaps a more appropriate term would be 'avoidance behaviour'. The resulting handicap can be just as severe as if they are physically unable to carry out the task and can lead to emotional distress (Yardley *et al.,* 1994); the self-imposed restrictions may cause an escalating circle of handicap and distress (Yardley, 1994a).

High handicap levels can be maintained in dizzy individuals not because of persistent dizziness but by the self-imposed restrictions on activity adopted for fear of recurrence of the dizziness (Yardley, 1994a). This avoidance of activities has also been reported in a third of working age people experiencing dizziness (Yardley *et al.,* 1998a).

2.3.2 Psychosocial consequences of dizziness

As was suggested earlier, there may be direct links between the physical and psychosocial consequences of dizziness. It can be easily seen from the examples given in the previous section that restrictions in certain activities can affect the psychological and social functioning of dizzy patients. There is evidence to support the idea that negative perceptions may arise from the physical symptoms experienced and contribute to the psychosocial difficulties (Yardley, 1994a). It is also clear that psychological factors play a significant role in maintaining or increasing the handicap and distress caused (Yardley, 1994a). The apparent discrepancies that have been reported between the complaints of dizzy patients and objective measures of balance system function may be explained by individual differences in attitudes to dizziness and coping strategies adopted (Hallams and Stephens, 1985).

Three clusters of beliefs about vertigo have been identified: concern about loss of control, fear of serious illness and anticipation of a severe attack (Yardley *et al.,* 1994). Patients perceive vertigo to be stigmatising and report negative encounters as a result of the vertigo (Yardley *et al.,* 1992b). The unpredictable nature of vertigo is often cited as the cause of the feelings of helplessness experienced (Newman & Jacobson, 1993).

The fear of vertigo and the consequent restriction of activity have been shown to be immediate causes of emotional distress (Yardley and Putman, 1992; Yardley *et al.,* 1992c; Yardley, 1994c). These factors are in turn indirectly affected by the severity of the vertigo (Yardley and Putman, 1992; Yardley *et al.,* 1992c). The emotional disturbance can also further prolong or exacerbate the handicap by enhancing the fear of vertigo and avoidance of a range of activities (Yardley and Putman, 1992) and contributing to the autonomic symptoms (Yardley *et al.,* 1992c).

Social anxieties have been identified to explain the largest proportion of the variation in patient distress (Yardley and Putman, 1992). The anxieties include concern that friends, family and strangers will respond with a lack of comprehension or sympathy (Yardley and Putman, 1992). Fear of social embarrassment and the perceived stigma attached to the dizziness have also been reported (Yardley, 1994c). It is these social anxieties that lead to some of the anticipatory disability reported (Yardley, 1994c).

Negative beliefs about dizziness are reported by patients and have been shown, alongside autonomic symptoms, to be significantly related to handicap (Yardley, 1994a). Such beliefs arise not from fears about possible physical danger but due to concerns about incompetence and the possibility of social embarrassment. In turn such fears about social embarrassment can lead into the vicious circle of anxiety and withdrawal from social activities.

Two clusters of autonomic symptoms have been identified (Yardley *et al.,* 1992a). The first is associated with anxiety, arousal and possibly hyperventilation; the second is apparently unrelated to the dizziness and described as somatisation. Autonomic symptoms and anxiety have been shown to be related to the severity of vertigo (Yardley *et al.,* 1994). It was proposed that this relationship may arise from excessive awareness and fear of physical symptoms or may be as a result of genuine physiological arousal, or even

hyperventilation. The relationship between anxiety and handicap has been shown to be mediated by the reported number and frequency of autonomic symptoms (Yardley *et al.*, 1992a).

Somatisation, defined as the heightened concern with physical symptoms, may contribute to the psychosocial problems experienced by the dizzy patient (Yardley, 1994a). This suggestion is supported by previous work to develop a model relating handicap longitudinally to anxiety and depression (Yardley *et al.*, 1992b).

Numerous studies have been cited as demonstrating a relationship between recurrent vertigo and emotional disturbance. Debate has existed over whether the relationship arises from predisposing personality traits in patients developing and reporting dizziness or whether such findings are as a result of the psychological effects of dizziness (Yardley and Putman, 1992; Yardley *et al.*, 1994). Evidence exists of a relatively high incidence of psychiatric problems, particularly anxiety, in dizzy patients (Sullivan *et al.*, 1992; Yardley *et al.*, 1994). There are reports that personality traits such as anxiety may influence the impact of vertigo (Eagger *et al.*, 1992; Yardley *et al.*, 1992a). However it has been argued that these measures of trait anxiety in populations of dizzy patients are due to the current levels of anxiety causing retrospective bias of previous experiences of anxiety and distress.

There is evidence for a vicious circle triggered by the initial vestibular insult where the autonomic symptoms lead to anxiety and further psychological arousal, which in turn further augments the vertigo (Yardley *et al.*, 1994). Often the physiological changes that occur, both due to vestibular events and autonomic symptoms, are interpreted as being catastrophic. This cycle of physiological change and catastrophic interpretations have been used to explain panic attacks and there are similarities with the association between autonomic symptoms, beliefs about vertigo, anxiety and handicap (Yardley, 1994a). Many of the problems experienced by dizzy individuals can be found within criteria for the diagnosis of panic disorders. A study of patients attending a clinic for dizziness found that 15% met the criteria for panic disorders and/or agoraphobia (Stein *et al.*, 1994). The fear of going out alone because of the dizziness may lead to patients being diagnosed with agoraphobia (Eagger *et al.*, 1992).

The combination of dizziness, anxiety and avoidance behaviour is more handicapping than any of these complaints alone (Yardley *et al.,* 1998a). Those with dizziness and psychiatric disorders have been shown to have reduced functional status compared to those with dizziness alone (Kroenke *et al.,* 1993). It has been suggested that this may be due to the above cycle of escalating anxiety, dizziness and handicap triggered by reduced compensation for a vestibular deficit as a result of the initial restriction of activities (Yardley, 1994b).

2.4 NEW APPROACH TO THE CLASSIFICATION OF HEALTH CONDITIONS

Recent work by the WHO has resulted in a revised classification to replace the traditional approach of assessing health in terms of impairment, disability and handicap (WHO, 1999). The classification is currently undergoing its final field trials. This International Classification of Functioning and Disability, known as ICIDH-2, reflects the increased emphasis towards patient functioning as a result of both health conditions and treatment that is present in the literature. It also coincides with the proliferation of work assessing quality of life and health status.

The classification is divided into three levels: body level, individual level and society level. The body level incorporates body system functioning and body structure. At the individual level, activities performed by an individual are addressed. The society level is concerned with the areas of life in which the individual is involved, has access to, and/or for which there are societal opportunities or barriers. At these latter two levels, a range of activities and areas are considered from the simple to complex. The influence of environmental factors is included in the classification because of their reported impact at each level of the scheme (WHO, 1999).

At the current field stage, there appears to be slight confusion as to how to refer to the three levels or dimensions in the classification. The labels of body dimension, activities dimension and participation dimension are also used. The levels of body, individual and society are similar to those involved in the original classification for impairment, disability and handicap as illustrated in Figure 2.1. The new classification appears to include reductions in body function without requiring a permanent impairment which is

appropriate for dizziness. The overall difference compared with the original classification (ICIDH) is a strong emphasis on functioning and activities and the effect of health on these and a removal of the psychosocial aspect (e.g. feelings).

2.5 PSYCHOMETRIC PROPERTIES OF QUESTIONNAIRES

Psychometric properties are statistical properties that can be used to describe the performance of a questionnaire. There is general agreement as to the properties that should be established: reliability, validity and responsiveness. Each of these properties will be discussed in turn due to their importance in selecting and developing questionnaires for use. In adopting a questionnaire, there should be evidence that the psychometric properties meet statistical requirements. If only one property does not meet these requirements, the meaning of any of the other established properties is in doubt. The values for the psychometric properties are specific only to the population on which they were established. Caution should be used when generalising the performance of questionnaires to all patient groups (Buchbinder *et al.,* 1995).

Validity and reliability have been described as the most important psychometric properties and the majority of research has been concerned with these (Deyo and Inui, 1984). For a questionnaire to be used as an outcome measure, its responsiveness to clinically significant change is important. The methods for assessing reliability and validity are well established. However there appears to be no consensus as to how the property of responsiveness should be assessed.

2.5.1 Reliability

Reliability is concerned with the contribution from random errors on measurement. A reliable questionnaire will contain a small amount of random error. Reliability can be assessed for both single administration of a questionnaire or for repeated administration and there are three types of reliability important for health outcome questionnaires.

2.5.1.1 Test-retest repeatability

This form of reliability concerns the extent to which a measuring procedure yields the same results on independent repeated trials under the same conditions (Guyatt *et al.,* 1987) and on an unchanged population (Wilkin *et al.,* 1992). This is an important requirement when the aim of the questionnaire is to assess the changes that occur as a result of an intervention. A high test-retest repeatability is required so that any changes detected by the questionnaire will be due to the intervention or real changes in the disease process. However, the measurement of this property is affected by the difficulty of obtaining truly independent trials on replication.

2.5.1.2 Internal consistency

This is the reliability of a single application of the questionnaire and has been defined as the ratio of the variance attributable to true differences among subjects to the total variance (Kirshner and Guyatt, 1985). It is the extent to which all items intended to assess a particular dimension measure that dimension. Correlations between the items and the dimension score are examined providing an assessment of the overall homogeneity of the questionnaire.

2.5.1.3 Inter-rater reliability

This refers to the consistency of responses on the questionnaire when administered by different users. Although probably not important within a study where the same person is involved in the administration of the questionnaire, it may however be important when intending a questionnaire to be used by many centres when results may be compared.

2.5.2 Validity

The validity of a questionnaire is the extent to which it measures what it claims to measure. Validity is related to the effects of non-random or systematic errors. Although there are clear definitions of the different forms of validity in the literature (e.g. Kirshner and Guyatt, 1985), the distinction between them in practice is not always clear .

2.5.2.1 Content validity

Content validity refers to the completeness with which a questionnaire covers the important areas that it is attempting to represent (Kirshner and Guyatt, 1985). The important areas to be covered depend on the purpose of the questionnaire. A discriminative questionnaire aims to include all those aspects common to the group being studied; an evaluative questionnaire aims to include those aspects that are subject to change with treatment (Kirshner and Guyatt, 1985).

There are no standard procedures to demonstrate content validity and so arguments in support of content validity tend to be based on reasoning rather than scientific evidence. Claims that the items included were either selected by a large number of representative judges, based on patient reports or from the published literature are often taken as sufficient to demonstrate content validity.

2.5.2.2 Criterion validity

This is the degree to which the results obtained by the questionnaire correspond to those obtained using a superior measure or gold standard simultaneously (Kirshner and Guyatt, 1985). A gold standard is a measure of a concept that is the same as that which the instrument under study aims at, and about which consensus exists concerning its accuracy in representing that concept (de Bruin *et al.,* 1997). The lack of a gold standard however for quality of life or functional status makes this form of validity difficult to assess.

2.5.2.3 Construct validity

This form of validity is the extent to which a particular measure relates to other measures in a manner that is consistent with theoretically derived hypotheses (Kirshner and Guyatt, 1985).

Since a gold standard does not exist for quality of life (Guyatt *et al.,* 1986; Kirshner and Guyatt, 1985; Deyo and Centor, 1986; de Bruin *et al.,* 1997), relationships with other relevant external criterion are proposed to assess the validity of quality of life questionnaires (Guyatt and Jaeschke, 1990).

There are two forms of construct validity. The existence of a correlation between a related questionnaire, but not a one to one correspondence provides evidence for what is referred to as convergent validity. The absence of a correlation between variables that should not be related provides evidence for what is referred to as discriminant validity.

2.5.3 Responsiveness to change

The ability of a questionnaire to detect changes within patients is known as responsiveness. This property is sometimes referred to as the sensitivity of the questionnaire to change. To reduce confusion with the alternative use of this term in epidemiology, responsiveness is used throughout.

There are subtle differences between the definitions of responsiveness available. Examples include being concerned with the ability to detect minimal clinically significant change (Guyatt *et al.,* 1987), the ability to detect changes in the concept being measured (de Bruin *et al.,* 1997) and the ability to detect a treatment effect (Buchbinder *et al.,* 1995). The absence of a gold standard for quality of life means that it is difficult to determine what constitutes the change to be detected. Although statistically significant difference is a condition for detecting change, not all statistically significant changes will represent a relevant change in the concept (de Bruin *et al.,* 1997).

Responsiveness of a questionnaire to change is a major concern for the evaluation of the impact of treatment (Katz *et al.,* 1992; Wilkin *et al.*, 1992). The responsiveness has been described as perhaps the most important property of a health outcome questionnaire (Stucki *et al.,* 1995a). Attention has been drawn by many researchers to the failure of existing health questionnaires to identify small but clinically significant changes (Deyo, 1984; Deyo and Centor, 1986; Deyo and Inui, 1984; Guyatt *et al.*, 1985). Little attention has been paid to responsiveness in the majority of studies concerned with the development and performance of functional status and quality of life questionnaires (Deyo and Inui, 1984).

2.5.3.1 Methods to assess responsiveness

Although a number of approaches have been adopted in the literature to measure responsiveness (Deyo and Inui, 1994; Stucki *et al.,* 1995a), there appears to be a lack of standardised methods available (Deyo and Inui, 1984; Deyo and Centor, 1986).

The methods differ in their rationale for the assessment of responsiveness and the statistical analysis carried out. Two methods have been proposed by assuming that outcome questionnaires are clinical predictive tests of improvement or deterioration. These have involved the assessment of the sensitivity and specificity for detecting change (Deyo and Inui, 1984; Deyo and Centor, 1986) and the construction of Receiver Operating Characteristic (ROC) curves (Deyo and Centor, 1986). Both these approaches require an external criterion to define the presence of an improvement or deterioration. As with the evaluation of many of the psychometric properties, the absence of a gold standard for quality life introduces difficulties in defining the external criterion. An advantage, however, of such methods is that comparisons of the responsiveness can be made between questionnaires.

An alternative method is to examine the correlations that exist between changes in the health outcome questionnaires and changes in clinical measures (Deyo and Centor, 1986). Although this links changes with the traditional domain used for assessing patient status (Kazis *et al.,* 1989), comparisons of responsiveness cannot be made between questionnaires.

Questionnaire score changes have been examined as a result of a treatment of known efficacy to indicate the responsiveness of the questionnaire (Deyo and Centor, 1986). The statistical significance of the score change reflects the responsiveness, with higher significance indicating greater responsiveness.

A number of indices of responsiveness have been proposed that involve a ratio based on score changes and an indicator of the precision of the measurement (de Bruin *et al.,* 1997). Such methods were developed to provide a standardised and dimensionless representation of the changes observed. Although these are claimed as measures of responsiveness, they quantify the changes demonstrated by the questionnaire under study rather than the validity

or clinical relevance of the change (de Bruin *et al.,* 1997). An external criterion is required to determine the validity of the changes observed.

The ratio of clinically important difference to the variability of scores in stable subjects has been proposed as the index of responsiveness (Guyatt *et al.,* 1986). This method is limited because of the difficulty in knowing what constitutes a clinically important difference (Liang *et al.,* 1990). Two similar ratios are the effect size (Kazis *et al.,* 1989) and the standardised response mean (SRM) (Liang *et al.,* 1990; Stucki *et al.,* 1995a). The effect size has been reported as the ratio of the mean change in score obtained on the questionnaire to the standard deviation of the score change whereas for the SRM, the denominator is the standard deviation of scores at baseline. A non-parametric version of the effect size is available for those cases where scores are highly skewed (Kazis *et al.,* 1989). The emphasis of the effect size appears to be as a tool for quantifying (de Bruin *et al.* 1997) and interpreting score changes (Kazis *et al.,* 1989) rather than as a measure of responsiveness.

2.5.4 Requirements for health outcome questionnaires

Health outcome questionnaires exist in all areas of health care and include measures of disability, handicap, quality of life, functional status and general well-being. The considerations to be made when choosing health outcome questionnaires are summarised in Table 2.3 (after Jette, 1980).

Consideration	Description
Intended use of measure	Is the measure to be used for comparing treatments, monitoring patients, assessing patient needs ?
Conceptual focus	What is the domain of assessment - impairment, disability, handicap, quality of life, activities of daily living, general well-being ? Is this relevant to the population under study ?
Quality of the measure	What are the psychometric properties of the measure including reliability, validity and responsiveness; ceiling and floor effects, length and acceptability ?

Table 2.3: Considerations for the choice of health measure (after Jette, 1980).

A shortcoming in the development of health outcome questionnaires and in particular quality of life questionnaires has been the lack of distinction between their possible uses (Kirshner and Guyatt, 1985). The three roles of health questionnaires are described as discriminative, predictive and evaluative. The statistical requirements for the three purposes of the questionnaires are different and can be conflicting (Kirshner and Guyatt, 1985).

The usefulness of questionnaires designed to evaluate change within persons over time is dependent not only on the reliability and validity of the questionnaire, but also on the ability to detect changes that occur (Kirshner and Guyatt, 1985; Guyatt *et al.,* 1987). This is in contrast to health outcomes that are developed for either discriminative or predictive purposes. For these measures it is sufficient to demonstrate only the validity and reliability of the measure (Kirshner and Guyatt, 1985). To discriminate between individuals over time, the between-person variation must be stable and large. For the health measure to be used for evaluation, for the stable individual, the magnitude of within-person variation over time must be small (Kirshner and Guyatt, 1985).

2.6 QUESTIONNAIRES TO ASSESS DIZZINESS AND ITS CONSEQUENCES

Questionnaires for the assessment and management of dizzy individuals can be considered to exist at two levels as shown in Table 2.4. For each level, the construct measured and the format of measures available are summarised. The general use of the term questionnaire is used here to also include rating scales and thermometer scales.

Measurement Level	Measurement Domain	Format
Disease-specific	Dizziness/symptoms Disability Handicap	Questionnaires Rating scales
Generic	Quality of life Health status Well-being	Questionnaires Rating scales Thermometer scales

Table 2.4: Levels of measurement for questionnaires for dizzy individuals.

The disease-specific level consists of measures that have been developed specifically for the dizzy patient and dizziness; the generic level consists of measures that are applicable to a wide range of health problems.

To date, the disease-specific measures have assessed the consequences of dizziness in terms of the traditional constructs of disability and handicap. These have been developed to provide an index to quantify the effectiveness of treatment (Newman and Jacobson, 1993). The generic measures have concentrated on the concepts of quality of life and health status. These measures assess all aspects of lifestyle in a way that is independent of the health problem.

There is a lack of psychometrically sound self-report instruments that measure dizziness and related factors (Hazlett *et al.,* 1996). As will be seen from the following review of the currently available measures, the traditional approach to the assessment of dizziness and its consequences may not be appropriate and provide a representative measure of the consequences of dizziness.

2.7 DISEASE-SPECIFIC QUESTIONNAIRES

A wide range of disease-specific questionnaires and rating scales are available for the dizzy individual. The measures available are reviewed here and those relevant to the purposes of this study are discussed in greater detail, in particular those concerned with the assessment of disability and handicap.

2.7.1 Measures of symptoms

Dizziness symptoms in terms of their frequency and severity are quantifiable (Honrubia *et al.,* 1996) and are shared by all patients, irrespective of the cause of dizziness.

2.7.1.1 Vertigo Symptom Scale

The Vertigo Symptom Scale (VSS) was developed as a tool to discriminate between the symptoms of true vertigo and the secondary symptoms associated with somatic anxiety (Yardley *et al.,* 1992a). The VSS provides a measure of the vertigo severity without

contamination from anxiety and distress (Yardley *et al.,* 1992c) as well as examining the range of symptoms complained of by the patient.

The VSS can be used as a single scale of symptom severity or as four independent sub-scales (Yardley *et al.*, 1992a, Yardley *et al.,* 1992c). Each sub-scale considers different types of symptoms: acute attacks of vertigo, short duration vertigo, autonomic symptoms and somatisation. It has been proposed that the sub-scales provide a new valid method for the evaluation of the level of functional impairment caused by vertigo (Yardley *et al.,* 1992a). This claim is made despite the fact that the sub-scales are in the symptom domain. The sub-scale scores can generate a profile of the symptoms experienced by the patient. Normative data are available for the VSS.

The VSS and its subscales have been shown to be reliable, possessing high internal consistency and 24-hour test-retest repeatability (Yardley *et al.,* 1992a). Comparisons of scores on the VSS and measures of anxiety, handicap, diagnosis and vestibular test results have been used to demonstrate the validity of the VSS (Yardley *et al.,* 1992a). A Spanish translation of the questionnaire for a Mexican sample has also been shown to be valid (Yardley *et al., 1999*).

Although the VSS was not originally developed as an outcome measure, a significant improvement in a shortened version of the VSS has been measured in a randomised controlled trial of vestibular rehabilitation (Yardley *et al.,* 1998b). The shortened version of the VSS has been described as being sensitive to change although responsiveness of either version of the questionnaire appears not to have been formally assessed. Although the questionnaire was shown to be reliable at baseline, the test-retest repeatability over a 6-week period in a control group was only moderate (reliability coefficient = 0.60).

2.7.1.2 Symptom rating scales

A subjective rating scale for symptom severity is available based on the average intensity of episodes of dizziness and associated symptoms of nausea and vomiting (Cohen *et al.*, 1995). For this scale each point was defined in terms of the symptoms experienced. A simpler approach has been adopted involving a scale numbered from 1 to 10 with 1 indicating no symptoms and 10 indicating the worst symptoms imaginable (Shepard, 1998).

A post-therapy symptom score has been developed (Shepard *et al.*, 1990) to quantify the change in symptoms before and after treatment. Originally designed to be assigned by clinicians, this rating scale is now completed by patients themselves (Shepard, 1998). No details of the psychometric properties of any of these symptom severity scales have been reported.

2.7.1.3 Other approaches

Alternative approaches have involved asking the patient directly whether the symptoms have improved (Horak *et al.,* 1992). In a number of studies not involving dizzy individuals, this style of question has been adopted as a gold standard for improvement. A danger of such a style of question is that it may assess patient satisfaction with treatment rather than reflecting a real change in symptoms (Spilker, 1990).

A formula method has been developed for use with patients suffering from Meniere's disease to express the change in spells of vertigo before and after medical or surgical treatment (Newman and Jacobson, 1993).

The number of exercise positions pre- and post-therapy in which dizziness occurs and the duration and intensity of the dizziness has been adopted as a measure of the outcome of the rehabilitation (Horak *et al.,* 1992). The Motion Sensitivity Quotient has been proposed as a method of symptom evaluation (Smith-Wheelock *et al.*, 1991). The formula is based on the symptoms in terms of the intensity and duration as provoked by rapid body position changes.

The emphasis of many of these methods has been on quantifying changes as a result of treatment. Often such methods use the specific rehabilitation exercises to quantify outcome. An improvement in the ability to carry out those specific exercises may be demonstrated without transfer of this improvement to the general functioning of the individual. Little information is provided about the status of the patient at the time of completion.

2.7.2 Measures of disability

The disease-specific disability measures available for dizziness are rating scales. All of the measures discussed here adopt the US definition of disability rather than the WHO version (WHO, 1980) and are concerned with the impact of dizziness on work status.

Disability, as shown in Table 2.5, has been defined by the Committee on Hearing and Equilibrium of the American Academy of Otolaryngology - Head & Neck Surgery (Newman and Jacobson, 1993).

Disability classification
No disability
Mild disability – Intermittent or continuous dizziness/unsteadiness that precludes working in a hazardous environment
Moderate disability - Intermittent or continuous dizziness/unsteadiness that results in a sedentary occupation.
Severe disability - Symptoms so severe they preclude gainful employment.

Table 2.5: Classification of disability (Committee on Hearing and Balance and Equilibrium of the American Academy of Otolaryngology - Head & Neck Surgery)

Although these disability classifications have limitations and are restricted to the domain of work, they were the first attempt to relate the impact of disease to a person's ability to function (Newman and Jacobson, 1993).

The disability rating score, shown in Table 2.6, was developed to quantify the level of disability experienced by patients and to quantify the change in disability before and after treatment. Although originally developed to be completed by clinicians, this is now done by patients (Shepard, 1998). Work is again included in the descriptions, although this can be extended to include college work or work in the home for those who are not employed.

A disadvantage of this disability scale, as well as the corresponding scale for symptoms has been the lack of formal psychometric testing (Newman and Jacobson, 1993). Although the disability scale has been validated against the Dizziness Handicap Inventory (Shepard and Telian, 1996), there are no published results of the test-retest reliability (Shepard *et*

al., 1990). The scale also has an underlying assumption that there is a relationship between the symptoms and the amount of disability.

Score	Description
0	No disability; negligible symptoms.
1	No disability; bothersome symptoms.
2	Mild disability; performs work duties, but symptoms interfere with outside activities.
3	Moderate disability; symptoms disrupt performance of both usual work duties and outside activities.
4	Recent severe disability; on medical leave or had to change jobs because of symptoms.
5	Long-term severe disability; unable to work for >1 year or established permanent disability with compensation payments.

Table 2.6: Disability Rating Scale

2.7.3 Measures of handicap

2.7.3.1 Dizziness Handicap Inventory

Questionnaire development

The Dizziness Handicap Inventory (DHI), a copy of which can be found in Appendix 1, was developed to quantify the effect of dizziness and imbalance on the daily life of balance-disorder patients (Jacobson and Newman, 1990). Recent reports refer to the questionnaire as assessing 'self-perceived disability-handicap' (Jacobson and Calder, 1998) rather than self-perceived handicap as originally described (Jacobson and Newman, 1990). It has even been referred to by others as assessing disability (Asmundson *et al.*, 1999) and quality of life (Enloe and Shields, 1997).

The DHI was developed from clinical experience and case histories from patients and therefore can be assumed to possess content validity. As a result it relates to patients' ability to perform daily activities in view of the balance problems experienced. The 25-item questionnaire is divided into three subscales of physical, functional and emotional

handicap. Items were assigned to each of these subscales based on *a priori* decisions by the developers (Jacobson and Newman, 1990).

Inspection of the item content reveals that many items assume a certain level of activity and that these activities are still carried out irrespective of the sensation of dizziness. But dizzy patients have been shown to avoid and restrict the activities that provoke dizziness (Yardley *et al.,* 1992b) and those that they fear might provoke the dizziness (Yardley, 1994a).

There is a lack of studies assessing the psychometric properties of the DHI (Asmundson *et al.,* 1999). Although validity, internal consistency (Cronbach's alpha=0.91) and short-term test-retest repeatability (correlation r=0.97) have been demonstrated (Jacobson and Newman, 1990), these properties were established during the development of the questionnaire itself. Justification for the criterion measures used to establish validity is not clear. Correlations of the DHI with computerised dynamic posturography have been shown to be low elsewhere (Robertson and Ireland, 1995) compared with the strong correlation previously found (Jacobson and Newman, 1990).

Based on the score changes observed in stable subjects in a day, a score change of 18 out of 100 has been reported to be needed before the change can be assumed to be a real change in status (Newman and Jacobson, 1993). Although the responsiveness of the DHI has been assessed using an index of responsiveness (Enloe and Shields, 1997), this only allows for comparison with other questionnaires applied at that time.

Subscale structure

The subscale structure of the DHI has led to claims that it can be used to identify specific functional, emotional or physical problems (Jacobson and Newman, 1990). Although a multi-dimensional structure in the DHI has been supported by factor analysis of patient responses, the dimensions have been found to differ substantially from those originally proposed (Asmundson *et al.,* 1999). Support for the subscale classification has also not been found from analysis of a new scale containing items from the DHI (Hazlett *et al.,* 1996). The results of this latter study found that the consequences of dizziness were more finely differentiated than in terms of this simple subscale structure.

Factor analysis of responses on the DHI has indicated two possible solutions (Asmundson *et al.,* 1999). The first consists of two factors interpreted as 'General Functional Limitations' and 'Postural Difficulties'. The second consists of three factors with 'General Functional Limitations' divided into 'Disabilities in Activities of Daily Living' and 'Phobic Avoidance'. The factor of 'Postural Difficulties' remained stable for the two solutions. Despite the fact that this factor consists of only two items, it is argued that the data support its reliability (Asmundson *et al.,* 1999). An interpretation of postural difficulties is perhaps also more appropriate to describe the item content of the original physical subscale of the DHI.

Although the DHI has been described as having gained acceptance as a useful measure for dizzy patients (Jacobson and Calder, 1998), there is a lack of empirical support for its subscale structure in responses from patients (Asmundson *et al.,* 1999). This means that scores on the subscales of the DHI should be interpreted cautiously (Asmundson *et al.,* 1999). The revised factor structure is proposed as provisional and recommendations have been made for further empirical evaluation and clarification (Asmundson *et al.,* 1999).

2.7.3.2 Shortened versions of the Dizziness Handicap Inventory

Two shortened versions of the DHI have been proposed (Jacobson and Calder, 1998; Tesio *et al.,* 1999) although only five items from the original DHI are common to both.

The former is described as a screening version formed from the 10 items exhibiting the highest item-total correlations in a survey of patients attending a tertiary referral centre for balance assessment (Jacobson and Calder, 1998). Items were scored as for the original DHI. High comparability of scores on the original DHI and screening version (DHI-S) were reported (Jacobson and Calder, 1998). One week test-retest repeatability as assessed by the correlation between scores was high ($r=0.95$). On the basis of these results, a score change of 4 points out of a maximum of 40 was recommended to indicate a real change in status.

A short form version of the DHI (DHIsf) was developed based on an Italian translation of the DHI "as agreed on by all authors" (Tesio *et al.,* 1999). This translated version of the DHI was not investigated for its psychometric properties before Rasch analysis was carried out to shorten the questionnaire. Analysis involved modification of the scoring scheme so

that responders answered yes or no for each item. Higher scores indicated lower handicap which is opposite to that on the original DHI. Good psychometric properties for the DHIsf were claimed by Tesio *et al.* (1999) although the evidence for this conclusion is not clear from the statistics presented. Despite the limitations in the study, the DHIsf has been described as an improvement on the DHI (Tesio *et al.,* 1999).

2.7.3.3 Vertigo Handicap Questionnaire

The Vertigo Handicap Questionnaire (VHQ) assesses the difficulties experienced by dizzy patients. The questionnaire is based on the most commonly reported difficulties encountered by patients presenting with a wide range of diagnoses (Yardley *et al.,* 1992b) and assesses the physical, practical, social and emotional impact of vertigo (Yardley *et al.,* 1992c). Items within the questionnaire are concerned with patient beliefs, behaviour and difficulties as expressed in in-depth interviews (Yardley and Putman, 1992) and therefore can be argued to possess content validity.

The questionnaire consists of 25 items split in to three sections. Again, as for the DHI, a level of activity and pursuit of hobbies is assumed in the phrasing of the questions. The response scale and scoring scheme changes across the sections of the questionnaire, which perhaps complicates the completion of the questionnaire for the responder. The handicap score is relatively simple to calculate.

Sub-scales of the VHQ were derived from analysis of patient responses to the questionnaire by identifying factors that contributed to patient distress. The sub-scales were defined as handicap or restriction of activities (REST); social anxieties (SOC); fears about vertigo (FEAR) and severity of vertigo (SEV). Analysis has shown all sub-scales to be significantly related to emotional distress (Yardley and Putman, 1992).

A criticism of the questionnaire is the lack of extensive psychometric testing with no report of its test-retest repeatability and validity.

2.7.3.4 Other disease-specific measures

Recent studies have presented new measures specific to dizziness. One of these is the Dizziness Factor Inventory (Hazlett *et al.,* 1996) which is a 44-item questionnaire

modelled on a multidimensional inventory for chronic pain patients. The scale is divided into three sections; the subjective experience of dizzy patients; patients' perception of the responses of significant others to them and participation in common activities. No psychometric testing has been carried out to date and further work has been recommended (Hazlett *et al.,* 1996).

Another measure is the VDI questionnaire specific to patients with vertigo, dizziness and imbalance (Prieto *et al.,* 1999). Although not explicitly stated, it is likely that this questionnaire had been developed in Spanish. Items were obtained from clinicians and patients and established symptom, disability and handicap questionnaires (Prieto *et al.,* 1999). Two versions of the questionnaire exist concerned with symptoms and health-related quality of life. Although the questionnaire is reported to reliable, valid and responsive, these properties were established in a population of patients over 50 years of age. The foundations of the questionnaire within the quality of life domain are also not clear, particularly in the absence of the questionnaire or example items in the report.

2.8 GENERIC QUESTIONNAIRES

The generic questionnaires that have been applied to dizzy patients have predominantly assessed quality of life. These studies have adopted either the SF-36 (Fielder *et al.*, 1996; Enloe and Shields, 1997; Kinney *et al.*, 1997) or the Sickness Impact Profile (Kroenke *et al.*, 1993; Mendel *et al.*, 1999). A survey of quality of life has also been carried out using the Nottingham Health Profile of a population of 76 year old Swedish citizens (Grimby and Rosenhall, 1995). The concept of quality of life, the measures available and the quality of life of dizzy patients are discussed in subsequent sections of this review.

A second generic approach to assess the consequences of dizziness has been to use Activities of Daily Living (ADL). Since the remainder of this review concentrates on quality of life, ADL and its application to dizzy individuals will be discussed here.

2.8.1 Activities of Daily Living

The generic Activities of Daily Living (ADL) has been used to assess the performance of daily activities and self-care tasks in dizzy individuals. The scale was used to indicate intolerance to motion and as an outcome measure for a rehabilitation programme (Cohen, 1992). The concern however would be that the questionnaire would not register those activities not carried out due to anticipated disability. No attention is made to social and emotional effects of dizziness in the ADL items.

The deficits measured in the ADL have been found to be related to the patient's fear of falling (Cohen, 1992). It has been found that those areas where the most impairment has been measured on the ADL also demonstrate the greatest improvement with rehabilitation (Cohen, 1992). Although scores have been found to be significantly improved after therapy, the responsiveness of the questionnaire has not been formally assessed for dizzy patients. The improvements in functional skill as indicated by the ADL scores are probably related to the reduction in dizziness experienced (Cohen *et al.*, 1995). The psychological benefits obtained from therapy in the continued presence of dizziness however cannot be registered on the ADL.

Care must be taken when applying the results of a measure such as the ADL that the tasks involved are appropriate for the patient population to which it is applied. The concern is that dizzy patients seen in routine outpatient departments are still able to carry out the many self-care items included on the questionnaire. This is supported by further work, which found that the majority of patients believe their functional skills are not affected or are minimally affected (Cohen and Kimball, 2000).

Concern that the original generic ADL scale was not refined enough to detect subtle problems of dizzy individuals has led to its modification (Cohen and Kimball, 2000). Reduction of the number of items by removing irrelevant items was achieved by panels of therapists rather than being data-driven. The remaining items were assigned to one of three subscales: functional, ambulation and instrumental. A new scoring scheme was introduced to allow smaller gradations of function to be reported. Although test-retest repeatability is claimed this was examined over only a two hour period which makes it possible that responses could be remembered between the two applications. Even though rationale for

the development of the Vestibular Disorders ADL was that the original ADL was not refined enough for dizzy individuals, no work has been carried out to date to assess the responsiveness of the scale. This has not prevented the authors from recommending it for assessing improvements with treatment.

2.9 QUALITY OF LIFE

The concept of quality of life and its importance in healthcare is often referred to in the literature (e.g. Guyatt *et al.,* 1986; Skevington, 1999). Extensive review of the concept and measures available to assess it is found in Bowling (1991, 1995). The discussion here is focused on those aspects important for the current study.

Quality of life has developed as a result of the increased recognition that a patient's functional status and subjective experiences are needed, in additional to the physical effects, to represent the impact of a health problem on an individual's lifestyle (Guyatt and Jaeschke, 1990). Measurement of quality of life has consequently become an attempt to define the functional outcome of a disease and its treatment with respect to the patient (Schipper *et al.,* 1990).

Despite this there appears to be no consensus in the literature as to its definition and conceptual basis (Bergner, 1989; Coons and Kaplan, 1993). Not only is this clear from reviews on health outcomes and clinical research, it is also apparent from differences in the literature on quality of life. The failure to define quality of life for the purpose of individual studies is also common.

The term quality of life has been used in a variety of ways. These have ranged from referring to 'a person's total well-being including his or her psychological, social and physical health status' to 'the duration of life as modified by the impairments, functional states, perceptions, and social opportunities that are influenced by disease, injury, treatment or policy' (Coons and Kaplan, 1993).

What is obvious from the many discussions on quality of life is that it is a multi-dimensional concept. This opinion is supported by others (Coons and Kaplan, 1993). Also

important to the concept is that the concerns and perceptions of the patient are central to its assessment (Skevington, 1999).

What differs between many of the definitions and descriptions of quality of life is the areas of lifestyle (dimensions and domains) that are included. Quality of life is generally assumed to consider four dimensions of physical status and functioning, social/role functioning, emotional/psychological status and disease and/or treatment-related symptomology or somatic sensation (Spilker, 1990; Coons and Kaplan, 1993). Others have included dimensions of cognition, sleep and rest, energy and vitality, health perception and general life satisfaction (Bergner, 1989). While such aspects of lifestyle have been included as separate dimensions by some, others have contained these within broader dimensions of quality of life.

Quality of life can be considered on a global scale as well as just within the realm of healthcare by also including domains such as financial, political and cultural (Tate *et al.,* 1996). Health-related quality of life has been used to refer to those components of quality of life that centre on or are directly affected by health, disease, disorder and injury (Anderson *et al.,* 1996; Tate *et al.,* 1996). Others have also included duration of life as one of the categories of the concept (Patrick and Deyo, 1989). However this distinction between 'health-related quality of life' and 'global quality of life' is often not made.

A definition of quality of life has recently been proposed by the World Health Organisation (Skevington, 1999). This defines quality of life as;

> 'an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept affected in a complex way by the person's physical health, psychological state, personal beliefs, social relationships and their relationship to salient features of their environment'.

The WHO definition has been developed from the statement that health is 'a state of complete physical, mental and social well-being and not merely an absence of disease or infirmity'. Although the WHO version of quality of life considers many other dimensions other than those contributing to health, others have restricted quality of life to simply the physical, psychological and social dimensions that parallel the definition of health.

The definition proposed by the WHO includes health as affecting quality of life but fails to specify all the dimensions of quality of life that should be evaluated. Factors listed such as psychological state and social relationships have been adopted by other definitions of quality of life. However the inclusion of health as one of the factors influencing quality of life emphasises the distinction between 'general quality of life' and 'health-related quality of life'. Defining quality of life as including health alongside other factors may limit application of the WHO definition to patient groups and health outcomes.

2.9.1 Health status

Not only is there much debate about the definition of quality of life, there is also much confusion between quality of life and other concepts under measurement (Skevington, 1999). This appears to be particularly true for the concept of health status. Health status has been reported as the same concept as quality of life by some (Coons and Kaplan, 1993), others have reported quality of life to be included within health status (Patrick and Deyo, 1989) while others have described them as entirely different concepts (Bergner, 1989).

The terms health status and quality of life are often interchanged when being applied to the same questionnaires or studies. One is often introduced into discussions about the other without any clear indication of the difference or relationship between the two.

2.9.2 Dimensions of quality of life

Quality of life has been evaluated on only a relatively small number of dimensions (Skevington, 1999). It may be the case that other important properties have not been evaluated. This potential failure may have arisen because of the lack of clear definition and conceptualisation of quality of life. However there is also an impact of the need for short scales for clinical use on the number and range of dimensions considered.

The dimensions considered could often be specific to the population to be surveyed or the purpose for which the concept is to be applied. There is no reason why all dimensions have to be measured if they will not provide information about the quality of life of patients (Spilker, 1990). However this is perhaps difficult to put into action when there is no agreement on the dimensions of quality of life.

2.10 QUALITY OF LIFE QUESTIONNAIRES

The choice of quality of life questionnaire is dependent on the aims of the study, the population being surveyed and where appropriate the intervention being assessed (Bergner, 1989). From the consequences of dizziness outlined in section 2.3, it is clear that quality of life and its dimensional approach to the impact of a health problem is appropriate for dizziness.

The quality of life questionnaires discussed below include those that have previously been applied to dizzy individuals and those that are important in health care research. The questionnaires are discussed in detail due to their importance in selecting a quality of life questionnaire for the current study.

2.10.1 Sickness Impact Profile

The Sickness Impact Profile (SIP) was developed as a behaviourally based questionnaire measure of the impact of sickness (Bergner *et al.,* 1976). It has been described as one of the best multi-purpose measures of disease (Wilkin *et al.*, 1992) and comprehensive measures of (negative) health status (Williams, 1996). There have been reports of its use as a gold standard for the measurement of health status (Jenkinson *et al.,* 1997).

The questionnaire is described by its developers as a measure of health status (Gilson *et al.,* 1975; Bergner *et al.,* 1981). This perception of the questionnaire has been maintained by others (e.g. Sullivan *et al.,* 1990; Butcher *et al.,* 1996; Petajan *et al.,* 1996). In the early stages of its development there was no mention of the questionnaire as a measure of quality of life. This interpretation of the questionnaire (e.g. Schweitzer *et al.,* 1995; de Jong *et al.,* 1997; Engstrom *et al.,* 1996) appears to have arisen with the increased popularity of this concept to investigate the effects of health problems. Interchange between the terms health status and quality of life is common while referring to the questionnaire (Scheitzer *et al.,* 1995; Essink-Bot *et al.,* 1996).

Reference however has also been made to the SIP as assessing disability (e.g. Bacon *et al.,* 1994; Gruen *et al.,* 1995; Hopman-Rock *et al.,* 1997). This interpretation does not agree with the WHO definition for disability (WHO, 1980) or the original development of the SIP. The only justification given for its adoption as a disability measure is that it is better

to regard the consequences of an impairment in terms of the International Classification of Impairment, Disability and Handicap (ICIDH) (Hopman-Rock *et al.,* 1997). However, the SIP is now generally accepted by most to be a generic measure of health-related quality of life (Bowling, 1995).

2.10.1.1 Sickness, disease and behaviour

The rationale behind the SIP is that sickness denotes the individual's experience of illness through its effects on everyday life and feelings. By relying on the individual's perception of the impact of sickness on usual daily activities, the intention was that the SIP would provide an appropriate and sensitive measure for use in health care (Gilson *et al.,* 1975). Rather than assessing the level of positive functioning, the SIP is concerned with dysfunction (Bergner *et al.,* 1981) and negative health status (Charlton, 1989).

The questionnaire concentrates on the behavioural rather than emotional response to disease (Wilkin *et al.*, 1992) and assesses functioning rather than perceived health (Essink-Bot *et al., 1996*).

This emphasis of the questionnaire is considered an advantage by some as behaviour can be more reliably reported and verified than subjective reports of feelings (Wilkin *et al.*, 1992; Williams, 1996). This structure has been reported to be appropriate for examining the impact of impairment on people who are chronically ill and to link medical performance to specific functional limitations and activity restrictions (Charlton, 1989).

The failure to include feeling states however has also been a criticism of the SIP as a generic measure of health (Jette, 1980) and developers of other questionnaires have adopted the opinion that subjective components should be central to health status assessment (Williams, 1996). This does not mean that the SIP does not assess the emotional consequences of a health problem. It does so by assessing emotion-related behaviour rather than by the expression of feelings.

The SIP provides information about the impact of illness as perceived by the responder (Gilson *et al.,* 1975). Behaviour is seen as the manifestation of the overall impact of the illness. Dizzy individuals experience anticipated disability in that they believe they are not able to carry out a particular task when in fact they can. By having a profile that assesses

patients' self-reported behaviour, this anticipated disability is included within the responses. This has been a failure of previous dizziness-specific questionnaires of handicap.

2.10.1.2 Development of the SIP

The SIP was developed in the US as a generic questionnaire that is applicable to different types and severities of disease. In particular, the questionnaire was developed for patients who are chronically ill. The questionnaire was also designed to avoid demographic and cultural bias and as a result versions of the questionnaire have been developed for Swedish (Mendel *et al.,* 1999) and Dutch populations (de Bruin *et al.,* 1994a). These versions are still referred to as the SIP. The British version of the questionnaire is known as the Functional Limitations Profile and is discussed in detail in Section 2.10.3.

2.10.1.3 Item content

The questionnaire contains 136 statements divided in to 12 categories that relate to the individual's health on the day of completion. The structure of the items is to assess behaviour and changes in performance rather than the capacity to perform (Williams, 1996). This is important for a health problem such as dizziness where activities are restricted or modified.

Items were obtained from a pool of statements describing aspects of behaviour associated with sickness. These were obtained from patients, health care professionals, individuals caring for patients and the apparently healthy and review of functional assessment instruments (Gilson *et al.,* 1975; Bergner *et al.,* 1981). The large number of items covers an extensive range of activities applicable to differing disease severities.

Examples of items are 'I walk shorter distances or often stop for a rest', 'I am not doing any heavy work around the house that I usually do' and 'I am not doing any of my usual physical recreation or activities'. A criticism of the questionnaire has been the combination of activities within one item which could be performed at different levels (Jette, 1980). Inspection of the items, however, suggests this may not be a particular problem since the majority of activities are provided as examples of a general area of functioning that is assessed by the item.

Although concern has been expressed that items of the SIP consider only minor difficulties (Stucki *et al.,* 1995b), this has not been reported elsewhere and may be particular to the group of patients who required surgery for their condition.

2.10.1.4 Questionnaire structure

The SIP contains two dimensions; physical dimension and psychosocial dimension (Bergner *et al.,* 1981). The categories forming these dimensions are summarised in Table 2.7 alongside the independent categories that contribute to neither dimension.

Category	Dimension	
	Physical	Psychosocial
Ambulation	x	
Mobility	x	
Body care and movement	x	
Social interaction		x
Alertness behaviour		x
Emotional behaviour		x
Communication		x
Sleep and rest		
Eating		
Work		
Home management		
Recreation and pastimes		

Table 2.7: SIP categories and dimensions

Descriptions of the development of this category structure are not clear from the literature, nor is justification for the development of the dimension structure. Despite standard sorting and grouping techniques being referred to by the developers (Bergner *et al.,* 1981) and by others (e.g. Williams, 1996), details of this analysis are not given. Others have reported the categorical structure to have been derived from *a priori* decisions on items referring to common activities (de Bruin *et al.,* 1994a). The theoretical or empirical content validity of the categorical structure has not been reported (de Bruin *et al.,* 1994a). The categorical structure has not been supported by statistical analysis of responses to a Dutch version of the SIP (de Bruin *et al.,* 1994a).

The dimension structure of the SIP appears to have arisen by examining correlations between categories and external criteria in patient groups with rheumatoid arthritis, hyperthyroidism and patients with hip problems (Bergner *et al.,* 1981). The dimension

structure of physical and psychosocial function, as shown in Table 2.7, has been supported empirically (de Bruin *et al.,* 1994a) although the category *recreation and pastimes* was found to contribute to both dimensions.

In contrast, factor analysis has indicated the inclusion of *household management* within the physical dimension and the inclusion of *sleep and rest* and *recreation and pastimes* in the psychosocial dimension (Essink-Bot *et al.,* 1996). Scores for the *communication* category have been shown to be poorly related to mood and mental well-being for rheumatoid arthritis patients (Sullivan *et al.,* 1990) despite its inclusion within the psychosocial dimension. The category *recreation and pastimes* has been found to be a better representation of patients' level of activity than the *work* category (Sullivan *et al.,* 1990). A large proportion of the rheumatoid arthritis patients were not working.

2.10.1.5 Scoring scheme

Responders are instructed to endorse those items that apply to them on that day and because of their health (Bergner *et al.,* 1976). Each item is weighted to take in to account the differing severities of dysfunction imposed by each item. Item weights have been described as having been developed using a Thurstone-paired comparison technique (Beaton *et al.*, 1996). However, the original references given (Gilson *et al.*, 1975; Bergner *et al.*, 1981) do not describe this.

The scaling of the items is described by the developers as having been achieved by items being rated on a dysfunction scale by 25 judges (Gilson *et al.*, 1975). The panel of judges consisted of nursing students, medical students, health service administration students and physicians. High agreement between judges in the scale values for items was found (Gilson *et al.*, 1975).

Scores are calculated for each category and dimension and for the overall questionnaire as the summation of the item weights for each item endorsed, represented as a percentage of the total score possible in that part of the questionnaire (Bergner *et al.,* 1976; Bergner *et al.,* 1981). This means that an overall score is generated from the summation of the category scores. This assumes that there is an additive effect of functioning in each of the categories to give the overall functional status (de Bruin *et al.*, 1994a). However this

means that the categories with the larger number of items contribute more to the overall score than smaller categories (Williams, 1996).

Although the questionnaire is designed to provide scores ranging from 0 to 100%, this is not possible since the endorsement of certain items precludes the endorsement of others (Williams, 1996). Although the item weights take aspects of this into account, it does affect the maximum score possible. It has been suggested that this provides a good reason for ignoring the item weights and simply scoring the questionnaire by a summation of the number of items endorsed (Williams, 1996). It is not clear, however, how this would solve the difficulty for example where a person who is able to walk endorses more items concerned with walking difficulties than the person who is unable to walk at all.

A criticism of the scoring scheme has been that it is not responsive to change as it neglects the range of performance between ability and inability (Jette, 1980).

2.10.1.6 Interpretation of scores

The total pattern of positive responses to items of dysfunction experienced by the individual and the calculated category and dimension scores generate a detailed profile of the impact on the individual's daily life (Gilson *et al.,* 1975). The profiles generated have been compared within disease groups and across individuals (Bergner *et al.*, 1981) and have been used to highlight areas important for understanding and treating health problems (Bergner *et al.,* 1981; Schweitzer *et al.,* 1995).

Suggestions have been made for interpretation of the scores on the SIP (Gruen *et al.,* 1995; Butcher *et al.,* 1996). Both have used the concept of disability which goes against the development of the SIP as a health status measure (Bergner *et al.,* 1976). As can be seen from Table 2.8, there are differences in the proposed interpretation and no classification for 'no disability' is included by Gruen *et al.* (1995).

Butcher *et al.*, 1996		Gruen *et al.*, 1995	
<4	No disability	<10	Mild disability
4-9	Mild disability	10-30	Moderate disability
10-19	Moderate disability	>30	Severe disability
>20	Severe disability		

Table 2.8: Classification schemes for the interpretation of SIP scores

2.10.1.7 Psychometric Properties

The SIP has been shown to be a reliable and valid measure of quality of life in a wide range of patient groups in addition to the reports from the original field trials for the questionnaire (Bergner *et al.*, 1976; Bergner *et al.*, 1981). These have included patients undergoing total hip arthroplasty (Stucki *et al.*, 1995b), renal insufficiency associated with anaemia (Essink-Bot *et al.*, 1996), injured workers with musculoskeletal problems (Beaton *et al.*, 1996) and rheumatoid arthritis (Sullivan *et al.*, 1990). Such studies have demonstrated the psychometric properties using established statistical techniques. Assessment of validity has included descriptive, concurrent and construct (convergent and discriminant) validity.

Responsiveness of the SIP to clinically significant change has been less extensively examined and conclusive evidence for its responsiveness is lacking in the published literature (de Bruin *et al.*, 1997). Particular limitations have been the methods adopted to assess the property. It has been commented that a questionnaire should be able to detect clinically important improvements irrespective of the health status score at baseline (Stucki *et al.*, 1995b). However results have shown reduced responsiveness where the baseline score is towards the extremes of the SIP scale (Stucki *et al.*, 1995b).

Adoption of the SIP has been justified by relying on the demonstration of its psychometric properties for comparable patient groups (e.g. Hopman-Rock *et al.*, 1997). Others have adopted the questionnaire even when there is no evidence for the validity of the questionnaire for that patient group (e.g. de Jong *et al.*, 1997).

A floor[1] effect for the SIP has been reported where large proportions of patients score zero indicating healthy status (Beaton *et al.*, 1996). Although this may be explained by the nature and severity of the limitations experienced by the group, in this case injured workers with musculoskeletal problems, other questionnaires administered at the same time did not show this effect.

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[1] Note that Beaton *et al* (1996) refer to this as a ceiling effect.

A repeated criticism of the SIP has been its relatively large number of items (de Bruin *et al.,* 1994b) which limits its use in both clinic and research settings (de Bruin *et al.,* 1994a). This has often been perceived as a disadvantage of the questionnaire in comparison with other measures (Essink-Bot *et al.,* 1996). This apparent disadvantage has not been found when consulting responders about measures with a smaller number of items but a variety of response formats which were felt to be just as long as the SIP (Beaton *et al.,* 1996).

Psychometric properties of generic measures are probably population specific (Essink-Bot *et al.,* 1990). It can be concluded that the SIP has been shown to be reliable, valid and responsive for a range of patient groups, often with chronic problems. Since the SIP is generic it is likely that the same would be true for a population of dizzy patients. Despite the use of the Swedish version of the SIP in a survey of dizzy patients (Mendel *et al.,* 1999), the psychometric properties have not been assessed for dizzy patients.

2.10.1.8 Administration method

The SIP can be administered in a number of ways - by an interviewer, by an interviewer but completed by the patient or by post and self-completed. In the studies that have been carried out, no problems have been encountered with the self-completion and there have been no objections to the areas of enquiry. The profile takes between 20 and 30 minutes to complete which has led to the suggestion that it may perhaps be too long for clinical practice.

Poorer internal consistency of the SIP has been reported for the postal questionnaire compared with interviewer administered version (Bergner *et al.*, 1981). This method has also exhibited poorer correlations with other health assessments compared with the interviewer-administered and interviewer-delivered self-administered techniques. This throws doubt on the comparability of the data obtained when the SIP is posted with that when using the alternative methods (Bergner *et al.*, 1981).

The self-administered versions of the SIP consistently provide higher mean scores than versions that are interviewer delivered. They also provide consistently higher correlations with other measures of dysfunction and sickness.

The authors conclude that the self-administered version of the SIP is the most valid version of the measure when the interviewer ensures comprehension and adherence to the instructions and conveys a sense of importance of the task before the profile is completed by the subject (Bergner *et al.*, 1981).

2.10.2 Shortened versions of the Sickness Impact Profile

Shortened versions of the SIP, both generic and disease-specific, are available. The motivation for the two types of shortened versions is different. The shortened generic version of the Dutch SIP was developed because of what was felt to be too many items in the SIP (de Bruin *et al.*, 1994a, b). Disease-specific shortened versions of the SIP have arisen because of the reported redundancy of many items in specific populations (Deyo, 1986). These have been developed for patients with low back pain (Deyo, 1986), head injuries (Temkin *et al.*, 1988; Temkin *et al.*, 1989) and rheumatoid arthritis (Sullivan *et al.*, 1993).

2.10.2.1 Generic shortened version of the SIP

Reduction in the length of the Sickness Impact Profile to develop a shortened generic version of the questionnaire was developed by analysis of the categorical structure of the SIP (de Bruin *et al.*, 1994a). This approach also served to validate the original categorical structure of the SIP (de Bruin *et al.*, 1994a).

A combination of removal of skewed items and the work category and factor analysis was carried out on the binary responses created by endorsement of the items on the original SIP. The work category was not appropriate for the population since the majority of responders did not work prior to the onset of illness. This has also been found for rheumatoid arthritis patients (Sullivan *et al.*, 1990) and dizzy individuals in the general population undergoing vestibular rehabilitation (Yardley *et al.*, 1998b). Item weights have the greatest influence on the overall score when they differ considerably between items, when there is little inter-correlation between items and when there is a small number of items (de Bruin *et al.*, 1994a). This argument has lead to the assumption that no bias was introduced by removing the item weights (de Bruin *et al.*, 1994a).

The 68 items of the shortened generic version of the SIP, known as the SIP68 were identified from the results of the factor analysis (de Bruin *et al.,* 1994a). The items were divided into six categories which contributed to two dimensions as shown in Table 2.9.

Category	Physical Dimension	Psychosocial Dimension
Somatic autonomy	x	
Mobility control	x	
Mobility range	x	
Psychic autonomy & communication		x
Emotional stability		x
Social behaviour		x

Table 2.9: Categorical structure of the SIP68

The *social behaviour* category was found to contribute to both dimensions. If this category was to remain in its own right as a dimension, it was implied by the authors that health-related functional status could be represented by three dimensions of physical, psychosocial and social and recreation activities (de Bruin *et al.,* 1994a). These dimensions relate to the three dimensions of the WHO definition of health; physical, psychological and social health.

The SIP68 provided information closely related to the information provided by the SIP in its entirety (de Bruin *et al.,* 1994a). The overall and category scores of the SIP68 have been shown to be reliable for rheumatoid arthritis patients (de Bruin *et al.,* 1994b) and patients undergoing rehabilitation for spinal cord injuries (Post *et al.,* 1996). This was as high as for the original SIP (de Bruin *et al.,* 1994b) and comparable to that obtained on the population used to develop the questionnaire (de Bruin *et al.,* 1994a). Test-retest repeatability of the SIP68 has been shown to be very good over a 48-hour period (de Bruin *et al.,* 1994b) and over a 3-week period (Streppel *et al.,* 1996).

Validity of the structure of the SIP68, including both criterion and construct validity has been shown for patients with spinal cord injuries (Post *et al.,* 1996) and patients with whiplash injuries (Streppel *et al.,* 1996).

Responsiveness to changes in functional health status is comparable for the SIP68 and the SIP for a range of patient populations (de Bruin *et al.,* 1997). However, the data used for the SIP68 was obtained from responses on the original SIP rather than by applying the SIP68 in its own right. Responsiveness has also been shown for short and long-term

changes in patients undergoing rehabilitation for whiplash injuries and pain (Streppel *et al.,* 1996)

The issue of the relationship between what has been developed as a health status and quality of life measure and disability and handicap has again been raised for the SIP68 (Post *et al.,* 1996). It is claimed that the objective of the SIP68 is closely related to the International Classification of Impairment, Disability and Handicap (ICIDH). It has been suggested that the categories somatic autonomy and mobility control can be considered to describe the level of disability while those of mobility range and social behaviour describe the level of handicap through role performance (Post *et al.* 1996).

However the SIP, and its shortened version the SIP68, involve the level of behaviour relative to the responders' own normal levels and pattern of behaviour. In the ICIDH, behaviour is compared with the general level of activity considered normal for an individual. The SIP only presents the restrictions encountered for that individual compared with their normal pattern of behaviour, and not necessarily what might be expected from the impairment.

For this population of patients suffering from chronic and lengthy disorders, the selection of items to form the SIP68 was found to be a good alternative to the SIP (de Bruin *et al.,* 1994a). It has been commented that investigations need to be performed to investigate whether the same principles and results apply to other patient groups and language translations (de Bruin *et al.,* 1994b).

2.10.2.2 Shortened disease-specific version of the SIP

Shortened versions of the original generic SIP questionnaire have been developed for a range of specific populations. These have included patients with low back pain (Roland *et al.,* 1983; Deyo, 1986), rheumatoid arthritis (Sullivan *et al.,* 1993) and head injury (Temkin *et al.,* 1988, 1989). The disease-specific questionnaires have differed in their development and the statistical methods adopted.

The Roland scale for patients with low back pain (Roland *et al.,* 1983) was derived from the SIP by the selection of 24 items considered to be most relevant by professionals for the patient group. The questionnaire has been shown to be as reliable, valid and responsive as

the overall SIP and its major subscales although the methods to assess this latter property were crude (Deyo, 1986). The validity of allowing professionals rather than patients or statistical analysis to select items is not clear.

A disease-specific version of the SIP for rheumatoid arthritis patients (Sullivan *et al.*, 1993) was developed based on a stepwise analysis model to explore the key categories and items of the SIP in the patient group. Three short-form versions of the SIP were evaluated in terms of their psychometric properties, each version having a different focus for its performance. The versions of the SIP were for discrimination, evaluation and prediction although the final outcome is the proposal for a shortened version of the SIP based on the combined item content from all of these. This resulted in a 64-item questionnaire which was recommended for further testing although there appear to be no further references to this questionnaire in the literature. The final questionnaire did not involve item weights. It was argued that a simple summation of the number of items endorsed was sufficient since the items reflect a strict selection of disease-specific problems.

Modifications have been made to the SIP for patients with head injuries to make the questionnaire more sensitive to problems experienced by these patients (Temkin *et al.*, 1988). These involved addition of items to capture the consequences specifically for the group, exclusion of items that were irrelevant and the re-weighting of areas of functioning. Results, however, indicated that the modifications made failed to achieve the aim of improving sensitivity to problems arising from head injury (Temkin *et al.*, 1988). Any improvements as a result of the modifications were not sufficiently large or consistent to provide a practical advantage over the generic SIP (Temkin *et al.*, 1989). The failure to improve the SIP for patients with head injury was likely to relate to the assumptions made in modifying the questionnaire (Temkin *et al.*, 1989).

The outcome of modification of the generic SIP into shortened disease-specific versions is mixed. The difference in performance of the new versions is likely to follow from differences in the procedures employed in their development. Formal statistical analysis and rationale similar to that adopted to develop the generic shortened version of the SIP described by de Bruin *et al.* (1994a, 1994b) would perhaps have been more appropriate.

2.10.2.3 Summary regarding the SIP

The SIP was developed with the intention of providing an appropriate, valid and sensitive measure of health status to aid in the assessment of the outcome of health care services (Gilson *et al.,* 1975). The belief was that behavioural dysfunction as displayed in daily activities would achieve this aim and be of potential use as an outcome for evaluation (Gilson *et al.*, 1975).

The SIP has been shown to be a reliable, appropriate, valid measure of the health status of patients; in particular those with chronic problems. Studies of these properties in a range of patient populations have been discussed. Although there is preliminary evidence for its responsiveness, there have been criticisms of a lack of this property by some (Wilkin *et al.,* 1992). It has been suggested that the lack of sensitivity to change is as a result of the design of the profile to be applicable to a wide range of health care groups (Wilkin *et al.,* 1992) and because of the response scheme for the items (Jette, 1980). Despite these concerns, the questionnaire has been recommended as an outcome measure for monitoring treatment where functional results are important (Deyo *et al.,* 1982).

Shortened generic and disease-specific versions of the SIP are available and the range of methods to develop these have been discussed. The poor testing of the psychometric properties have meant that clear demonstration of the benefit of disease-specific versions is not yet available.

2.10.3 Functional Limitations Profile

2.10.3.1 Background

The Functional Limitations Profile (FLP), shown in Appendix 1, is the British translation of the Sickness Impact Profile (SIP). It was originally developed for a survey of disablement in the UK (Charlton, 1989). Disablement was defined as a collective term referring to any experience that was a consequence of disease and which may be identified as impairment, disability or handicap.

The SIP was chosen for modification because of its perceived comprehensive description of behaviours, its logical fit with the disablement concept and its demonstrated reliability,

validity and responsiveness (Charlton, 1989). The choice of the SIP, described both as a health status measure and quality of life measure, to assess a concept based on impairment, disability and handicap is an interesting one. The terminology used to describe the FLP and the concept it measures has changed from reports of it as a disability measure (Charlton *et al.,* 1983) to reports of it as a health status measure (Williams, 1996) and as a quality of life measure (Wilkin, 1992). Reference to the questionnaire has also changed within one article changing from a disability to a health status measure (Hutchinson and Hutchinson, 1995).

It is possible that the references to the FLP as a disability measure arise from its original development within a study of disablement. Advances in the concepts used to investigate and describe the effects of health problems since the time of the FLP's development may be responsible for changes in the terminology used and the interpretation of what the questionnaire assesses. The conceptual focus of a health status measure has been reported as one of the points to be considered when selecting a measure to assess impairment, disability and handicap (Jette, 1980). In light of current attitudes to health care measurement it appears that the conceptual focus of the FLP is within the domain of quality of life rather than disability. The FLP is now widely considered as a quality of life (health status) measure rather than a disability measure (Bowling, 1995).

2.10.3.2 Items and scoring scheme

Because the categories of the SIP had been developed in the US, the content of the items and their relevance was investigated for a UK population and British English language (Charlton *et al.*, 1983). To develop the FLP, the wording of the SIP was modified to make it more meaningful for a British population (Patrick *et al.,* 1982). Item weights were also adjusted (Patrick *et al.,* 1985). Items within each FLP category were judged in terms of how 'dysfunctional' each item was considered to be for that particular category of behaviour. The derived item weights were found to be highly predictive of those on the SIP which indicated that judges gave similar ratings to the items (Patrick *et al.,* 1985).

The meaning of a particular score on the questionnaire has been reported to be difficult to interpret because of the wide variation in the pattern of item responses and therefore limitations that are reported for a particular questionnaire score (Charlton *et al.,* 1983).

Despite this, it can generally be assumed that higher scores indicate greater limitations and worse quality of life.

A classification scheme for the FLP scores has been proposed (Williams and Bury, 1989) based on that previously recommended by the questionnaire's developers, although there are few details about this original scheme. The scheme presents score ranges for different severities of 'disability'[2]as measured on the FLP. The classification scheme is shown in Table 2.10.

Overall FLP score range (%)	Disability severity
0 -8	Very minor/Minor
8-20	Moderate/Appreciable
20-30	Severe
30-100	Very severe/High grade

Table 2.10: Classification scheme for 'disability' severity associated with FLP scores (Williams and Bury, 1989)

Interpretation of the scores using such a scheme may be dependent on the patient population being surveyed.

2.10.3.3 Structure of the FLP

The dimensional structure of the FLP is different from that of the original SIP (Charlton *et al.,* 1983) and was revealed using multi-dimensional scaling and cluster analysis. The difference is likely to be explained by the analysis techniques performed and the superiority of multidimensional scaling over cluster analysis alone (Charlton *et al.,* 1983). Those categories not contributing to either dimension acted as independent categories in the questionnaire. The structure for the FLP and the SIP is shown in Table 2.11.

The original evidence for the category structure of the SIP has not been clearly presented in the literature. Variations on the original structure have been found using data-driven analysis based on responses on the questionnaire (Bergner *et al.*, 1981; Essink-Bot *et al.*, 1996). These variations in SIP structure are similar to the proposed structure for the FLP.

[2] Disability is referred to by these authors in quotation marks which may acknowledge the inappropriate use of this term.

Category	Physical Dimension		Psychosocial Dimension	
	SIP	FLP	SIP	FLP
Ambulation	x	x		
Body care and movement	x	x		
Mobility	x	x		
Household management		x		
Recreation and pastimes				x
Social interaction			x	x
Emotion			x	x
Alertness			x	x
Sleep and rest				x
Eating				
Communication			x	
Work				

Table 2.11: Category structure of the physical and psychosocial dimensions for the SIP and the FLP.

The two main groupings of categories were described as physical and psychosocial disability (Charlton *et al.,* 1983). Dysfunction was also reported to be assessed by the eating, communication and work disability scores. These five scores in total were described as global scores of dysfunction (Charlton *et al.,* 1983) and little attention seems to have originally been placed on the overall score.

The phrases physical and psychosocial dimensions are now routinely used and are adopted in the current study. Such terminology appears to have emerged with the current references to the questionnaire as a quality of life measure. This division into physical and psychosocial dimensions was also found for the SIP (Bergner *et al.,* 1981) although the category content of the dimension does differ.

2.10.3.4 Psychometric properties

The FLP has been shown to be repeatable over a 48-hour period in disabled patients (Charlton *et al.,* 1983) and over a 6-month period in patients with multiple sclerosis who had not changed on established clinical measures (Hutchinson and Hutchinson, 1995). The construct validity of the FLP has also been shown in this latter patient group by examining correlations between external disease-specific measures (Hutchinson and Hutchinson, 1995).

Initial concerns were expressed by the developers as to the sensitivity of the questionnaire to change (Charlton *et al.,* 1983). However the FLP has been demonstrated to be responsive in a number of patient groups and by a number of different methods (e.g. Fitzpatrick *et al.,* 1989; Hutchinson and Hutchinson, 1995; Jenkinson *et al.,* 1997). As for other studies examining responsiveness, demonstration of responsiveness was limited by the methods available to assess this property as discussed previously.

The assessment of the psychometric properties of the FLP has been reported to be limited (Williams, 1996) and this is clear from the findings presented here. For those studies that have addressed this issue, the statistical techniques applied have not been rigorous.

It is clear that there is considerable work to be done in further establishing the psychometric properties of the FLP for UK populations. There is greater evidence of these properties for the original SIP which has been recommended as a gold standard against which other measures can be judged (Jenkinson *et al.,* 1997). Due to the similarities between the FLP and the SIP, it is likely that the FLP is also a reliable and valid measure of quality of life. Due to the limitations in the methods available to assess responsiveness, the ability of the FLP to detect changes in status is not yet clear.

2.10.4 SF-36

The SF-36 questionnaire was developed by the Rand Corporation to survey health status in the Medical Outcomes Study. It is a generic quality of life questionnaire that assesses eight health concepts (Ware and Sherbourne, 1992). These are limitations in physical activities because of health problems, limitations in social activities because of physical or emotional problems, limitations in usual role activities because of physical health problems, bodily pain, general mental health (psychological distress and well-being), limitations in usual role activities because of emotional problems, vitality (energy and fatigue) and general health perceptions.

These health concepts were chosen to include those most commonly involved in health surveys as well as those of bodily pain and vitality that were indicated from an empirical study to achieve breadth of measurement (Ware and Sherbourne, 1992). The majority of items were also obtained from the health assessment literature. The SF-36 considers feelings about physical and emotional health in these different areas of quality of life.

These could be affected by external influences beyond the health domain. The SF-36 also provides little insight into the limitations experienced in daily life. The developers admit that some important concepts are not included within the questionnaire (Ware and Sherbourne, 1992). These include health distress, family functioning, sexual functioning, cognitive functioning and sleep disorders.

Items were constructed for scoring using a method of summated Likert ratings to achieve depth of measurement (Ware and Sherbourne, 1992). The response scheme changes for the different items on the questionnaire. Scores are calculated for each of the concepts that generates a profile of health status (Ware and Sherbourne, 1992). No aggregate score is incorporated into the scoring scheme for the questionnaire.

Since the questionnaire is a short-form version, it is more susceptible to floor and ceiling effects although floor effects on the SF-36 indicating the worst possible quality of life are rare (Ware and Sherbourne, 1992).

The popularity of the SF-36 has been reported to be due to its short length and comprehensiveness (Ware and Sherbourne, 1992). As has already been commented this preference due to its short length may be counteracted by the difficulty encountered by changes in the response scheme across the questionnaire.

There are reports of the use of the SF-36 to assess the quality of life of dizzy patients in the literature (Enloe and Shields, 1997; Kinney *et al.*, 1997). Although studies have recommended the SF-36 as a measure for dizzy patients, quality of life of dizzy patients as measured on the SF-36 has not differed significantly from normative data (Fielder *et al.*, 1996).

2.10.5 Comparison of SIP and SF-36 quality of life questionnaires

Both the SIP and the SF-36 are established generic quality of life questionnaires for which British translations are available. Both have also been used to assess the quality of life of dizzy individuals. Table 2.12 compares the two questionnaires.

Property	SIP	SF-36
Overall score for quality of life	x	
Long time to complete	x	
Easy to complete response scheme	x	
Scores for different aspects of quality of life	x	x
Physical & psychosocial dimensions link with effects of dizziness	x	
Measures limitations in behaviour	x	
Measures feeling states		x
Likert ratings		x
Dichotomous responses	x	
Good documentation on application, analysis, interpretation		x
Normative data available		x
Each aspect of quality of life assessed by a large number of items	x	
Consistent response format	x	

Table 2.12: Comparison of the SIP and the SF-36 for the assessment of quality of life

2.11 QUALITY OF LIFE AND DIZZY INDIVIDUALS

Studies of the quality of life of dizzy individuals have been published in the literature. These studies have mostly adopted either the SF-36 (Fielder *et al.,* 1996; Enloe and Shields, 1997; Kinney *et al.,* 1997) or the SIP (Kroenke *et al.,* 1993; Mendel *et al.,* 1999) as the quality of life measure of choice. A survey of quality of life has also been carried out using the Nottingham Health Profile of a population of 76 year old Swedish citizens (Grimby and Rosenhall, 1995).

Justification for the choice of questionnaire is not clear from these studies. It has been suggested that the choice of the SF-36 is often based on its widespread use and validation as a generic quality of life measure (Stucki *et al.,* 1995b). This, however, does not necessarily mean that it is appropriate for the assessment of dizziness and its consequences.

The studies are in agreement that health-related quality of life is affected by dizziness although the significance and nature of this impact differs between the studies. There are differences in the populations surveyed for example, those on ENT waiting lists and those undergoing vestibular rehabilitation. The studies are considered in greater detail in subsequent sections. The differences in the quality of life measured are unlikely to be

explained solely by differences in the groups studied but are likely to be due in part to differences in the quality of life measures adopted.

2.11.1 Psychometric properties of quality of life questionnaires for dizzy individuals

There has been a lack of assessment of the psychometric properties of the quality of life questionnaires for dizzy individuals. The limited work that has been carried out has been only for the SF-36 questionnaire.

The SF-36 has been demonstrated to have test-retest reliability over a 24- to 48-hour period for patients attending for assessment for vestibular rehabilitation (Enloe and Shields, 1997). The lowest repeatability was for the physical related scales. It may be that the physical effects as measured by the SF-36 are related to the day-to-day fluctuations in dizziness whereas the psychosocial effects are more stable and are the long-term effect of dizziness. This reduced repeatability for the physical scales was also evident in the poor repeatability of the physical subscale of the DHI (Enloe and Shields, 1997).

Comparisons have been made between the performance of the DHI as a disease-specific measure and the SF-36 as a generic quality of life measure (Fielder *et al.,* 1996; Enloe and Shields, 1997; Kinney *et al.,* 1997). Although the results of such comparisons can be used to assess the construct validity of the SF-36 for dizzy patients, no hypothesised correlations were proposed to examine this property.

Examination of the presented correlations between the DHI and its subscales and the dimensions of the SF-36 (Enloe and Shields, 1997) show the strongest (0.7) and weakest (0.1) correlations between scales that could be proposed as measuring related and unrelated concepts respectively. Stronger correlations (0.5-0.7) between the two questionnaires were reported by Fielder *et al.* (1996). The relationships between scores on the DHI and scores on the SF-36 will be affected to a certain extent by the construct of the DHI (Enloe and Shields, 1997) and because the questionnaires measure different health constructs. What is important for construct validity is the relative magnitude of the correlations between the two questionnaires, which has not been investigated. This issue has not been addressed at all for the SIP.

Responsiveness of the SF-36 has been assessed by examining the relationship between score changes on the DHI and the SF-36 (Enloe and Shields, 1997). The improvements in quality of life as measured by the SF-36 as a result of vestibular rehabilitation have also been found in the score changes of the DHI (Enloe and Shields, 1997). The DHI was found to be more responsive overall although there were categories of the generic SF-36 that demonstrated greater responsiveness. These were the categories of role limitation due to physical problems and social function. It should be noted that the category 'role limitations due to physical problems' consists of a single question. These results, however, are in contrast to a yet unpublished study that found the SF-36 to be more responsive than the DHI (Shepard, 1998).

The floor and ceiling effects for the SF-36 and DHI have been compared for dizzy patients attending a vestibular rehabilitation programme (Enloe and Shields, 1997). In that study, floor effects referred to those reporting the poorest function while ceiling effects referred to those reporting the best function for both questionnaires. Greater floor and ceiling effects were found for the SF-36. Floor effects were evident in particular for the areas of role limitations due to both physical and emotional problems. Ceiling effects were evident for the areas of bodily pain, social function and role limitation due to emotional problems. Minimal floor and ceiling effects were reported for the DHI (Enloe and Shields, 1997).

Both the original US SIP and a Swedish version of the SIP have been applied to dizzy patients (Kroenke *et al.*, 1993; Mendel *et al.*, 1999). The psychometric properties of these questionnaires have not been established for dizzy patients.

2.11.2 Quality of life scores for dizzy patients

Health-related quality of life and health status have been shown to be affected by dizziness using the SF-36 (Fielder *et al.*, 1996; Enloe and Shields, 1997) and a Swedish version of the Sickness Impact Profile (Mendel *et al.*, 1999).

Reductions in quality of life have been found in the dimensions of the SF-36 - physical function, social function, role limitations due to physical problems, role limitations due to emotional problems, mental health, vitality, pain and general health (Fielder *et al.*, 1996; Enloe and Shields, 1997). Comparison of the SF-36 scores for patients in an ENT waiting list against normative data adjusted for age and sex showed reductions to be significant

only for role limitations due to physical problems, vitality and pain (Fielder *et al.,* 1996). The effect of the small number of patients involved upon the power of the statistical analysis should be noted for this survey. In addition, the nature of the population surveyed means there would be a wide range of dizziness experiences. In contrast a significant effect of dizziness on quality of life as measured by the SF-36 was observed in patients attending for assessment for vestibular rehabilitation (Enloe and Shields, 1997).

Quality of life of patients presenting with peripheral vestibular disorders as measured by the Swedish version of the SIP (Mendel *et al.,* 1999) was statistically worse than that of a healthy reference group. This patient group is precisely defined in the paper but the restrictive nature of the criteria for inclusion means that it is not representative of typical patients attending for the assessment of dizziness, at least in the UK. Data are also presented from comparison groups of predialytic patients, oral cancer patients after surgery and patients with rheumatic disorders. Unfortunately no formal statistical comparison of the results for these groups is made.

The profile of the impact of dizziness across the dimensions of the SF-36 is not remarkable. Examination of the scores on the dimensions from the published studies (Fielder *et al.,* 1996; Enloe and Shields, 1997) shows similar scores across each of the dimensions although there are more marked differences in impact for role limitation dimensions and vitality for vestibular rehabilitation patients (Enloe and Shields, 1997). Differences in the profile have also been found between males and females (Fielder *et al.,* 1996). Both sexes show reductions in quality of life in role limitations due to physical problems. In addition, males reported reductions in social functioning whereas females reported reductions in vitality.

In contrast there is an obvious profile for the quality of life for peripheral vestibular disorders as measured by the Swedish SIP (Mendel *et al.,* 1999). Unfortunately again no formal statistical testing of this profile has been carried out and it is also difficult to examine fully the functioning across all categories of the questionnaire because of the presentation of the results. Most impact on the named categories is in categories of sleep and rest and recreation and pastimes.

Patients with dizziness had significantly greater scores on the SIP indicating worse functioning than for a control group with no dizziness (Kroenke *et al.,* 1993). Unfortunately the only questionnaire scores presented are those for the overall questionnaire and its two dimensions. Those identified with a psychiatric disorder in addition to the dizziness had worse functional status compared with those with dizziness alone.

The SF-36 has also shown an improvement in health-related quality of life towards that of a normal population as a result of vestibular rehabilitation although the final scores were still reduced compared with the normative scores (Enloe and Shields, 1997). Such results have lead to the recommendation of the SF-36 as an outcome measure for vestibular rehabilitation (Fielder *et al.,* 1996).

The limited analysis carried out in the above studies of quality of life of dizzy individuals and the lack of detail in presentation of the data and analysis means that it is difficult to quantify the results. What is clear from the studies is that quality of life is affected by dizziness. Differences in the questionnaires administered and the lack of detail of the studies makes it difficult to quantify these in a meaningful way.

2.11.3 Quality of life of patients with Meniere's disease

A number of the studies published to investigate the quality of life of the dizzy individual have been carried out on patients with Meniere's disease using both a self-developed questionnaire (Hagnebo *et al.,* 1996) and the SF-36 (Kinney *et al.,* 1997). For this group, the quality of life measured is due not only to the dizziness but also the associated hearing loss, tinnitus and aural pressure. Also, the episodic nature of the condition may mean that the questionnaire data related to different phases of the symptoms. For this reason, this patient group is considered separately.

A study investigating the long-term effects of Meniere's disease using the SF-36 found that patients scored worse on the emotional rather than physical aspects of quality of life (Kinney *et al.,* 1997). The performance of the patients was evaluated by comparing the scores against data for minor and major medical conditions. For physical aspects of functioning, dizzy patients scored similar to minor conditions defined as uncomplicated chronic medical conditions. For the emotional aspects, dizzy patients scored similar to

major medical conditions defined as advanced or complicated chronic medical conditions. There was a large amount of variability in scores within the scales which was interpreted as confirming how reactions to the disease differ among individuals (Kinney *et al.*, 1997). This wide variability in scores has also been commented on for peripheral vestibular disorder patients using the Swedish SIP (Mendel *et al.*, 1999).

This profile of impact is opposite to that found in the population of patients waiting for ENT appointments (Fielder *et al.*, 1996) where patients scored worse for the physical aspects of quality of life. This profile may be explained by the fact that the number of days spent feeling dizzy with Meniere's disease is relatively small and so it may be that the physical limitations encountered are minor. However, the fear and psychosocial consequences of episodic conditions have been shown to be great (see Section 2.3 for a discussion).

2.11.4 Comparison of dizziness-specific measures and generic quality of life measures

Relationships between symptom characteristics and demographics with responses on the VSS, VHQ and Swedish SIP have been examined (Mendel *et al.*, 1999). Swedish translations of the VSS and VHQ were adopted although there is no evidence of psychometric testing of the new versions of the questionnaires.

There was a negative effect of age on functioning in the work category and the psychosocial dimension of the SIP with older responders reporting fewer limitations and better quality of life. Men scored significantly worse quality of life in the work category than women. The duration of dizziness had a significant effect on psychosocial functioning on the SIP with longer durations of dizziness associated with decreased psychosocial functioning. In contrast the categories of sleep and rest, home management, recreation and pastimes and eating and the physical dimension were not affected by the symptom characteristics of age, sex and duration of dizziness (Mendel *et al.*, 1999).

2.11.5 Current status of the knowledge of the consequences of dizziness on quality of life

The studies that have been carried out to investigate the quality of life of dizzy patients (Kroenke *et al.,* 1993; Fielder *et al.,* 1996; Hagnebo *et al.,* 1996; Enloe and Shields, 1997; Kinney *et al.,* 1997; Mendel *et al.,* 1999) and dizzy elderly individuals in the general population (Grimby and Rosenhall, 1995) have shown that health-related quality of life is reduced as a consequence of dizziness. These studies have provided preliminary evidence of the appropriateness of quality of life to assess the consequences of dizziness.

The exact nature and extent of the impact is not conclusive due to limitations in the studies. Such limitations include the patient populations studied, sample sizes, the questionnaires used, failure to assess the psychometric properties of the questionnaires and the lack of rigorous statistical analysis to examine the questionnaire responses obtained. There are also discrepancies in some of the results obtained between studies.

The SF-36 is recognised as the most commonly adopted quality of life questionnaire. Although this is also true for research into dizziness, it is perhaps not the most appropriate questionnaire for this group. No material significant difference in quality of life between dizzy individuals and normative data has been shown to date for the SF-36 (Fielder *et al.,* 1996). In addition, the criticism that the SF-36 fails to include health distress and cognitive functioning (Ware and Sherbourne, 1992) is particularly relevant to dizzy individuals.

In contrast the SIP has demonstrated significant differences between dizzy individuals and a healthy control group (Mendel *et al.,* 1999). Although this may be due in part to the patient population surveyed compared with the above study with the SF-36, it is also likely to be due to the focus of measurement of quality of life on the SIP.

The SIP and its British translation, the FLP are behaviour based. This means that it allows for quantification of the limitations in lifestyle, either due to the dizziness itself or self-imposed due to the fear of dizziness and the emotional response to the dizziness. Failure of the DHI, the traditionally adopted questionnaire in this group, to assess such modifications in behaviour has been a criticism made in the review here of currently available questionnaires. The division of the SIP (and FLP) in to physical and psychosocial

dimensions links with the division in the documented consequences of dizziness from Yardley and colleagues discussed in section 2.3.

The work presented in the literature to develop shorter versions of the SIP, both generic and disease-specific is encouraging. Further work to develop shortened generic versions of the SIP for other language versions has been recommended (de Bruin *et al.,* 1994b) although there appears to be no need to restrict the approach to only generic versions. The methods adopted to develop the generic SIP68 (de Bruin *et al.,* 1994a, b) could be applicable to development of a shortened dizziness-specific version of the FLP, the British translation of the SIP.

3.0 AIMS AND OBJECTIVES

As has been shown in Section 2.0, the presumed consequences of dizziness are well documented. However these have been established using the traditional approach of assessing the handicap experienced as a result of the dizziness. The original WHO classification of impairment, disability and handicap (ICIDH) (WHO, 1980) however is being superseded by a functional approach to the assessment of the consequences of health problems (ICIDH-2) (WHO, 1999). This shift in emphasis is particularly relevant and important for dizzy individuals since it allows the global behaviour of dizzy individuals in daily life to be assessed rather than the perceptions of the dizziness. Functioning associated with a health problem such as dizziness can perhaps be more reliably reported than perceptions. However the shift towards classifying the effects of disease in this way excludes the measurement of feelings and emotions that arise. It should be commented that although these feelings are more difficult to assess, this should not be the sole justification for their exclusion from classifications of the consequences of health problems.

The questionnaires that are currently available to assess the effects associated with dizziness are limited and their disadvantages have been discussed in Section 2.6. Particular limitations with the approach are that assumptions must be made by clinicians and professionals about the difficulties encountered by dizzy individuals when items are devised to be included within the questionnaires. Although such assumptions are based on interviews with dizzy individuals, there is the possibility of bias from the clinician's perspective on the understanding of the presumed consequences of dizziness. Clinicians may omit issues that are not volunteered by patients under the circumstances of a clinical interview. They may over- or under-represent issues according to their relevance to the process of clinical diagnosis and management.

Quality of life is a concept that has developed from the recognition that it is important to assess the effects of health in terms of an individual's self-report of their functioning, subjective experience and well-being. Fundamental to the concept is that the health problem is assessed from the individual's perspective.

Little is known about the quality of life of dizzy individuals and those studies that have been carried out are limited in their scope. These have been discussed in detail (see

Section 2.11). There are no currently available questionnaires specifically designed to assess the quality of life of dizzy individuals. Evidence obtained using generic quality of life instruments on samples of dizzy patients is also limited by small sample size and lack of control over representativeness.

To address this lack of representativeness, the current study firstly aims to increase understanding of the *characteristics* of dizziness experienced by dizzy individuals in clinic and general population samples. These characteristics include the populations of individuals affected and the nature and severity of the symptoms encountered.

Secondly, the study aims to increase understanding of the quality of life of dizzy individuals and the *limitations* reported in lifestyle. This is to be achieved partly by developing and refining a theoretical model of quality of life so that it is data driven for dizzy individuals as shown in Figure 3.1.

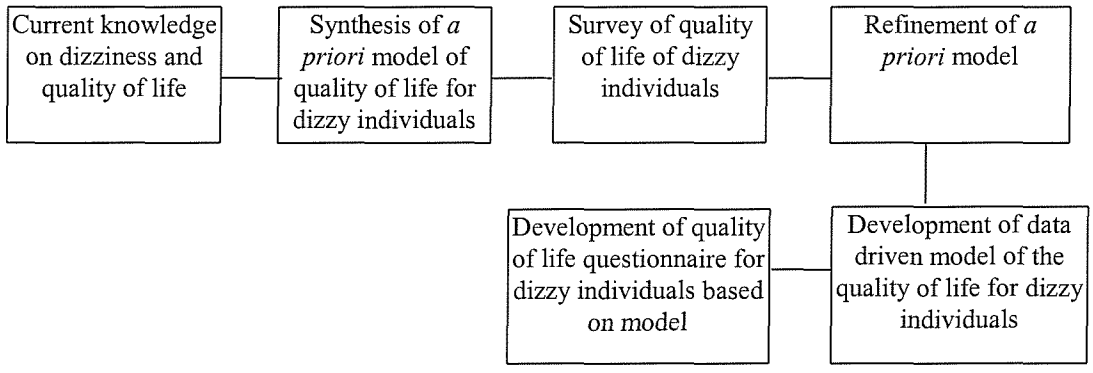


Figure 3.1: Steps involved to increase understanding of the limitations experienced by dizzy individuals

The new approach of quality of life, describing the limitations experienced by dizzy individuals, assesses the individuals functioning and participation in activities at a personal and social level. It is reasonable to assume that at least some of the emotions and feelings of the dizzy individuals are included within the model of quality of life in terms of their effect on the functioning of the individual.

Current knowledge about quality of life and documented presumed consequences of dizziness are combined to develop a theoretical model of the quality of life of dizzy individuals. Comparison of this model against data obtained from a survey of quality of

life of dizzy individuals leads to the refinement of the original theoretical model to one that is based on the limitations reported by individuals on an established quality of life questionnaire. A resulting quality of life questionnaire specifically for dizzy individuals is developed for use.

The aims and objectives of the study are outlined below. The study is divided into three parts, each addressing different aspects of the aims of the work.

3.1 AIMS

- To *characterise* dizziness in clinic and general population samples in terms of severity and nature of dizziness
- To describe the *limitations* reported by dizzy individuals by quantifying and establishing dimensions of quality of life for dizzy individuals in clinic and general population samples
- To *model* the processes and factors involved in the quality of life of dizzy individuals
- To develop and assess a *questionnaire instrument* to measure the quality of life of dizzy individuals

3.2 OBJECTIVES

- To carry out a questionnaire survey of the dizziness reported in clinic and general population samples of dizzy individuals using existing questionnaire instruments
- To establish the psychometric properties of the principal instruments used to assess the consequences of dizziness (the Dizziness Handicap Inventory) and limitations reported by dizzy individuals (the Functional Limitations Profile)
- To measure the effects associated with dizziness using a commonly applied handicap measure, the Dizziness Handicap Inventory
- To measure the quality of life of dizzy individuals in clinic and general population samples and appropriate comparison groups using the Functional Limitations Profile (FLP) quality of life questionnaire

- To develop theoretical and data-driven models of the quality of life of dizzy individuals
- To develop a dizziness-specific questionnaire using principal component analysis to assess the quality of life of dizzy individuals and assess its psychometric properties

3.3 SURVEY GROUPS

The questionnaire surveys of dizzy individuals were carried out for clinic and general population samples. A general aim was that all groups were sufficiently large and unselected to ensure at least a degree of representativeness.

Dizzy individuals in the clinic sample (clinic dizzy sample) are by definition self-selecting since they have sought help for the dizziness that they are experiencing. However, attempts were made to ensure that within the clinic populations sampled, patients were included non-selectively. The nature of referral patterns means that this group primarily consists of those individuals where the underlying problem is presumed to be otological in origin.

Dizzy individuals in the general population (population dizzy sample) were also surveyed to provide knowledge and understanding of dizziness in the public health domain. In that case, formal random sampling was employed to ensure representativeness. This would also provide information as to the wider impact of dizziness beyond that in the clinical setting. It is reasonable to assume a wider diversity of conditions that could give rise to the report of dizziness in the general population although some may well be otological in nature.

Since the quality of life questionnaire, the FLP had not previously been applied to dizzy individuals, comparison groups were sought without dizziness to make a comparison of the nature and severity of the reduction in quality of life against those with dizziness. It should be noted that these two groups were not intended to act as control groups but comparison groups. A summary of the four survey groups is shown in Table 3.1.

For the first comparison group, a group of individuals was sought who presented with a health problem other than dizziness. It was desirable for the health problem to have a similar presentation to dizziness in that it is a chronic problem while having a different and

specific reduction on quality of life. These differences would be in terms of both the severity of the reduction in quality of life and the profile of the reduction across the categories and dimensions of the FLP. This would show whether the responses obtained on the quality of life questionnaire adopted were specific to the limitations experienced by dizzy individuals rather than representing non-specific limitations associated with a chronic health problem. The comparison group was also to be sourced in an outpatient department so that they would be comparably 'help-seeking' compared with the clinic dizzy sample.

Survey group	N	Source	Group name	Role
Dizzy individuals in the clinic population	405	Outpatient departments	Clinic dizzy sample	Experimental group
Dizzy individuals in the general population	55	HTA survey of ENT problems	Population dizzy sample	Experimental group
Facial pain patients	54	Maxillofacial outpatient department	Facial pain sample	Comparison group
'Normal' individuals in general population	217	HTA survey of ENT problems	Population 'normal' sample	Comparison group

Table 3.1: Summary of survey groups in the questionnaire study

Patients presenting with facial pain in Maxillofacial departments were considered to meet the requirements for the comparison group. Facial pain patients can be assumed to be comparable to the dizzy individuals in the clinic population in that facial pain is typically a chronic condition that is difficult to diagnose and that is often longstanding. Such characteristics are also true for dizziness. Secondly, there were expected to be smaller reductions in quality of life compared with the clinic dizzy sample. Furthermore, there would be minimal reductions in the physical dimension of quality of life and in the categories concerned with social and leisure activities and greater reductions for the emotional aspects of quality of life. Demonstration of these differing reductions in quality of life compared with the dizzy individuals can be interpreted as showing the FLP scores to be specific to the population surveyed.

A second comparison group was selected to provide a normative reference group against which all other survey groups could be compared. This group comprised of individuals

identified in the general population with no ear, nose and throat problems or dizziness. This group was obtained from the same general population sample as the population dizzy sample. This group is referred to as the population 'normal' sample.

Both samples obtained from the general population were identified from responses to the Medical Research Councils' Health Technology Assessment (HTA) study of Ear, Nose and Throat problems. That study was carried out by formal random sampling in the general population and provided individuals for the population samples to be surveyed in the current study. These samples allowed prevalence estimates of dizziness and a material impact on quality of life to be made in the general population.

4.0 THEORETICAL MODEL OF THE QUALITY OF LIFE OF THE DIZZY PATIENT

In this part of the study a theoretical model of quality of life is developed based on existing knowledge. This is the first stage towards understanding the quality of life of dizzy individuals and forms a framework for the design and analysis of the main study.

Quality of life is a term that has been readily used in healthcare research and has recently been applied to dizziness-related research (e.g. Fielder *et al.*, 1996; Enloe and Shields, 1997; Mendel *et al.*, 1999). Up until the definition of quality of life from the World Health Organisation, (WHO, 1999), no formal definition of quality of life existed. However, health is included as just one factor of a general concept of quality of life which means that the definition is not solely concerned with health-related quality of life.

Prior to this, quality of life was generally assumed (Spilker, 1990) to be the self-report in four areas:

- physical function
- psychological function
- social interaction
- somatic sensation.

This construct of quality of life is adopted in the current survey.

4.1 MODEL OF THE QUALITY OF LIFE OF THE DIZZY INDIVIDUAL

Four dimensions of quality of life for the dizzy patient are proposed here based on the four areas considered above in the adopted definition of quality of life. Functioning in each dimension affects the overall quality of life of the dizzy individual.

Known consequences of dizziness have been described in Section 2.3. Although these were originally revealed by studies of disability and handicap, the consequences themselves can be assumed to hold also for function according to the above schema.

Reduced functioning and self-reported limitations contribute to the quality of life of the dizzy individual in each of the four dimensions of the model. Aspects of functioning that

contribute to quality of life in each of these dimensions have been well reviewed for example by Spilker (1990). These link with the activities and aspects of functioning that are reported as being affected by dizziness in particular by Yardley and colleagues (see Section 2.3 for a review).

Quality of life is a patient-centred concept. At present the consequences of dizziness and the limitations reported by dizzy individuals have only been identified from clinician-driven approaches to item selection. Although these have predominantly been obtained from interviews with and surveys of dizzy individuals, it is acknowledged that the results can still be biased by the clinician's perspective.

Since quality of life has not formally been investigated rigorously for representative samples of dizzy individuals, in the current study the theoretical model of quality of life has been based on the consequences of dizziness that have been identified in previous handicap-related research. *A priori* decisions were made to position the known consequences of dizziness within the dimensional structure of quality of life proposed by Spilker (1990). Known consequences of dizziness were related to activities cited as contributing to each of the dimensions of quality of life.

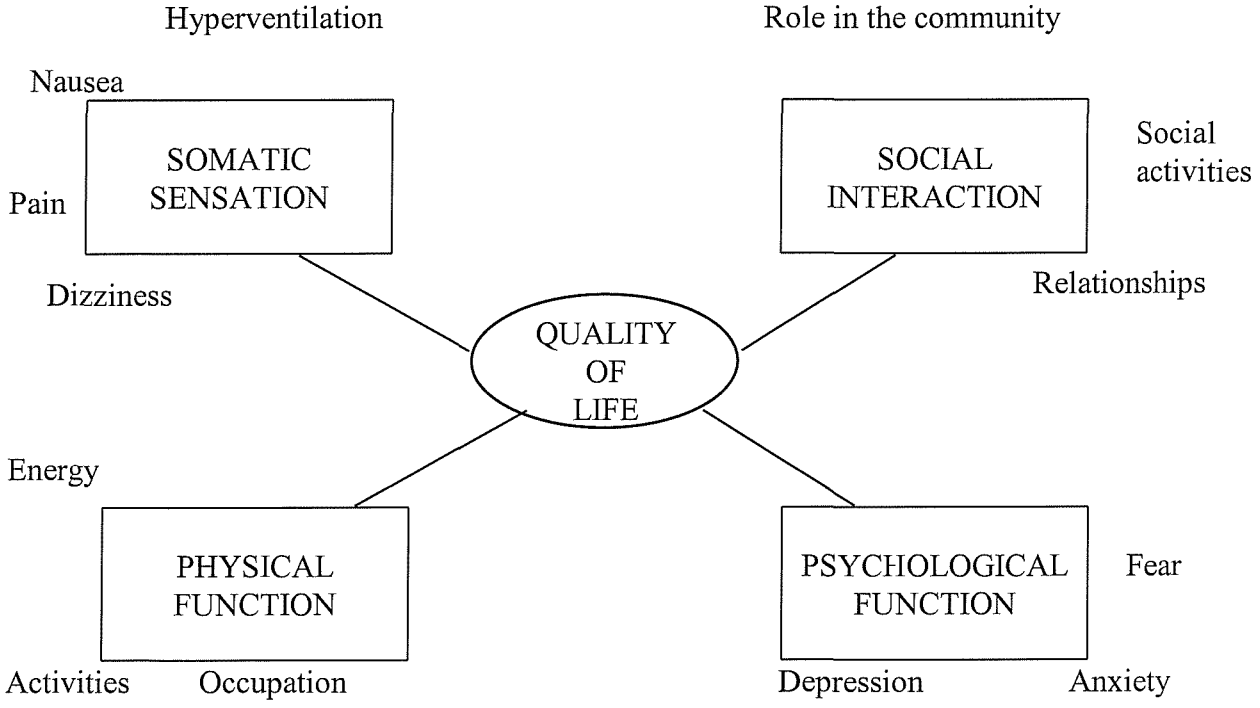


Figure 4.1: Theoretical model of the quality of life of dizzy individuals

The proposed *a priori* model of quality of life synthesised from existing knowledge is shown in Figure 4.1. The four dimensions of quality of life are represented by the four boxes; around each dimension are the known consquences of dizziness that are proposed to affect the quality of life in each of the dimensions.

PART I

PSYCHOMETRIC PROPERTIES OF THE DHI AND FLP QUESTIONNAIRES FOR DIZZY INDIVIDUALS

5.0 INTRODUCTION

In order to quantify and characterise the limitations in daily activities and lifestyle reported by dizzy individuals, it is important that the applied questionnaire is shown to be valid and reliable for dizzy individuals. In this part of the study, the psychometric properties of two questionnaires are established in the survey of the clinic sample of dizzy individuals: the Dizziness Handicap Inventory (DHI) and the Functional Limitations Profile (FLP). The former questionnaire has commonly been applied to assess the associated effects of dizziness while the latter is applied in the current survey to assess the quality of life of dizzy individuals for the first time.

To date, the validity and reliability of the FLP has not been assessed for dizzy individuals and there is only limited information for other patient groups. In fact assessment of psychometric properties has not been carried out for any established quality of life questionnaire for dizzy individuals.

Assessment of the psychometric properties of the DHI is important given its role in this current survey to assess the validity of the FLP. The intrinsic subscale structure of the DHI has been shown by Asmundson *et al.* (1999) to be different to that originally proposed by its developers. Re-evaluation of the structure of the DHI was carried out for the current survey of the clinic dizzy sample. No psychometric testing of the British English version of the questionnaire has previously been published.

6.0 QUESTIONNAIRE SELECTION AND DEVELOPMENT

All questionnaires administered in each of the surveys carried out in the current study are reviewed here.

6.1 INTRODUCTION

Questionnaires were administered in each of the four surveys to elicit information about symptoms and handicap experienced and quality of life. The questionnaires to be used could be chosen in two ways. The first was to adopt established questionnaires. This would mean that evidence would already be available for the reliability and validity of the questionnaires although these would only apply to the population from which they were obtained. However such questionnaires may not be appropriate for the current surveys. The second approach was to design questionnaires specifically for the purposes of the current study.

Following a critical review of the literature, a number of questionnaires have been identified as appropriate. Additional questionnaires were designed, piloted, refined and applied for those aspects of the survey that were not covered by existing questionnaires.

The questionnaires adopted and designed are discussed in terms of symptom, disease-specific and generic quality of life questionnaires for all groups surveyed. These questionnaires, their origin and the survey groups receiving them are summarised below.

		Survey group			
Questionnaire	Origin of questionnaire	Clinic dizzy	Facial pain	Population dizzy	Population normal
Symptom questionnaire	Self-designed	x	x	x	
Dizziness Handicap Inventory	Established	x		x	
Functional Limitations Profile	Established	x	x	x	x
Health Technology Assessment symptom questionnaire	Self-designed			x	x

Table 6.1: Table of questionnaires administered to the four survey groups

6.2 SYMPTOM QUESTIONNAIRES

The aim of the symptom questionnaire was to determine the symptom characteristics of the group surveyed. This would both establish a profile of the symptoms experienced by individuals and allow the relationship between symptoms and quality of life to be

examined. The symptom questionnaire for each of the survey groups is discussed in this section.

6.2.1 Symptom questionnaire for dizzy individuals in the clinic population

The aim of this questionnaire was to establish the relationship between the symptoms of dizziness and the reports made on both the traditional disease-specific and quality of life questionnaires.

The symptoms of interest were those assessed clinically and proposed to have a potential association with the consequences of dizziness and quality of life. This meant that a large number of questionnaires were required. The questionnaire length, ease of completion and time taken to complete were important considerations for the design and selection of questionnaires particularly in view of their potential effect on the return rate.

Two symptom questionnaires for dizzy individuals, the Vertigo Symptom Scale (VSS) (Yardley *et al.,* 1992a) and its short form version (Yardley *et al.,* 1998b) have been reviewed previously. Both are established and well validated and the short version is also quick and easy to complete. Although providing information about the severity of dizziness symptoms and autonomic symptoms, the symptom characteristics are not covered.

A new symptom questionnaire was therefore developed, piloted and refined. The questionnaire was applied to dizzy individuals in both the clinic and population samples. A copy of the symptom questionnaire is found in Appendix 2.

6.2.1.1 Symptom Characteristics

Response categories for all items were based on knowledge of dizziness, published research and response categories adopted in established symptom questionnaires such as the VSS (Yardley *et al.,* 1992a). The response categories were defined to represent the range of types and causes of dizziness. The categorical responses to the items were coded for analysis.

Throughout the symptom questionnaire, the term 'attack' was used as a generic term to encompass all sensations experienced by the dizzy individuals. The attacks could range

from continuous imbalance to brief spells of lightheadedness to acute attacks of spinning. Although the use of this term did not appear to cause any interpretation problems, an explanation of the term could have been included as part of the instructions for the questionnaire.

The duration of dizziness, average length of attacks and average frequency of attacks were obtained to describe the temporal characteristics of the dizziness. Information was also obtained about the provoking factors for the attacks. Dizziness encountered in clinical practice can be split into two main categories, that which occur spontaneously without an obvious trigger and that which are provoked by head and/or body movements. These were used as the defined response categories for the item concerned with provoking factors. An open response category was also included for patients to specify any other factors that provoked the dizziness. Visual triggers are also known to provoke dizziness. Although the omission of these from the list of factors could be considered a weakness of the list, responders did not report such triggers in the open response category.

As discussed earlier, dizziness is a generic term that includes a range of symptoms experienced by patients. Patients often find the sensations experienced difficult to describe and the terms used to describe the symptoms are often very specific to the individual. A checklist of descriptions used to describe dizziness symptoms was provided to allow patients to indicate the sensations experienced. Patients could also indicate other symptoms experienced.

The debilitating nature of the attacks of dizziness was assessed by the item, 'Do the attacks incapacitate you?'. The dichotomous Yes/No response would allow for comparison of quality of life questionnaire responses between the two groups.

6.2.1.2 Symptom Severity Ratings

As has previously been discussed, a number of published measures of symptoms are available. These have tended to be long questionnaires or have been devised to be used as outcome measures for rehabilitation programmes. A rating scale was chosen as it would be short and simple to complete and would provide a measure of the severity of the symptoms experienced.

The scale, as shown in Figure 6.1, is numbered from 1 to 10. The end points are defined where 1 represents no symptoms and 10 represents the worst possible symptoms. The responder circles the score that represents the severity of dizziness experienced; this was originally done by the clinician. Whilst no psychometric testing has been carried out on this scale, justification for its use has been based on clinical experience and preliminary evidence for its validity has been demonstrated against the Dizziness Handicap Inventory (Shepard, 1998).

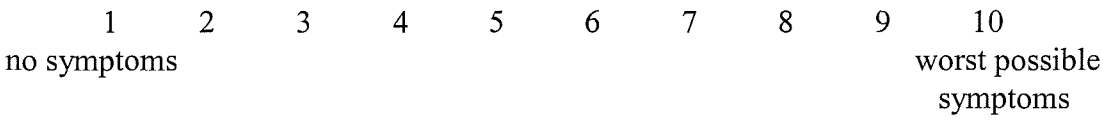


Figure 6.1: Symptom severity rating scale

When originally developed as an internal department tool, the scale applied to symptoms that had been experienced 'recently'. This would therefore provide an overall average rating of the severity of the symptoms, allowing for the day-to-day fluctuations in symptom severity. To link with the style of other questions on the symptom questionnaire, the term 'nowadays' was adopted to replace 'recently'. To assess changes in symptom severity between the two applications within the repeatability study, a version of the scale was also included for symptoms 'today', the day of completion of the questionnaires. Modification to the instructions for the scale is assumed not to have any material effect on its performance.

A criticism of rating scales has been that responders avoid the extremes of the scale (Moser and Kalton, 1971). Although this could be true for the upper extreme of the symptom severity scale shown in Figure 6.1, it is unlikely to be true for the lower extreme that corresponds to 'no symptoms' since this is a well defined state.

The idea of a symptom severity rating for 'nowadays' implies an average rating of the symptoms over a period of time. However, the time scale considered as 'nowadays' by patients when rating symptom severity is not known and could differ from patient to patient depending on the characteristics of the symptoms. Recent or severe events may have an unknown bias on the responses.

Equally the relationship between the symptom rating for nowadays and that for today can be expected to be dependent upon the temporal characteristics of the symptoms. The disparity between the two might be expected to be less for chronic dizziness and greater for spontaneous episodic dizziness.

6.2.1.3 Hearing and tinnitus

The structure of the questions about hearing difficulties and tinnitus was based on that used in the Medical Research Council's National Study of Hearing (Davis, 1997). For the hearing question, a possible limitation is that the responder is restricted to a dichotomous response. However, this was considered to be sufficient since the purpose of the item was to obtain information about co-existing otological problems rather than to provide a detailed study of hearing difficulties.

The tinnitus item considers tinnitus experienced for longer than 5 minutes to be clinically significant and allows for the differentiation between intermittent and continuous tinnitus.

6.2.1.4 Health Technology Assessment ratings

Items concerned with dizziness within the Health Technology Assessment (HTA) survey of ear, nose and throat problems were included in the symptom questionnaire.

These items will collectively be referred to as HTA ratings. The final items, shown in Figure 6.2, resulted from negotiation with the HTA researchers and suggestions for revised and additional items.

Particular improvements were made to the work item that included a graded response for varying amounts of time stopped from working. This is compared with the original item that was only concerned with work prevented for more than one day.

Although comments were made relating to the combination of the mood states of annoyance, worry and upset and the use of only annoyance in the response categories, no alterations were made to this item. It is not clear whether responders would make this fine semantic distinction between the emotions.

Has dizziness or unsteadiness ever stopped you from working or carrying out your normal activities for more than 1 day?

- ☐ No
- ☐ Yes, more than 1 day and less than 1 week
- ☐ Yes, more than 1 week and less than 1 month
- ☐ Yes, more than 1 month

Nowadays, how much does your dizziness or unsteadiness worry, annoy or upset you?

- ☐ Not at all annoying
- ☐ Slightly annoying
- ☐ Moderately annoying
- ☐ Severely annoying

Nowadays, what impact does your dizziness or unsteadiness have on your quality of life? Consider participation in social events, work, relationships, personal well-being.

- ☐ Not affected
- ☐ Slightly affected
- ☐ Moderately affected
- ☐ Severely affected

Figure 6.2: HTA rating scales included on the symptom questionnaire

The third item of Figure 6.2 was an additional item originally proposed but not accepted for the main HTA survey. This item was a modification of an item from a published questionnaire to quantify dizziness and its effects (Honrubia *et al.,* 1996). The item was concerned with the self-perceived impact of dizziness on quality of life, defined as participation in social activities, work, relationships and personal well-being.

6.2.1.5 Other health problems

The question concerned with other health problems consisted of a checklist of problems, as shown in Figure 6.3.

The list contained conditions common in the general population that could affect the balance and quality of life of the responder. Obtaining this information would allow the role of other health problems when assessing the quality of life of the dizzy individuals to be examined. It might be expected that there would be an interaction between these other health problems and the dizziness.

Lower limb problems, including paralysis or artificial limbs and the more common arthritis of the lower joints were specified because of their effect on mobility and balance

which could interact with an additional dizziness problem. Head injuries as well as being a cause of traumatic vestibular disorders can result in a wide range of additional severe disabling conditions. Patients are generally questioned about blood pressure during clinical examinations although it is usually low blood pressure that can cause the symptom of lightheadedness. Raised blood pressure was included since it is common in the general population and can result in a restriction of activities such as walking distances or going up steps.

Please tick any of the following that apply to you and have experienced recently. If you have a health problem that is not listed then please specify (You can tick more than one box).

- ☐ Lower limb problem e.g. artificial leg, paralysis
- ☐ Head injury with loss of consciousness for more than one hour
- ☐ Raised blood pressure
- ☐ Neck problems e.g. arthritis
- ☐ Arthritis of lower joints e.g. hips, knees, ankles
- ☐ Depression/anxiety
- ☐ Other (please specify)

Figure 6.3: Health item on the symptom questionnaire

Neck problems are anecdotally reported in dizzy patients and cervical vertigo is a documented, although controversial condition (Clendaniel, 2000). It was therefore important to record the self-report of neck problems. Although arthritis was specified as an example of a neck problem, neck stiffness could also lead to a positive response. By specifying only arthritis as an example of a neck problem, this may have deterred some patients from indicating that they had another type of neck problem.

Depression and anxiety were combined together as part of the same health problem because they both indicate a mood state. These were included because of the known psychosocial effects of dizziness on emotional state and the increased prevalence of psychological problems in dizzy populations (see Section 2.3). It is also likely that there would be an association between these states, dizziness and the quality of life. It was found that certain responders would cross out depression to indicate that they were only anxious and it was later considered that depression and anxiety might have been listed separately.

Patients were given the opportunity to specify other health problems, which would allow for the less common health problems to be reported that could have an important role when assessing quality of life in the current survey.

The health problems reported on this item were reliant on the accuracy of the self-report and not confirmed by medical opinion. Although for the majority of the health problems it is likely that a doctor will have confirmed the condition during its investigation and diagnosis, this is not necessarily the case for neck problems and depression and anxiety. The report of these health problems is perhaps more susceptible to the bias of self-report.

It was recognised in the analysis stage of the study that additional health problems should have been included in the list on the questionnaire. Specific omissions were cardiac problems, strokes, neurological conditions and visual disorders. The responders were able to report other health problems that were not specifically mentioned in the list of other health problems. This does rely on the report of the individual and how relevant the additional health problem is considered to be. The later survey of facial pain patients means that facial pain should have also been included in the list of health problems for completeness.

In addition, there are items within the list that can be considered to be either secondary symptoms of vestibular disease as well as being possible triggers for dizziness or co-existing health problems. No distinction is made between these on the questionnaire. Neck problems and depression/anxiety are such items.

6.2.1.6 Demographic details

Demographic details about the responders were obtained. These included age and sex of the responders and details of the occupational status of the responder and spouse.

Occupation details were obtained to provide information about social class. Classification of occupational type was based on the spouse in those cases where the responder was a housewife. Information about the usual occupation was requested for those who were not currently working either because of retirement, unemployment or health reasons. The item was not always completed correctly and the employment details supplied were not always

sufficient to classify occupational type using the Registrar General's Classification of Occupation (OPCS, 1991).

6.2.1.7 Treatment

The nature of referral pathways means that by the time of recruitment into this survey, both a GP and an ENT consultant would have been consulted. It is possible that medication or other forms of treatment may have been prescribed. Since these may have had a beneficial effect on the dizziness symptoms themselves, details about any current medication or previous treatment were obtained. This issue is particularly important for medical conditions that are causes of dizziness but which can be controlled well by treatment, such as raised blood pressure and diabetes. It should be noted that although medication or treatment may improve symptoms, it does not automatically follow that quality of life will improve.

The separate issue of medication for health problems other than the dizziness was not addressed in the survey. In view of the large number of other health problems reported in the survey, information about the use of drugs other than for dizziness would be been useful. This is particularly true for those drugs that could exacerbate or cause dizziness.

6.2.2 Symptom questionnaire for dizzy individuals in the general population

Dizzy individuals in the general population received a copy of the dizziness symptom questionnaire previously discussed for the clinic population of dizzy individuals. To re-establish responses to the items used to select individuals to take part in this survey in the general population, a second symptom questionnaire, the HTA dizzy symptom questionnaire was administered. This is shown in Appendix 3.

The items from the original HTA questionnaire to select subjects were repeated to confirm that the individual reported dizziness nowadays with or without hearing difficulties and tinnitus nowadays and with no nose, throat or voice problems in the last 12 months. The items were dichotomous requiring a simple yes/no response.

An additional item from the HTA survey to determine whether individuals had visited their GP or hospital due to dizziness was included.

6.2.3 Symptom questionnaire for facial pain patients

The questionnaire elicited details about the symptom characteristics of the facial pain patients surveyed. It was important that where possible, information was comparable with that obtained for the dizzy patients.

The questionnaire was developed based on discussions with the maxillofacial consultants collaborating with the survey. The subsections and items of the questionnaire are discussed here in the same way as they were presented for the dizziness symptom questionnaire. A copy of the facial pain symptom questionnaire is shown in Appendix 4.

6.2.3.1 Symptom characteristics

As for the dizzy patients, the duration of problems, length and frequency of episodes of pain were obtained to generate a profile of the symptoms experienced. In addition, information about the localisation and type of pain was obtained.

The response categories for each of these items were based on discussions with the consultants involved. Where possible the same response categories that were used for the dizziness symptom questionnaire were adopted for the facial pain questionnaire.

The items concerned with the duration of problems and frequency of episodes of facial pain were almost identical to the corresponding items on the dizziness symptom questionnaire. This was possible because of similarities in the presentation of facial pain and dizziness, which had previously been used as justification for using facial pain patients for the comparison group.

There were differences in the response categories for the length of episodes of facial pain compared with the corresponding dizziness item to reflect the typically longer durations of facial pain episodes.

Items about the localisation and type of pain experienced provided information about the physical characteristics of the facial pain. Response categories were chosen to reflect the typical reports made by patients.

6.2.3.2 Symptom severity ratings

The severity of the symptoms both *nowadays* and *today* was assessed using a modified version of the symptom severity rating scale for dizziness symptoms. As previously for the dizzy symptoms, these would allow examination of the relationship between the severity of symptoms and quality of life.

The presentation and instructions for the severity rating scales were modified for facial pain. The effect of the temporal characteristics on the severity ratings for *nowadays* and *today* as discussed for dizziness (see Section 6.2.1.2) also applies to facial pain.

6.2.3.3 HTA rating scales

The HTA ratings developed for dizziness were modified for facial pain to allow for comparison between the survey groups. The only modification required was for the phrase 'dizziness or unsteadiness' to be replaced by 'your facial pain'. It was assumed that this change would not affect the validity of any comparisons made between the survey groups.

6.2.3.4 Other health problems

The list of other health problems included in the dizziness symptom questionnaire was included for the facial pain patients. This would allow those with and without other health problems to be distinguished when assessing the self-report of limitations using the Functional Limitations Profile (FLP).

A comparison of the response profiles on the FLP questionnaire was to be made between dizzy individuals and facial pain patients. It was therefore important to identify those facial pain patients who also presented with dizziness. An item to ask directly about the presence of dizziness was therefore included in the questionnaire. The items concerned with hearing difficulties and tinnitus were also included in the same form as for the dizziness symptom questionnaire.

6.2.3.5 Demographic details

In the same way and for the same reasons as for the dizzy individuals, demographic information about the subjects was obtained on the facial pain symptom questionnaire. This included age, sex and occupational type.

The limitations in the item concerned with occupational type previously highlighted also apply here. Since these were identified after the commencement of the survey of facial pain patients, any changes could not be implemented in its design for this survey group.

6.2.3.6 Treatment

Report of the use of medication for facial pain was important since facial pain is more responsive to treatment by medication compared with dizziness and therefore more likely to be prescribed. Medication could have been prescribed by the General Practioner and/or the consultant within the Maxillofacial department. Information was therefore obtained about the type of medication and when this was prescribed. In the same way as for the dizzy individuals, unfortunately the use of the medication for health problems other than facial pain was not considered.

Treatment other than medication was not considered to be an issue for this group. It was unlikely that patients would have received treatment prior to the initial assessment within the maxillofacial department and the often idiopathic nature of facial pain means that treatment other than medication is not usually carried out at the initial assessment. Any treatment that was carried out at the appointment was noted on the diagnostic sheet by the clinician.

6.2.4 Symptom questionnaire for individuals with no ear, nose or throat problems or dizziness in the general population

The sample of individuals in the general population with no ENT problems nowadays and no dizziness nowadays or ever (population 'normal' sample) received a questionnaire containing the HTA items used to select the sample. Responses to these items were to be used to confirm inclusion within the population 'normal' sample. A copy of this questionnaire is found in Appendix 5.

6.3 DISEASE-SPECIFIC QUESTIONNAIRE

A disease-specific questionnaire was only applied to those individuals with dizziness, either in the clinic or population samples. This type of questionnaire was not administered

to the facial pain sample since the main aim was to compare the profile of quality of life for this group against that of dizzy patients.

6.3.1 Disease-specific questionnaire for dizzy individuals

This type of questionnaire has been commonly used to assess the effects of dizziness. Although there are limitations in the measures available it was important that this type of questionnaire was administered to demonstrate the validity of the applied quality of life questionnaire. This would also enable the limitations in lifestyle reported by dizzy individuals as proposed in the model of quality of life, and refined from the results of this survey, to be compared with those indicated from the traditional approach.

The choice of disease-specific questionnaire was based on demonstrated psychometric properties, patient acceptability and a structure that would enable validation of the quality of life questionnaire and its dimensional structure for dizzy individuals.

Of those disease-specific questionnaires reviewed in Section 2.7.3.1, the Dizziness Handicap Inventory (DHI) (Jacobson and Newman, 1990) meets the outlined requirements for the questionnaire. The DHI was therefore selected as the disease-specific questionnaire in the study.

6.3.2 Dizziness Handicap Inventory (DHI)

The DHI, a copy of which can be found in Appendix 1 is a validated questionnaire reported to quantify the handicapping effects of dizziness. The three-subscale structure measuring functional, emotional and physical effects associated with dizziness lends itself to examine the validity of the quality of life questionnaire and its structure.

Recent research (Asmundson *et al.,* 1999) does not support the validity of the original subscale structure of the DHI and there is a paucity of evidence for this original proposed structure. Despite this, the DHI is probably the most extensively tested and applied disease-specific questionnaire available for dizzy individuals.

To date, no psychometric testing of the questionnaire has been published for the UK. Although the questionnaire was developed from interviews with dizzy individuals in the US, it is reasonable to assume that there would be no significant difference in the impact

and consequences reported by a UK population. The dizziness specific nature of items means that any cultural and semantic differences should not have a material effect on responses.

Questionnaire Item	Original US Version	Anglicised Version
F14	Because of your balance problem is it difficult for you to do strenuous housework or *yardwork*?	Because of your balance problem is it difficult for you to do strenuous housework or *work in the garden*?
P17	Does walking down a *sidewalk* increase your problem?	Does walking down a *road* increase your problem?

Table 6.2: Anglicised items of the DHI

To account for language differences, two items of the DHI were rephrased for administration to a UK group. Since the meaning of the item has not been altered, it is assumed that the reliability and validity of the items and questionnaire scores has not been affected. The modified items of the DHI are shown in Table 6.2. The psychometric properties of the questionnaire will be established for the UK from responses in the current survey.

6.3.3 Scoring scheme for the Dizziness Handicap Inventory

The response scale for each item is 'Yes', 'Sometimes' and 'No', scoring 4, 2 and 0 points respectively. In the context of this scale, 'Yes' implies 'most of the time' and 'No' implies 'virtually never'. The subscale for each item is indicated on the item labels by a letter P, F, and E for physical, functional and emotional respectively.

The number of items and maximum scores in the three subscales and the overall score are shown in Table 6.3.

Scale	Number of items	Maximum score
Physical subscale	7	28
Functional subscale	9	36
Emotional subscale	9	36
DHI	25	100

Table 6.3: Items and scores for the DHI questionnaire

Subscale scores will be expressed throughout as percentages of maximum scores for that subscale to allow comparison to be made across the subscales.

The scoring scheme for the questionnaire is simple to implement and handicap scores are obtained for the subscales as well as the overall questionnaire. However in light of the doubts expressed about its subscale structure (Asmundson *et al.,* 1999), the meaning of these scores is not clear.

6.4 GENERIC QUALITY OF LIFE QUESTIONNAIRE

A review of quality of life measures used in health care and those that have been used for dizzy individuals is found in Section 2.11. The Functional Limitations Profile (FLP) was chosen as the generic quality of life questionnaire for the survey. Justification for its selection is found in Section 2.11.5.

6.4.1 Functional Limitations Profile (FLP)

The FLP, a copy of which can be found in Appendix 1, is a validated questionnaire consisting of 12 categories considering different aspects of functioning. Combinations of these categories create two dimensions and all categories contribute to the overall score for the questionnaire.

A summary of the categories and the dimensions to which they belong is shown in Table 6.4 along with the number of items and scores for each section of the questionnaire. The independent categories do not contribute to either dimension but are included in the calculation of the overall quality of life score.

Calculation of the category and dimension scores in addition to the overall score allows for a profile of the quality of life of a healthcare group to be established.

	Number of items		Score[1]
	Dimension	Category	
Ambulation		12	1006
Body care and movement		23	1927
Mobility		10	727
Household management		10	695[2]
Physical dimension	55		4355
Recreation and pastimes		8	383
Social interaction		20	1289
Emotion		9	693
Alertness		10	711
Sleep and rest		7	591
Psychosocial dimension	55		3667
Eating		9	706
Communication		9	685
Work		9	520[3]
FLP overall score	136		9923

Table 6.4: Dimensions and categories of the FLP.

6.4.2 Scoring scheme for the Functional Limitations Profile

Each item of the questionnaire has a weight assigned to it. The derivation of the weights has been discussed previously in Section 2.10.3.2. Category and dimension scores are calculated by summation of the item weights for each item endorsed within that section of the questionnaire. The overall score is calculated by summing the weights of all items endorsed on the questionnaire.

Scores are calculated as percentages of the maximum possible score for each section of the questionnaire as shown in Table 6.4. An exception is the work category for which the score is calculated as 70% of the summation of item weights. This value has been determined based on the distribution of scores on the work category (Patrick, 1989) although the reason for this is not entirely clear. In addition, the weight for the item indicating that the responder no longer works because of their health (W128) has been statistically adjusted since the responder is unable to endorse any other items in the category.

[1] See Section q.4.2 for discussion of the FLP scoring scheme

[2] Maximum household management score reported to be 685 and for the physical dimension as 4345 (Patrick, 1989). Summation of the individual item weights is equal to 695 for the household management category. Corrected item weight summations used here for these scores. Reported overall item weight kept as 9923.

[3] Calculated as 70% of the summation of item weights in category

7.0 PSYCHOMETRIC PROPERTIES OF THE DIZZINESS HANDICAP INVENTORY

The Dizziness Handicap Inventory (DHI) has been reported to be a reliable and valid measure of the effects of dizziness (Jacobson and Newman, 1990). This is despite poor statistical methods having been adopted to assess these psychometric properties. Recent publications have raised doubts about the development and structure of the DHI (Hazlett *et al.,* 1996; Asmundson *et al.,* 1999). It has previously been the questionnaire of choice for application to dizzy individuals.

In this chapter, the psychometric properties of the DHI are established and its subscale structure re-evaluated based on the current survey of dizzy individuals in the clinic population. The statistical methods adopted to assess these properties are reviewed in Appendix 6.

7.1 MISSING DATA

7.1.1 Incomplete DHI questionnaires

Incomplete DHI questionnaires were obtained from 16% of responders. This included omission of certain items, non-completion of the second side of the questionnaire and return of the questionnaire not completed.

It was possible that failure to indicate that items continued on to the second side of the questionnaire resulted in the non-completion of this side. This however accounted for only 6% of the incomplete questionnaires. Responders also failed to complete the second side of the symptom questionnaire even though instructions were included to continue on the second side.

Seven responders returned the DHI not completed and one did not return the questionnaire at all. The reason for this is unclear. All of these responders endorsed items on the FLP so it can be assumed that the failure to complete the DHI did not affect the reliability of the FLP. Two of these responders later went on to take part in the study of the test-retest repeatability of the DHI at which time they did complete the DHI questionnaire.

The majority of incomplete DHI questionnaires (81%) was due to omission of one or more items across the whole of the questionnaire. Although certain omissions may be due to responder error, it was felt that the content of certain items on the questionnaire affected completion.

Particular difficulties were for items in the physical and functional subscales. These items assume a certain level of activity or participation in certain activities prior to the onset of dizziness. Examples of such items are 'Does walking down the aisle of the supermarket increase your problem?' and 'Does your problem significantly restrict your participation in social activities such as going out to dinner, movies, dancing or parties?'. It is possible that responders do not complete the items that are not relevant to them.

7.1.2 Missing responses

Two approaches to deal with missing responses on the DHI were considered. The first was to replace these with either the median or modal score from the remaining endorsed items in that subscale. The second was to remove any incomplete questionnaires from the analysis.

Items within each subscale consider very different activities or emotions and there is limited evidence for the subscale structure of the DHI. Since it is likely that in the majority of cases items were missed as they were not relevant to the responder, replacing missed responses by the median or mode score may bias scores towards greater levels of handicap.

Incomplete DHI questionnaires were therefore removed from any analysis of responses reducing the number of completed questionnaires in the clinic sample to 342.

7.2 INTERNAL CONSISTENCY

Internal consistency of the DHI and its subscales was assessed using Cronbach's alpha, the values of which are shown in Table 7.1.

The internal consistency of the overall DHI is not presented since this is affected by the structure of the questionnaire. For the subscales, the physical subscale demonstrated the lowest internal consistency and the emotional subscale the highest.

Scale	Number of items	Cronbach's alpha
Physical subscale	7	0.74
Functional subscale	9	0.84
Emotional subscale	9	0.84

Table 7.1: Cronbach's alpha for the DHI and its subscales (N=342)

7.3 TEST-RETEST REPEATABILITY

The test-retest repeatability of the DHI and its short form version has previously been demonstrated (Jacobson and Newman, 1990; Jacobson and Calder, 1998). The methodology for the investigation of this property in this current study is presented in the context of the main survey in Section 11.7.

7.3.1 Return rate

Questionnaires were returned from 87 dizzy individuals in the clinic population taking part in the study of test-retest repeatability of the DHI. The return rate for the test-retest repeatability study was 51%. Of these, only 65 (75%) completed the DHI correctly for both administrations. Repeatability was assessed for those completing the DHI on both occasions over a one-month period.

7.3.2 Demographics of sample taking part in repeatability study

The mean age of responders returning complete DHI questionnaires (N=65) was 51.9 years (95% CI: 48.5, 55.2; SD: 13.6). Comparison between this and the mean age of responders for the main survey (mean age 52.5 years, 95% CI: 51.2, 53.9; SD: 13.6) showed no statistically significant difference (Mann-Whitney U-test, $p>0.05$). As for the main survey, men (mean age 56.2 years; 95% CI: 49.7, 62.7; SD: 12.6) were older than women (mean age 50.4 years; 95% CI: 46.4, 54.3; SD: 13.7) although this did not reach significance. The male to female ratio was not significantly different to that found in the main survey with 74% of responders in the repeatability study female.

7.3.3 Repeatability statistics

The Komogorov-Smirnov statistic showed DHI difference scores between time 1 and time 2 could be assumed to be normally distributed. The mean and standard deviations for the change in raw and percentage scores between time 1 and time 2 are shown in Table 7.2. The maximum possible score on each of the scales is shown. Percentage scores are presented to allow for comparison between the scales while raw score changes can be related to the individual item scores. Spearman's correlation coefficient between scores at time 1 and time 2 is also presented showing a high correlation between the scores.

Scale	Maximum possible score	Mean change	SD of change	Mean % change	SD of % change	Spearman
All responders in repeatability study (N=65)						
Physical	28	0.52	4.46	1.87	15.94	0.78
Functional	36	1.57	6.20	4.36	17.22	0.77
Emotional	36	0.74	4.53	2.05	12.60	0.87
DHI	100	2.83	12.39	2.83	12.39	0.82
Responders with no changes in symptoms on day of completion (N=19)						
Physical	28	1.79	3.77	6.39	13.45	0.88
Functional	36	1.23	4.95	3.50	13.76	0.86
Emotional	36	0.42	2.87	1.17	7.98	0.85
DHI	100	3.47	9.40	3.47	9.40	0.91

Table 7.2: One-month test-retest repeatability for the DHI.

Standard deviations of change were also calculated for those subjects whose symptom severity rating for today did not change between time 1 and time 2 (N=19) and are also shown in the table. The standard deviations were significantly smaller for the functional and emotional subscales. Significance was determined by calculating the F value from the variances and comparing against the F distribution.

No significant differences were found between the overall score and subscale scores obtained at time 1 and time 2 (Wilcoxon matched-pairs signed ranks test, $p>0.05$).

The level of agreement between the measure at time 1 and at time 2 on the DHI and its subscales was illustrated using Bland-Altman plots in Figure 7.1 (Bland and Altman, 1986).

The outer horizontal lines plotted indicate $\pm$ 2 SD from the mean change. It can be seen from the figures that there is a large spread in the changes between time 1 and time 2 on

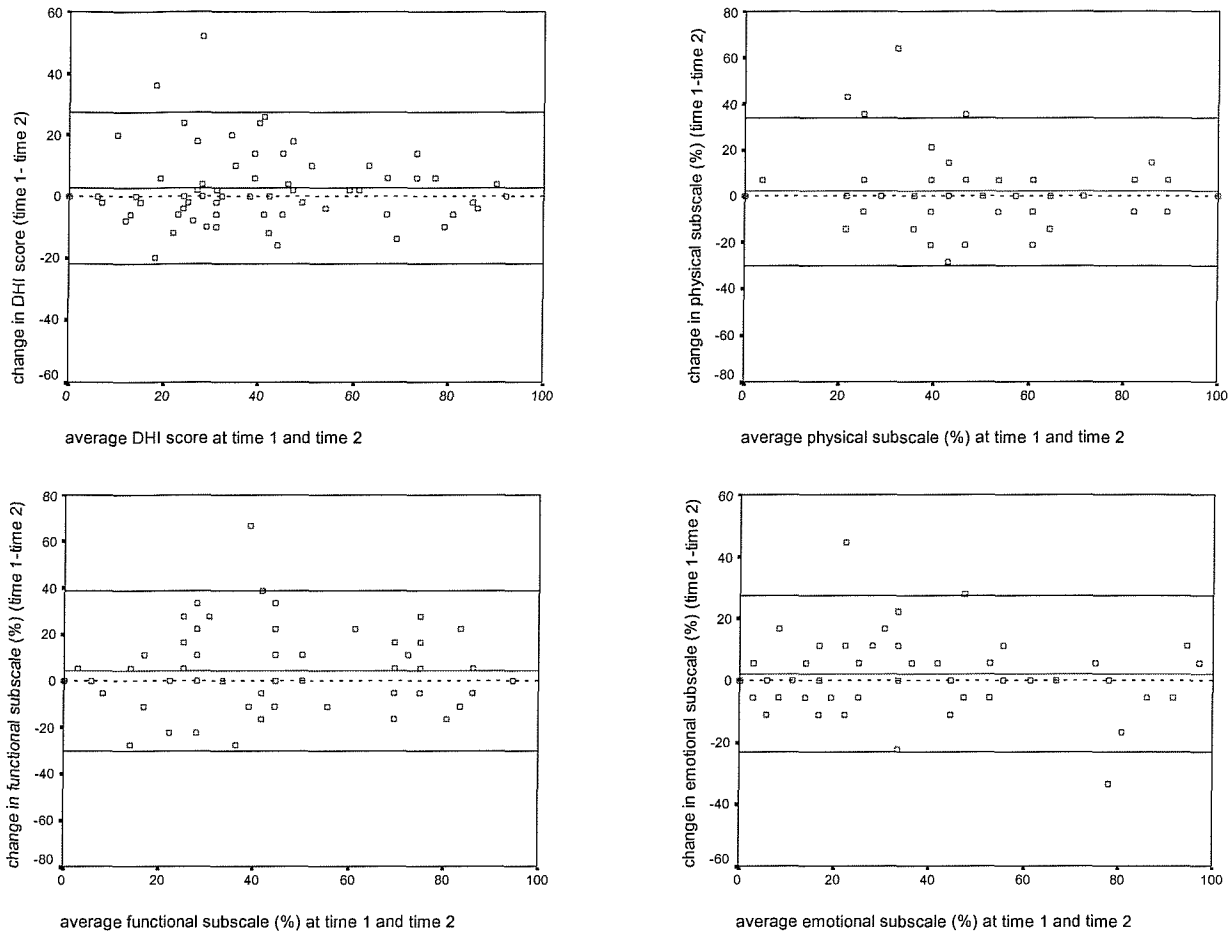


Figure 7.1: Bland-Altman plots to illustrate the repeatability of the DHI and its subscales (N=65).

the subscales and overall score. For the physical subscale and overall score, there appears to be a relationship between the mean score difference and the average score where the scatter of the differences decreases as the handicap increases. This may be related to the compression properties of the physical handicap scale at the higher handicap levels, which is evident when investigating the properties and performance of the questionnaire.

7.3.4 Comparison of the repeatability with previous studies

Previous studies have assessed the repeatability of the DHI using the parametric Pearson correlation coefficient. To compare the repeatability obtained here with that reported previously, this correlation coefficient was calculated. The coefficient was similar in magnitude to the non-parametric Spearman correlation coefficient. A summary of the studies of repeatability is found in Table 7.3. All correlations were significant. Questionnaire scores were recalculated for the screening version of the DHI (DHI-S)

(Jacobson and Calder, 1998) using responses obtained in this current study on those items contained within DHI-S for further comparison.

The one-month test-retest period used in the present study is longer than in previous studies but is similar to follow-up periods commonly used for vestibular rehabilitation. Although correlations for this longer period were smaller than those achieved over 1 week and 1 day, they were still high. The difference in magnitude of the correlation coefficient can be explained by the longer test-retest period and less control over the stability of the groups surveyed.

Study	Version	Number of subjects	Test Period	Scale	Pearson correlation
Present study	DHI	65	1 month	Overall	0.86
				Physical	0.76
				Functional	0.81
				Emotional	0.90
	DHI-S	65	1 month	Overall	0.87
Jacobson & Newman, 1990	DHI	14	same day	Overall	0.97
				Physical	0.92
				Functional	0.94
				Emotional	0.97
Jacobson & Calder, 1998	DHI-S	45	1 week	Overall	0.95

Table 7.3: Comparison of the repeatability of the DHI and its screening version (DHI-S) between studies.

7.4 FLOOR AND CEILING EFFECTS

The floor and ceiling effects of the DHI and its subscales were examined. Floor effects relate to the percentage of responders who score zero on the scale, indicating no handicap; ceiling effects relate to the percentage of responders who score the maximum score on the scale, which in this case is 100% indicating maximum handicap.

Since the DHI is a disease-specific questionnaire it was anticipated that there would be no material floor effects. It was also expected that there would be a small percentage of responders who would score the maximum for the scales because of the wide range of severities of symptoms reported in the clinic dizzy sample. The percentages of responders scoring zero and 100% are shown in Table 7.4.

Scale	% floor [a]	% ceiling [b]	range (%)
DHI score	1.2	0.3	0 - 100
Physical subscale	3.2	1.2	0 - 100
Functional subscale	4.7	0.6	0 - 100
Emotional subscale	3.2	1.2	0 - 100

[a] percent of responders scoring zero indicating no dizziness related handicap
[b] percent of responders scoring 100% indicating maximum dizziness related handicap
Table 7.4: Floor and ceiling effects and ranges of scores for the DHI and its subscales (N=65).

The least floor and ceiling effects were found for the overall DHI. This is not surprising since it is based on scores from the three subscales that can be affected in different ways depending on the reaction of the individual to the dizziness. The highest floor effects were for the functional subscale with nearly 5% of patients reporting no handicap in this subscale. As might be expected this scale had the smallest ceiling effect. Floor and ceiling effects were identical for the physical and emotional subscales.

Items were relevant to over 98% of responders to the questionnaire indicating that the majority in the clinic dizzy sample experienced some level of dizziness associated handicap as measured by the DHI.

7.5 CONTENT VALIDITY

Correlations between item and subscale scores using the Spearman Rank Order Correlation Coefficient to assess the content validity of the DHI are shown in Table 7.5. The strongest correlation between an item and a subscale is shown in bold. Correlations are presented between the raw item responses and the subscale percentage scores (original). Item responses were also corrected for the overall severity of the handicap reported by subtracting the average item score for each responder from all original item responses. Correlations were examined between these new variables and the newly calculated subscale scores (corrected). The new variables generate a profile of responses for each responder that is a deviation from the average pattern of handicap that accounts for overall severity.

For the majority of items in both analyses, the strongest item-total correlations were with their corresponding subscales. There were five exceptions to this where items correlated

strongly with another subscale. For the analysis using the original item response, correlations were high and similar across two and in some cases three subscales. For other items, correlations were low with all subscales including those that they are reported to belong to. The pattern of correlations in the analysis taking into account the overall handicap severity is clearer. Items clearly loaded onto one subscale, which in the majority of cases was the subscale to which the item belonged although the magnitudes of the correlations were generally lower.

DHI Item	Physical Subscale		Emotional Subscale		Functional Subscale	
	Original[1]	Corrected[2]	Original[1]	Corrected[2]	Original[1]	Corrected[2]
P1	**0.652**	**0.611**	0.248	-0.367	0.329	-0.255
P4	**0.574**	**0.158**	0.498	-0.038	0.492	-0.142
P8	**0.663**	**0.287**	0.504	-0.184	0.565	-0.102
P11	**0.729**	**0.638**	0.309	-0.419	0.413	-0.247
P13	**0.500**	**0.519**	0.088	-0.368	0.238	-0.143
P17†	0.530	0.045	**0.548**	0.040	0.538	**-0.120**
P25	**0.710**	**0.532**	0.351	-0.390	0.483	-0.142
E2	0.426	-0.212	**0.725**	**0.317**	0.559	-0.148
E9†	0.366	**-0.313**	0.624	0.199	**0.634**	0.114
E10	0.322	-0.243	**0.632**	**0.440**	0.421	-0.230
E15	0.359	-0.216	**0.661**	**0.460**	0.443	-0.288
E18	0.424	-0.272	**0.690**	**0.301**	0.601	-0.023
E20	0.252	-0.057	**0.449**	**0.229**	0.381	-0.181
E21	0.469	-0.254	**0.701**	**0.392**	0.560	-0.192
E22	0.364	-0.224	**0.664**	**0.466**	0.460	-0.253
E23	0.410	-0.265	**0.714**	**0.445**	0.517	-0.232
F3	0.422	**-0.413**	0.643	0.053	**0.750**	0.399
F5	0.383	0.205	0.193	**-0.272**	**0.392**	0.088
F6	0.446	-0.336	0.598	-0.057	**0.751**	**0.454**
F7	0.396	-0.048	0.419	-0.108	**0.551**	**0.200**
F12	0.387	-0.048	0.404	-0.196	**0.581**	**0.297**
F14	0.596	-0.049	0.526	-0.329	**0.770**	**0.400**
F16	0.484	**-0.273**	0.635	0.061	**0.710**	0.233
F19	0.442	-0.150	0.495	-0.045	**0.662**	**0.248**
F24	0.516	-0.177	0.606	-0.098	**0.734**	**0.319**

Table 7.5: Item-subscale correlation coefficients for the DHI (N=342) [† indicates those items where the strongest correlation is not with the corresponding subscale].

[1] Correlations determined between raw item responses and percentage subscale scores
[2] Correlations determined between (item response -average item response) and subscale scores

The results of this analysis provide general support for the validity of the subscale structure of the DHI questionnaire. Despite this, certain items do not appear to contribute to the handicap reported in the subscales.

7.6 RE-EVALUATION OF THE SUBSCALE STRUCTURE OF THE DHI

The structure of the DHI consisting of three subscales of physical, functional and emotional handicap was developed based purely on *a priori* groupings made by the developers of the questionnaire (Jacobson and Newman, 1990). There is no published evidence to support the assumptions that the items fall into the subscale structure proposed (Hazlett *et al.,* 1996).

Claims have been made that the DHI subscales provide information about the effects of dizziness on functional, emotional and physical aspects of everyday life (Jacobson and Calder, 1998) and that they can be used to identify problems in specific areas. If the subscale structure is not valid, this raises doubts about the interpretation of the scores on the current subscales.

Screening (Jacobson and Calder, 1996) and short-form (Tesio *et al.*, 1999) versions of the DHI questionnaire have been proposed. These have been reviewed elsewhere in Section 2.7.3.2. Recent studies have also re-evaluated the subscale structure of the DHI based on empirical evidence (Asmundson *et al.,* 1999).

Re-evaluation of the subscale structure of the questionnaire is important for two reasons. It is reasonable to say that the DHI has generally been the questionnaire of choice to measure the effects of dizziness. It is therefore important that it is a valid measure, that is it measures what it claims to measure. The present subscale structure is not strongly supported by empirical evidence. Therefore the DHI in its present form may not be a valid measure of the handicapping effects of dizziness. The issue of the validity of the subscale structure is also important since it was applied in this present study to demonstrate the construct validity of the FLP as a measure of quality of life for dizzy individuals. Therefore, the structure of the DHI was re-evaluated by factor analysis on data obtained in the present study.

7.6.1 Factor analysis of the item content of the DHI

7.6.1.1 Factor extraction

Principal component analysis with varimax rotation was carried out on item responses obtained from the 342 completed DHI questionnaires in the clinic dizzy sample. The Scree plot indicated the extraction of three factors for the initial solution. This enabled direct comparison with the current three-subscale structure of the DHI and a three-factor solution reported in the literature identified using oblique rotation (Asmundson *et al.,* 1999). In this present study, orthogonal rotation was performed on the initial factor solution to simplify the interpretation of the factors.

The extracted three-factor solution accounted for 49.8% of the variance in the original data. The rotated solution and factor loadings are presented in Table 7.6. All items loaded onto a factor with a loading greater than 0.4.

Item and description		Factor 1	Factor 2	Factor 3
F3	Restrict travel	**0.73**	0.28	0.06
E23	Depressed	**0.72**	0.12	0.14
E2	Frustrated	**0.69**	0.20	0.08
E18	Concentration	**0.67**	0.22	0.14
F6	Social activities	**0.67**	0.33	0.10
E22	Stressed relationships	**0.62**	0.19	0.53
F24	Job/house responsibilities	**0.62**	0.29	0.27
E21	Feeling handicapped	**0.60**	0.36	0.14
F7	Reading	**0.52**	0.14	0.22
F14	Strenuous housework	**0.49**	0.32	0.45
E20	Afraid of being home alone	**0.48**	0.17	0.08
P8	Sports, dancing, household chores	**0.44**	0.34	0.33
E15	Afraid of appearing drunk	0.19	**0.71**	0.02
P17	Walking along pavement	0.32	**0.68**	0.00
F16	Walking by yourself	0.44	**0.67**	0.05
E10	Embarrassed in front of others	0.21	**0.62**	0.04
E9	Afraid to leave home alone	0.48	**0.55**	0.02
F12	Avoid heights	0.10	**0.53**	0.30
P4	Walking down shop aisle	0.40	**0.50**	0.07
F19	Walking in house in dark	0.35	**0.49**	0.20
P13	Turning over in bed	0.08	-0.16	**0.74**
P11	Quick head movements	0.09	0.25	**0.73**
P1	Looking up	0.09	0.12	**0.72**
P25	Bending over	0.15	0.33	**0.65**
F5	Getting in/out of bed	0.21	-0.09	**0.63**

Table 7.6: Three-factor solution using principal component analysis with Varimax rotation (N=342).

The factor structure presented in Table 7.6 is markedly different to that proposed in the original DHI and does not support the subscale structure proposed by Jacobson and Newman (1990). Items from the original subscales, indicated in the table by P, F and E are distributed across the new factor structure. Although the multidimensional construct of handicap is maintained, the structure of this and the interpretation of the factors is very different to the original arbitrary structure of the DHI.

The new structure is very similar to that previously found by Asmundson *et al.* (1999). Table 7.7 compares the item content of the three extracted factors. Note that the second and third factors are in reverse order in this study compared with that reported in Asmundson *et al.* (1999).

Item and description		Factor 1		Factor 2		Factor 3	
		Present	A *et al.*	Present	A *et al.*	Present	A *et al.*
F3	Restrict travel	x					x
E23	Depressed	x	x				
E2	Frustrated	x	x				
E18	Concentration	x	x				
F6	Social activities	x	x				
E22	Stressed relationships	x	x				
F24	Job/house responsibilities	x	x				
E21	Feeling handicapped	x	x				
F7	Reading	x	x				
F14	Strenuous housework	x	x				
E20	Afraid of being home alone	x					x
P8	Sports,dancing,household chores	x	x				
E15	Afraid of appearing drunk			x			x
P17	Walking along pavement			x			x
F16	Walking by yourself			x			x
E10	Embarrassed in front of others			x			x
E9	Afraid to leave home alone			x			x
F12	Avoid heights			x			x
P4	Walking down shop aisle			x			x
F19	Walking in house in dark		x	x			
P13	Turning over in bed				x	x	
P11	Quick head movements		x			x	
P1	Looking up		x			x	
P25	Bending over		x			x	
F5	Getting in/out of bed				x	x	

Table 7.7: Comparison of the factor structure for the present study (Present) (N=342) with Asmundson *et al.* (1999) (A *et al.*) (N=95).

The main difference between the two solutions is the larger number of items in the third factor in the present study compared with the corresponding second factor in Asmundson *et al.* (1999). The additional items falling into this factor link well with the original content

of the factor from Asmundson *et al.* (1999). The new items in this factor are from the original physical subscale and are concerned with postural movements that can cause an increase in dizziness. For the model proposed by Asmundson *et al.* (1999), these items had contributed to factor one which had been interpreted as 'Difficulties in Activities in Daily Living (ADL)'. Since the change in item content resulted from a more powerful analysis due to larger subject numbers, the difference can be assumed to improve the strength of the structure.

7.6.1.2 Factor interpretation

Interpretation of the solution published by Asmundson *et al.* (1999) was of factors assessing Disability in ADL (Factor 1), Postural Difficulties (Factor 2) and Phobic Avoidance (Factor 3). Improvements to these interpretations can be made due to the refinement in the item content of the factors from the increased power of the present analysis. Factor 1 mainly considers home-based activities or activities that are routine and therefore familiar to the responder. This is in contrast to Factor 2 in this present solution, which can be interpreted as being more specific than simply phobic avoidance. The factor resembles agoraphobia in that it is concerned with activities away from the home. This consideration of phobic behaviour is important for the dizzy individual because of the relationship between dizziness and panic (Asmundson *et al.*, 1999). The interpretation of the third factor as assessing postural difficulties is strengthened by the inclusion of the additional items. The interpretations of the two solutions are summarised in Table 7.8.

Extracted factor	Interpretation	
	Asmundson *et al.* (1999)	Present study (2000)
Factor 1	Difficulties in ADL	Restriction of familiar activities
Factor 2	Postural difficulties	Agoraphobia
Factor 3	Phobic avoidance	Postural difficulties

Table 7.8: Interpretation of the factor structure.

7.6.1.3 Discussion

The existing *a priori* subscale structure of the DHI in terms of physical, functional and emotional handicap (Jacobson and Newman, 1990) is not supported by the results of this

survey. From re-evaluation of the subscale structure, a revised structure is proposed which is a refinement of a similar structure proposed by Asmundson *et al.* (1999).

The majority of items assessed limitations at the personal and home environment level. Although the second factor assesses agoraphobia, this does not describe all items contributing to the factor. The third factor is interpreted as assessing postural difficulties. The term postural perhaps more appropriately describes the item content of the original physical subscale because of the specific dizziness provoking activities included in this subscale.

Despite the results of the data-driven examination of the factor structure of the DHI, concerns about the DHI as a measure of the limitations experienced by dizzy individuals still remain. These centre on the assumption within the items that activities are still carried out despite the dizziness. The new structure still fails to include the restriction and modification of activities because of the dizziness.

7.7 CONCLUSIONS

The reliability (internal consistency) and repeatability over a one-month test-retest period of the DHI have been shown to be adequate. Although there are high correlations between replication scores, the large within-subject standard deviations in score changes mean that the questionnaire is only reliable for monitoring group changes over time and not individual changes. This does not affect its application in the current survey but means that it is of less value to the clinical management of individual patients.

Support for the validity of the subscale structure of the DHI is not conclusive. A revised factor structure consisting of three factors has been found that agrees with previous published findings (Asmundson *et al.,* 1999). Refinement of this previous structure based on the current survey has led to a three-subscale structure of restriction of familiar activities, agoraphobia and postural difficulties. Despite the original proposal for an emotional subscale (Jacobson and Newman, 1990), both the current revised structure and that proposed by Asmundson *et al.* (1999) do not identify social or psychological aspects

within the intrinsic structure of the DHI. As reviewed in Section 2.3, such aspects have been shown by Yardley and colleagues to be important in the consequences of dizziness.

Further discussion of the relevance of these conclusions for the aims of this part of the study and the overall aims of the work is found in Section 9.0

8.0 PSYCHOMETRIC PROPERTIES OF THE FUNCTIONAL LIMITATIONS PROFILE

The Functional Limitations Profile (FLP) was applied in the current survey to quantify and characterise the limitations in quality of life reported by dizzy individuals. The questionnaire has not previously been applied to dizzy individuals. Although the Swedish version of the original Sickness Impact Profile has been used for dizzy individuals in a recent study (Mendel *et al.,* 1999), the psychometric properties of the questionnaire were not assessed.

It is important to assess the psychometric properties of the FLP to establish whether the questionnaire is a reliable, valid and appropriate measure of the quality of life of dizzy individuals. The psychometric properties of the FLP were established for the clinic dizzy sample. The statistical methods applied to assess these are reviewed in Appendix 6.

8.1 INTERNAL CONSISTENCY

Internal consistency of the FLP dimensions and categories was assessed using Cronbach's alpha, the values of which are shown in Table 8.1. Higher values of Cronbach's alpha indicate higher internal consistency. All dimensions and categories except sleep and rest, eating and work have a Cronbach's alpha greater than 0.7; this criterion has been recommended for questionnaires that are to be used to assess changes in status over time (Ware *et al.,* 1998).

The highest reliability was found for the physical dimension. This is not surprising since many of the activities relevant to the dizzy individual in this dimension are related in terms of the level of functioning required to carry out the activities rather than the activities themselves. This link between physical activities recurs throughout the analysis of the FLP and the development of the model and questionnaire presented later in Part III.

The psychosocial dimension contains categories that consider very different psychological and social functions. This means that the reliability of this dimension is reduced compared with the physical dimension.

FLP Scale	Number of Items	Cronbach's Alpha
Ambulation	12	0.75
Body care & movement	23	0.82
Mobility	10	0.75
Household management	10	0.82
Physical dimension	55	0.94
Recreation & pastimes	8	0.71
Social interaction	20	0.85
Emotion	9	0.75
Alertness	10	0.84
Sleep & rest	7	0.54
Psychosocial dimension	54	0.93
Eating	9	0.25
Communication	9	0.71
Work	9	-0.08
FLP overall score	136	0.93

Table 8.1: Cronbach's alpha values for the FLP questionnaire and its dimensions and categories (N=405).

Reliability was lower at the category level although it was still good for all categories contributing to the dimensions except for the Sleep and Rest category of the psychosocial dimension. The independent categories of eating and work also had poor reliability. The poor reliability of these three categories is likely to be due to the relevance of only a small number of items to the dizzy individuals.

From the results presented here, the reliability of the FLP and its physical and psychosocial dimensions was high. The reliability at the category level was generally lower than that at the dimension level although it was still generally good for those categories contributing to the dimensions.

8.2 TEST-RETEST REPEATABILITY

8.2.1 Return rate

Analysis for the study of the repeatability of the FLP was carried out for the 87 responders in the clinic dizzy sample who returned the questionnaire for a second time after one month. The return rate for the study was 51%.

8.2.2 Demographics

The mean age of responders was 53.6 years (95% CI: 50.4, 56.5 years; SD: 14.3 years). Comparison between this and the mean age of responders for the main survey (mean age 52.5 years; 95% CI: 51.2, 53.9 years; SD: 13.6 years) showed no significant difference. As for the main survey, men (mean age 59.3 years; 95% CI: 54.5, 64.1; SD: 12.3 years) were significantly older than women (mean age 50.7 years; 95% CI: 47.0, 50.8; SD: 14.4 years). The ratio of men (32%) to women (68%) was identical to that for the main survey.

8.2.3 Repeatability statistics

8.2.3.1 Difference scores

The Komogorov-Smirnov statistic showed the FLP difference scores between time 1 and time 2 could be assumed to be normally distributed. The mean and standard deviations for changes in scores between time 1 and time 2 for the overall questionnaire, dimensions and categories are shown in Table 8.2. Score changes are presented as percentages of the possible maximum score, which are shown in brackets. Score changes are also presented for a subgroup of those taking part in the repeatability study whose symptom severity rating for today did not change between time 1 and time 2. Changes in score were calculated as the percentage score at time 1 minus the percentage score at time 2. A negative mean change indicates a decrease in quality of life at time 2.

There was a large range in the standard deviations of score changes. Standard deviations for change tended to be smaller for the dimensions and overall score than for the categories and smaller for physical categories than for psychosocial categories. Large standard deviations were found in particular for household management, recreation and pastimes, social interaction, alertness and work.

Although the standard deviations for the group with no change in symptom severity tended to be lower compared with the overall group, only the reduction in the standard deviation for the mobility category reached statistical significance[1] ($p<0.05$). The remaining

[1] Significance determined by calculating the F value from the variances and comparing against the F distribution.

statistics to assess repeatability are therefore presented for the larger group of all responders taking part in the repeatability study.

Questionnaire score (maximum possible score)	All responders (N=87)			Responders with no change in symptom severity (N=22)		
	Mean change[2]	SD of change[2]	Spearman	Mean change[2]	SD of change[2]	Spearman
Ambulation (1006)	0.28	7.81	0.86	0.10	5.60	0.93
Body care & movement (1927)	-0.29	6.10	0.80	0.02	6.42	0.92
Mobility (727)	0.81	7.20	0.80	1.03	4.06	0.78
Household management (695)[3]	0.78	12.99	0.84	2.35	11.31	0.91
Physical dimension (4355)	0.20	5.73	0.89	0.56	4.47	0.89
Recreation & pastime (383)	1.88	16.50	0.76	2.69	16.13	0.86
Social interaction (1289)	1.96	10.00	0.74	3.30	9.02	0.82
Emotion (693)	-0.01	9.54	0.83	-1.88	10.30	0.83
Alertness (711)	3.68	17.02	0.76	5.94	11.16	0.83
Sleep and rest (591)	2.01	9.84	0.82	1.54	8.42	0.88
Psychosocial dimension (3667)	1.92	7.80	0.84	2.49	5.61	0.89
Eating (706)	0.40	2.82	0.67	0.19	2.50	0.57
Communication (685)	-0.67	6.28	0.65	-2.80	5.29	0.65
Work (520)	1.62	15.99	0.66	-1.68	11.37	0.70
Overall score (9923)	0.90	4.77	0.90	0.86	3.53	0.90

Table 8.2: Test-retest repeatability statistics for the FLP.

Significant differences[4] in the distributions of the quality of life scores for the whole sample between replications were found for the psychosocial dimension and the alertness category ($p<0.01$).

Correlations between scores at time 1 and time 2 are also presented in Table 8.2 for both groups of responders. Greater correlations between time 1 and time 2 were generally found for the group of responders with no change in symptom severity between replications.

8.2.3.2 Agreement between replications

Illustration of the level of agreement between the measurements on the FLP at time 1 and time 2 is found in the Bland-Altman plots in Figure 8.1. The difference between test and

[2] Score change presented as the percentage of the maximum possible score

[3] Maximum household management score reported to be 685 and for the physical dimension as 4345 (Patrick, 1989). Summation of the individual item weights is equal to 695 for the household management category. Corrected item weight summations used here for these scores. Reported overall item weight kept as 9923.

[4] p value adjusted to 0.01 for significance at the 5% level for multiple comparisons (see Appendix 6)

retest percentage scores are plotted against the average of the test and retest percentage scores for each subject.

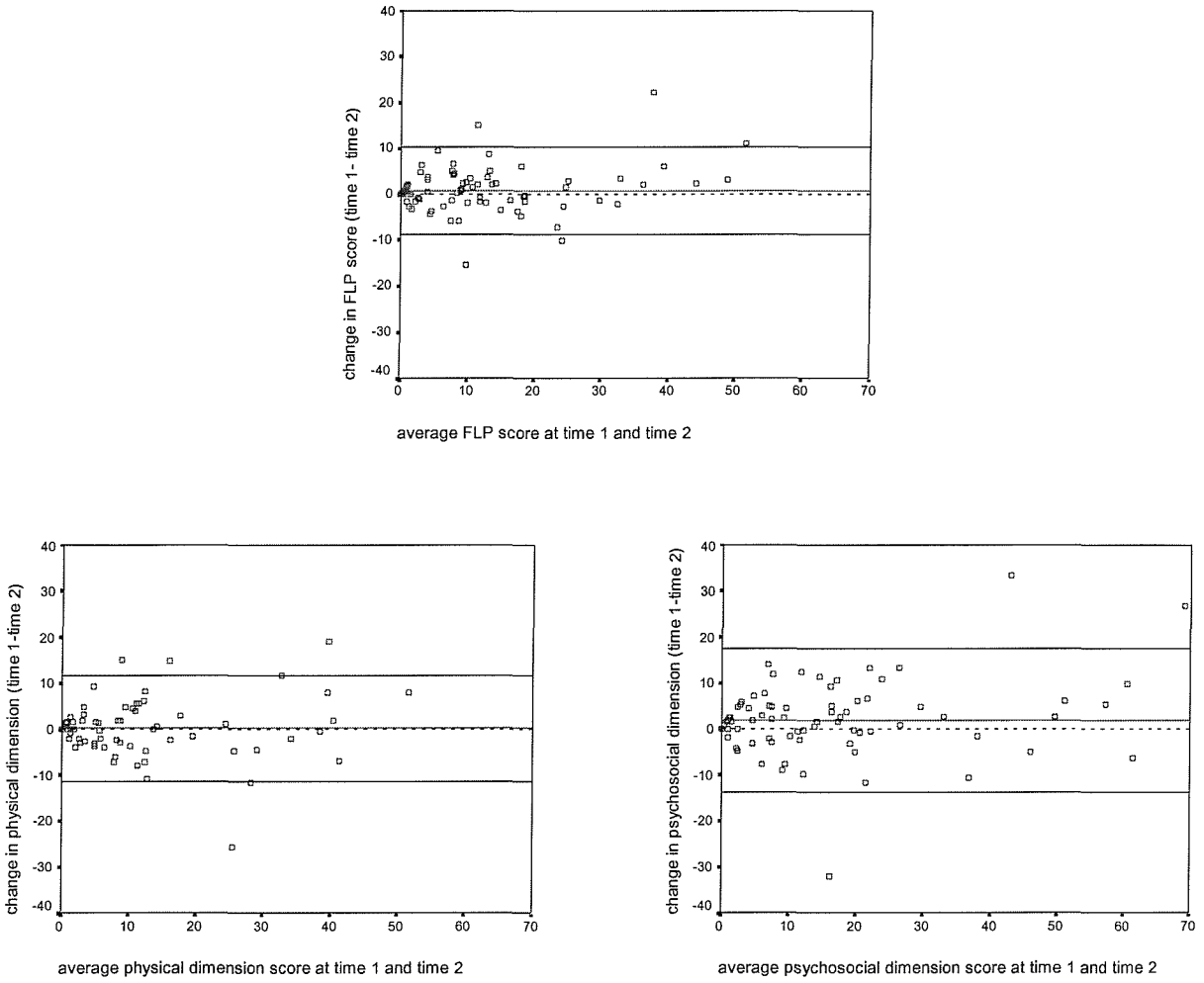


Figure 8.1: Bland-Altman plots to illustrate the repeatability of the FLP and its dimensions (N=87).

There is a concentration of questionnaire scores around zero at both time 1 and time 2 for which the changes in scores between time 1 and time 2 are small. For scores greater than zero, the spread of the changes in score is similar across all average scores on the FLP and its dimensions.

8.2.3.3 Conclusion

The FLP has been shown to have good internal reliability. The high correlations between replication scores over a one-month period are similar to previous findings on different

patient groups. The standard deviations of the score changes over this period, however, are large.

The high correlations between the FLP scores over the one-month test-retest period mean that individuals are consistently placed in relation to the broad spread amongst individuals. However the large spread of score changes within individuals means that the questionnaire is not reliable for monitoring changes in individuals over time. This perhaps should be expected as a natural consequence of the generic nature of the questionnaire. This distinction has not been previously made when assessing the test-retest repeatability of the FLP questionnaire.

8.3 FLOOR AND CEILING EFFECTS

The floor and ceiling effects for the FLP questionnaire and its categories and dimensions were examined.

FLP Scale	% floor [a]	% ceiling [b]	Range (%)
Ambulation	44.7	0	0 - 81.81
Body care & movement	48.4	0	0 - 55.84
Mobility	70.9	0	0 - 77.72
Household management	46.4	0.2	0 - 100.00
Physical dimension	29.1	0	0 - 68.75
Recreation & pastimes	40.5	0.5	0 - 100.00
Social interaction	34.8	0	0 - 94.18
Emotion	49.6	0	0 - 79.65
Alertness	46.2	1.2	0 - 100.00
Sleep & rest	41.2	0	0 - 87.82
Psychosocial dimension	17.8	0	0 - 82.49
Eating	76.5	0	0 - 21.10
Communication	70.9	0	0 - 81.46
Work	59.8	0	0 - 48.60
FLP overall score	13.1	0	0 - 58.80

[a] percent of responders scoring zero indicating no impact on quality of life
[b] percent of responders scoring 100% indicating worst possible impact on quality of life

Table 8.3: Floor and ceiling effects and ranges of scores for the FLP and its dimensions and categories (N=405)

The percentages of responders scoring 0% (floor effects) and 100% (ceiling effects) are shown in Table 8.3. Floor effects relate to those who indicate no impact on quality of life;

ceiling effects relate to those who indicate the worst possible impact on quality of life. The ranges of scores on the questionnaire are also shown.

8.3.1 Floor effects

The percentage of responders scoring zero was high for the categories of the FLP but was lower for the dimensions. Only 13% scored zero for the overall questionnaire. The categories that were relevant to the least number of dizzy individuals were mobility, eating and communication for which over 70% of responders scored zero.

Despite the substantial floor effects for the categories, the range of scores was large with the majority of maximum scores over 70%. Since the FLP is a generic questionnaire, this means that certain individuals in the clinic dizzy sample were reporting considerable reduction in quality of life.

8.3.2 Ceiling Effects

The structure of the FLP and its items means that the endorsement of certain items prevents the responder from endorsing others in that category. This issue is particular true for the physical dimension categories and also for the categories of recreation and pastimes and social interaction. For example, endorsing an item concerned with an activity that is no longer carried out means that the item concerned with carrying out that activity less often cannot also be endorsed. For categories containing such items, it is theoretically not possible to score 100% and no ceiling effects should be expected. Contrary to this, one and two responders for household management and recreation and pastimes respectively have scored the maximum 100%.

The alertness category demonstrated the greatest ceiling effect with 5 responders scoring 100%. The distribution of scores in this category perhaps reflects the extent to which alertness is affected for dizzy individuals.

8.4 VALIDITY

Both content and construct validity of the FLP were examined.

8.4.1 Content validity

Correlations between the category and dimension scores of the FLP using the Spearman Rank Order Correlation Coefficient to assess the content validity of the FLP are shown in Table 8.4. Strongest correlations were expected between categories and the dimension to which they belonged. The correlation coefficients shown in bold indicate the strongest relationship between a category and dimension.

FLP Category	FLP Dimension	
	Physical dimension	Psychosocial dimension
Ambulation	**0.87**	0.51
Body care and movement	**0.85**	0.60
Mobility	**0.69**	0.54
Household management	**0.87**	0.63
Recreation & pastime	0.65	**0.76**
Social interaction	0.62	**0.88**
Emotion	0.55	**0.80**
Alertness	0.79	**0.81**
Sleep and rest	0.56	**0.75**
Eating	0.39	0.40
Communication	0.44	0.52
Work	0.48	0.49

Table 8.4: Spearman rank-order correlation coefficients between the category and dimension scores (N=405).

As expected, scores for each category correlate most strongly to the dimension to which they belong within the structure of the FLP. The alertness category is similarly highly correlated with both the physical and psychosocial dimensions although the strongest correlation is with the psychosocial dimension to which it contributes. The independent categories of eating, communication and work are correlated poorly with both dimensions.

8.4.2 Construct Validity

As the current questionnaire of choice for the assessment of the effects of dizziness, the DHI both in its original and revised subscale form was used to assess the construct validity of the FLP. Construct validity was measured in terms of convergent and discriminant validity. Convergent validity is the existence of a relationship with a related measure;

discriminant validity is the absence of a correlation between variables that should not be related.

The FLP is a generic questionnaire that considers a wide range of functioning, aspects of which are not necessarily affected for the typical dizzy individual. In addition, dizzy individuals may interpret areas of functioning included in the FLP in a different way to their meaning in the generic FLP.

It was therefore not sufficient to simply propose a pattern of correlations based on the labels of the DHI subscales and FLP categories. Relationships were hypothesised based on the item content of the subscales and categories.

8.4.2.1 Proposed correlations between the FLP and the DHI

The hypothesised correlations assume that the report of dizziness for activities in items of the DHI limits the ability to carry out related activities in items on the FLP. They do not take into account the situation where the individual may not report dizziness for an activity on the DHI because they have limited this activity, which would be registered on the FLP.

Magnitudes of correlations were not expected to be high since the questionnaires assessed somewhat differing activities and constructs. Poor correlations have also been found between the dimensions of the SF-36 and the DHI subscale and overall scores (Fielder *et al.*, 1996; Enloe and Shields, 1997).

The directions of the correlations between DHI items and FLP categories relative to each other are proposed and these are summarised in Table 8.5. Correlations could not be proposed for all DHI items. Construct validity is assessed in terms of the observed compared with the proposed relationships between the FLP and the scores on the DHI for both the original subscale and the revised subscale structure. The location of each DHI item in the two structures is shown in the table although the items are presented according to the original subscale structure.

It was difficult to propose how categories of the FLP were related to the original DHI physical subscale and revised postural difficulties subscale items as these were concerned with specific movements to bring on dizziness rather than general activities of daily living.

Such movements could be involved in the majority of activities considered by the FLP. It was therefore anticipated that all scores on the FLP would be correlated poorly with the DHI physical subscale and revised postural difficulties subscale.

Original DHI	Revised DHI	DHI Item	FLP Category
P1	Postural difficulties	Does looking up increase your problem	
P4	Agoraphobia	Does walking down the aisle of a supermarket increase your problem	Household management
P8	Restriction of familiar activities	Does performing more ambitious activities like sports, dancing, and household chores such as sweeping or putting dishes away increase your problem	Recreation & pastime Household management
P11	Postural difficulties	Do quick movements of your head increase your problem	
P13	Postural difficulties	Does turning over in bed increase your problem	
P17	Agoraphobia	Does walking down a road increase your problem	
P25	Postural difficulties	Does bending over increase your problem	
F3	Restriction of familiar activities	Because of your problem do you restrict your travel for business or pleasure	Ambulation Mobility Recreation & pastime Social Interaction
F5	Postural difficulties	Because of your problem do you have difficulty getting into or out of bed	Body care & movement
F6	Restriction of familiar activities	Does your problem significantly restrict your participation in social activities such as going out to dinner, movies, dancing or parties	Recreation & pastime Social Interaction
F7	Restriction of familiar activities	Because of your problem do you have difficulty reading	Recreation & pastime Alertness
F12	Agoraphobia	Because of your problem do you avoid heights	
F14	Restriction of familiar activities	Because of your problem is it difficult for you to do strenuous housework or gardening	Household management
F16	Agoraphobia	Because of your problem is it difficult for you to go for a walk by yourself	Ambulation
F19	Agoraphobia	Because of your problem is it difficult to walk around your home in the dark	Mobility
F24	Restriction of familiar activities	Does your problem interfere with your job or household responsibilities	Household management Work
E2	Restriction of familiar activities	Because of your problem do you feel frustrated	Emotion Alertness
E9	Agoraphobia	Because of your problem are you afraid to leave your home without having someone accompany you	Mobility Ambulation Recreation and pastimes Social interaction
E10	Agoraphobia	Because of your problem have you been embarrassed in front of others	Emotion
E15	Agoraphobia	Because of your problem are you afraid people may thing you are intoxicated	Social interaction Emotion
E18	Restriction of familiar activities	Because of your problem is it difficult to concentrate	Alertness
E20	Restriction of familiar activities	Because of your problem are you afraid to stay home alone	
E21	Restriction of familiar activities	Because of your problem do you feel handicapped	

Original DHI	Revised DHI	DHI Item	FLP Category
E22	Restriction of familiar activities	Has your problem placed stress on your relationship with members of your family and friends	Social interaction Emotion
E23	Restriction of familiar activities	Because of your problem are you depressed	Emotion Alertness Sleep and rest

Table 8.5: Proposed relationships between the DHI and FLP.

The proposed relationships are discussed below according to the FLP dimensions and categories.

Physical dimension and its categories

The categories of ambulation, body care and movement, mobility and household management predominantly consider activities included within the items of the DHI functional subscale. It was therefore proposed that these FLP categories and the physical dimension formed from these categories correlate most strongly with the functional subscale. From the item content of the DHI physical subscale, the weakest correlation for the FLP physical dimension and its categories was proposed to be with this DHI subscale.

For the revised structure of the DHI, the physical dimension categories were proposed to be similarly related to both the restriction of familiar activities and agoraphobia subscales and least correlated with the postural difficulties subscale.

Psychosocial dimension and its categories

The recreation and pastimes category was concerned with activities included predominantly within the functional subscale but also the emotional subscale to a lesser extent. This category was therefore proposed to be most strongly correlated with the functional subscale and least correlated with the physical subscale. Social interaction, emotion and alertness mainly related to items within the emotional subscale and least related to items of the physical subscale.

It was difficult to determine to which subscale the sleep and rest category would be related, as it was possible that it could be correlated to all three subscales. Items involving resting during the day could be most strongly correlated with the functional subscale. However interruptions with sleep could be related to the physical subscale because of

dizziness brought on when lying down or to the emotional subscale because of the effect of stress on energy and sleep.

Based on the majority of proposed correlations for the psychosocial dimension and its categories, the proposal was made for the dimension to correlate most strongly to the emotional subscale and the least to the physical subscale from the original DHI.

In the revised structure of the DHI, the absence of a social or psychological subscale makes it difficult to propose relationships with the FLP psychosocial dimension and its categories. However from Table 8.5, the FLP psychosocial categories and dimension are proposed to be mainly related to the restriction of familiar activities subscale. The least correlation was proposed with the postural difficulties subscale.

Eating, communication and work categories

No items of the DHI directly considered activities of eating or communication. There may be a possible effect of stress or nausea, which are included in the DHI on appetite. Stress is also important for certain items in the FLP communication category, which may be relevant to dizzy individuals. Therefore the strongest correlations for the FLP categories of eating and communication were proposed to be with the emotional subscale and the least with the physical subscale.

Work was considered within the functional subscale of the DHI and therefore it was proposed that the strongest correlation for the work category would be with the functional subscale and the least with the physical.

For the revised subscale structure, it was proposed that none of the subscales related strongly with these FLP categories apart from the work category that could be related to the restriction of familiar activities subscale.

8.4.2.2 Observed correlations between the FLP and DHI

The observed correlations (Spearman Rank-Order Correlation Coefficient) between the FLP categories and the subscales of the original and revised DHI can be seen in Table 8.6. The coefficients in bold represent the strongest correlations. Since the scores for the two

questionnaires are measuring different concepts, as expected the magnitudes of the correlations are not high although all correlations are significant at the 5% level.

	Original DHI subscales			Revised DHI subscales		
	Physical	Functional	Emotional	Intrinsic limitations	Agora-phobia	Postural difficulties
Ambulation	0.43	**0.49**	0.41	0.44	**0.49**	0.28
Body care & movement	0.47	**0.49**	0.46	**0.47**	0.46	0.36
Mobility	0.36	**0.48**	0.44	0.46	**0.54**	0.19
Household management	0.44	**0.61**	0.54	**0.59**	0.54	0.31
Recreation & pastimes	0.39	**0.54**	0.51	**0.55**	0.51	0.23
Social interaction	0.45	0.56	**0.63**	0.63	0.51	0.29
Emotion	0.37	0.45	**0.54**	**0.51**	0.42	0.24
Alertness	0.37	0.42	**0.51**	0.46	**0.47**	0.22
Sleep & rest	0.28	**0.39**	**0.39**	**0.41**	0.39	0.20
Eating	0.15	**0.25**	**0.25**	0.25	0.29	0.11
Communication	0.25	0.29	**0.38**	**0.35**	0.34	0.14
Work	0.30	**0.40**	0.36	**0.41**	0.34	0.23
Physical dimension	0.52	**0.62**	0.56	**0.59**	**0.59**	0.35
Psychosocial dimension	0.45	0.56	**0.62**	**0.60**	0.54	0.28

Table 8.6: Correlations between the FLP and DHI as measured by Spearman rank-order correlation coefficient (N=342).

Validity of the FLP against the original DHI

As anticipated the correlations between the physical subscale of the DHI and categories of the FLP were low with no correlation greater than 0.45. This includes those FLP categories from the physical dimension. This shows that the physical subscale of the DHI measures a very different concept to that measured by the physical dimension of the FLP and its categories. There were also minimal differences in the magnitudes of the correlations between the FLP categories of the physical dimension and the three DHI subscales.

For all categories of the FLP, the correlations were in the proposed directions as described above. Sleep and rest and eating were equally correlated to both the functional and emotional subscales, which had been proposed above. All categories apart from body care and movement and ambulation demonstrated the lowest correlation with the physical subscale as hypothesised. These correlations were only marginally higher than with other subscale scores.

Validity of the FLP against the revised DHI

For the revised subscale structure of the DHI, there is little difference in many cases between the magnitudes of the correlations for the restriction of familiar activities and agoraphobia subscales with the FLP. This is true for both the physical and psychosocial dimension categories, but particularly for the physical dimension. The observed correlations reflect the proposed correlations for these two dimensions.

As expected the correlations with the FLP eating and communication categories were low. The work category correlated strongest with the intrinsic limitations subscale. In all cases, the correlations of the FLP categories and dimensions that consider functioning and activities with the postural difficulties subscale were small.

The agreement between the proposed and observed correlations between the FLP dimensions and its categories and both the original and revised DHI are interpreted as supporting the convergent and discriminant validity of the FLP for dizzy individuals.

8.5 CONCLUSIONS

The psychometric properties of reliability, test-retest repeatability and validity for the FLP when applied to dizzy individuals in a clinic population have been assessed. These properties have been shown to be adequate for the questionnaire as a measure of the quality of life of dizzy individuals. Although a reliable and valid questionnaire it is unlikely to be applicable to monitor changes in individuals over time in its present form due to the large spread of changes observed over a one-month period unless those changes are large. This is in common with the DHI and does not affect its application in the current survey to assess the limitations reported by dizzy individuals.

Further discussion of these conclusions is presented alongside those for the DHI in the following section in the context of the aims of the study.

9.0 CONCLUSIONS

The aim of the first part of the study was to establish the psychometric properties of the two principal questionnaires applied, the Dizziness Handicap Inventory and the Functional Limitations Profile. These would then be used in the remaining two parts of the study. In addition, it was intended to take this opportunity to re-evaluate the factor structure of the Dizziness Handicap Inventory given the doubt cast on the original structure by Asmundson *et al.* (1999).

Although the psychometric properties of the Dizziness Handicap Inventory (DHI) have been reported previously, the methods adopted to assess these properties have been limited in terms of types of validity investigated, sample size, representativeness and timescale of assessment. In the current study, these limitations have been addressed and the DHI is shown here to be a reliable overall measure of the associated effects and presumed consequences of dizziness. Although there is some general support for the validity of the original subscale structure, factor analysis identified limitations in the structure and revised subscales for the DHI have been proposed based on the underlying factor structure of the DHI. Despite this refined data-driven structure, there are still shortcomings associated with the item content of the questionnaire, the emphasis of the items towards postural difficulties, and the assumption that activities are carried out despite the presence of dizziness. These shortcomings are discussed in greater detail within the context of the responses obtained on the DHI in the survey described in Section 13.0.

The Functional Limitations Profile (FLP) has not previously been applied to dizzy individuals. The current study suggests that the questionnaire is a reliable and valid measure of the quality of life of dizzy individuals. Dizzy individuals are known to restrict their activities either because of the dizziness or because of the fear and emotions that arise because of the dizziness (see Section 2.3 for a review). The theoretical model of the quality of life of dizzy individuals (see Section 4.0) proposes that dizziness causes a restriction in the functioning of the individual in certain aspects of lifestyle and hence reduces quality of life. The FLP is a behaviour-based questionnaire. This means that these modifications in behaviour and restrictions and limitations in lifestyle reported by dizzy individuals can potentially be quantified from responses on the FLP.

There are two approaches to the assessment of health problems: behaviour-based and perceptual. The behaviour-based approach provides an objective measure of the limitations experienced and the quality of life of a health care group. This however has the disadvantage of not assessing directly the emotion and feelings that can arise. Although the alternative perceptual approach assesses these emotions and feelings, this involves subjective judgements, which are considered to be less reliable than descriptions of behaviour patterns. It is however reasonable to accept that the behaviours can be influenced by emotions and feelings and that the behaviour-based approach indirectly assesses these psychological states. On balance, the behaviour-based approach adopted by the FLP was chosen to assess the quality of life of dizzy individuals. Nonetheless, its limited ability to tap emotions and feelings must be borne in mind when interpreting the results of the present study.

A shortcoming common to both questionnaires is their inability to assess small changes in state, which limits their clinical application to monitoring individual patient changes over time. The reliability can only be considered to be adequate to assess group changes over time. This distinction between the reliability to monitor individuals and to compare groups has not been previously highlighted and yet is important if the questionnaires are used to assess the effectiveness of individual patient management.

Despite these shortcomings, the commonly applied DHI and the newly applied FLP appear to be adequately reliable and valid for dizzy individuals. Therefore, on balance, both the DHI and FLP are appropriate measures of the restrictions and limitations reported by dizzy individuals in the current study.

PART II

QUESTIONNAIRE SURVEYS OF CLINIC AND GENERAL POPULATION SAMPLES OF DIZZY INDIVIDUALS

10.0 INTRODUCTION

There are two main aims in the second part of the study. The first is to characterise the nature of the dizziness in the two samples and to investigate how they might also differ between the two groups. The second is to assess the handicap and quality of life reported by the dizzy individuals.

Although research has been carried out to assess the consequences of dizziness in clinic populations of dizzy individuals, there is little evidence of the characteristics of dizziness reported. Research into dizziness has generally been carried out within just one clinical department. Surveys of dizziness in a representative sample of dizzy individuals attending for assessment are lacking. There is only limited evidence on the quality of life of dizzy individuals. These studies and their limitations have been reviewed in Section 2.11.

Within the general population, dizziness has been reported by 40% (Davis, 1997). However, the characteristics of this dizziness have not been described and the consequences of the dizziness are not known.

Results of the current questionnaire survey of the symptoms, handicap and quality of life are presented here for clinic and general population samples of dizzy individuals. It is anticipated that dizziness in the clinic population will be more severe than in the general population and that the reported handicap and quality of life will be greater. In this part of the study, the characteristics of the dizziness in the two samples are contrasted. An estimate is also made of the prevalence of dizziness with a material impact on quality of life in the general population. The responses from the survey allow the limitations and restrictions in quality of life to be quantified for typical clinic and general populations and described in each of the dimensions assessed by the FLP questionnaire.

The detailed responses obtained on the quality of life questionnaire will be used in Part III to identify the underlying dimensions of quality of life important for dizzy individuals. These dimensions will be used as the basis of the development of a new questionnaire to assess quality of life of dizzy individuals.

11.0 DESIGN OF SURVEY OF QUALITY OF LIFE OF DIZZY INDIVIDUALS IN CLINIC AND GENERAL POPULATION SAMPLES

Many aspects of the design of the survey of dizzy individuals in clinic and general population samples were similar. This provided consistency in the data collection and minimised any possible bias introduced by differences in methodology and questionnaire administration. The design for both surveys of dizzy individuals is presented here.

11.1 SUBJECTS

11.1.1 Selection criteria in the clinic sample

Dizzy individuals in the clinic population were consecutive adult patients attending for the initial assessment of dizziness within audiology outpatient departments.

Criteria for inclusion were defined as;

- those attending audiology outpatient departments for the initial assessment of dizziness
- dizziness experienced for more than 2 months
- over 18 years of age
- fluent in written English.

An experience of dizziness for more than 2 months was required to reduce the incidence of spontaneous resolution of the dizziness during the survey. The survey was restricted to adult dizzy individuals with a lower age limit of 18 years. It was important that those taking part in the survey were fluent in written English so that the questionnaires were understood. Assessment of an individual's fluency in written English was based only on the judgement of the clinician administering the questionnaires rather than formal assessment. The type or severity of dizziness did not restrict selection into the survey.

As has been discussed previously in Section 3.3, the dizzy individuals in the clinic population are by definition self-selecting since they have sought help for their dizziness. In addition, since the individuals are attending audiology outpatient departments, there

must have been selection of patients appropriate for audiological assessment. Bias may therefore be introduced into the sample. The bias introduced may not be the same across the centres depending on the approach for the management of this patient group. The proportion of 'psychological' versus 'pathological' dizziness may therefore differ across centres. No assumptions are made as to the distribution of the nature of the dizziness at the test centres.

The dizzy individuals surveyed in the clinic dizzy sample were considered to be representative of those attending audiology outpatient departments for the initial assessment of dizziness.

11.1.2 Selection criteria in the general population sample

Dizzy individuals in the general population were selected from responders to the Health Technology Assessment (HTA) study of ear, nose and throat problems in the general population within the Southampton postal district.

Individuals were identified from responses on the HTA survey as having a current problem of dizziness, with or without current hearing problems or tinnitus and without nose, throat and voice problems (NT problems) in the last 12 months. Individuals were also required to be over 18 years of age and fluent in written English as for the clinic sample.

Example item from HTA survey	Current Problem	
Nowadays how much does the dizziness or unsteadiness worry, annoy or upset you?	Yes	No
Do not have a problem with dizziness or unsteadiness		x
Not at all annoying	x	
Slightly annoying	x	
Moderately annoying	x	
Severely annoying	x	

Table 11.1: Responses on HTA item to indicate presence or absence of a current problem (x represents the response on the item).

The presence of current ENT problems was based on the responses to the items in the HTA survey concerned with the level of worry, annoyance and upset associated with each

of the ENT problems and dizziness. Responses to indicate the presence or absence of a current problem are represented by an 'x' as shown in Table 11.1.

The items used and the responses required to select individuals for the population dizzy sample are summarised in Table 11.2. The required report of a problem or no problem on the items is shown by the 'x' in the table.

Although there is a difference in the time scale over which the ENT problems and dizziness are considered in the items, using the same style of item allows for consistency in the definition of the presence or absence of the problems.

The item used to identify those experiencing a current problem of dizziness only specifies dizziness and unsteadiness. Other items elsewhere on the HTA questionnaire also include the sensations of lightheadedness and feeling faint. It is assumed that this is unlikely to have an effect on the sample selected since the term dizziness is often used as a general term to encompass the many sensations experienced.

Item	Problem	No problem
Q8 Nowadays how much does any difficulty in hearing worry, annoy or upset you?	x	x
Q13b Nowadays how much do these noises [tinnitus] worry, annoy or upset you when they are at their worst?	x	x
Q15 In the last 12 months, how much have ANY problems with your nose worried, annoyed or upset you?		x
Q18 In the last 12 months, how much has ANY voice problem worried, annoyed or upset you?		x
Q21 In the last 12 months how much has ANY throat problem worried, annoyed or upset you?		x
Q23 Have you ever suffered from dizziness etc. [sic]	x	
Q24 Nowadays how much does the dizziness or unsteadiness worry, annoy or upset you?	x	

Table 11.2: Items and responses from the HTA questionnaire to select individuals for the population dizzy sample (x indicates the required problems to be reported).

11.2 SAMPLE SIZE

11.2.1 Sample size for clinic dizzy sample

Sample size was based primarily on the principal component analysis to be carried out to develop the new questionnaire, the Dizziness Impact Profile. For this analysis, the number of responders should be five times the number of independent variables on which the analysis is to be carried out (Howitt and Cramer, 1999). Using each of the 136 items of the FLP as an independent variable, this indicates that approximately 680 responders would be required for the questionnaire survey.

Principal component analysis identifies underlying variables that explain the pattern of correlations between the original variables, in this case the items of the FLP. Those items that apply to none or all of the responders provide little information about the patient group. Removal of these items would reduce the number of responders required for the analysis to be carried out.

It was possible to estimate prior to data collection those items of the FLP that would not be particularly relevant to dizzy individuals. These items were identified based on responses from a pilot study and knowledge of the group. Of the 136 items of the questionnaire, 59 were proposed to not be particularly relevant to dizzy individuals leaving 77 items to enter the analysis. Based on this estimate for the number of relevant items, 385 subjects were required to complete questionnaires.

The number of items with none or only a few responders were monitored during the survey to ensure that a sufficient number of completed questionnaires would be obtained. There was close agreement between the number of anticipated and actual relevant items for the group.

11.2.2 Sample size for population dizzy sample

Sample size calculation for the population dizzy sample was based on the ability to detect differences in FLP quality of life scores between the clinic and population dizzy samples.

To detect a significant difference ($p<0.05$; 2 tailed) between an assumed FLP overall mean score of 10% (SD: 12%) in the clinic dizzy sample and an assumed mean of 8% (SD: 8%) for the population dizzy sample at a power of 80% would require a population dizzy sample size of 78. Assumed mean score for the clinic dizzy sample was based on the score obtained in the pilot study; that for the population dizzy sample was based on the

assumption that quality of life would be affected but to a lesser extent than in the clinic dizzy sample.

Of the original responders to the HTA survey, 425 met the selection criteria outlined in Section 11.1.2 for the population dizzy sample. Concern of a low return rate for this population dizzy sample meant that all responders meeting the criteria for the population dizzy sample were invited to take part in the survey.

11.3 TEST CENTRES

The choice of centres for the survey of the clinic population was made to provide a clinic sample of dizzy individuals that was representative of dizzy individuals within the audiology outpatient setting. The general population sample of dizzy individuals was restricted to those in the Southampton postal district. This section concentrates on the issues concerned with the test centres for the clinic survey.

11.3.1 Participating centres

The clinic survey was carried out in ten audiology outpatient departments in the UK. Centres were recruited in two stages and are shown in Table 11.3.

Stage of survey	Hospital	City
Stage 1	Royal United Hospital	Bath
	Royal South Hants Hospital	Southampton
	ISVR Hearing and Balance Centre	Southampton
	Singleton Hospital	Swansea
	King Edward VII Hospital	Windsor
Stage 2	Royal Infirmary	Aberdeen
	Freeman Hospital	Newcastle
	Queen Alexandra Hospital (Audiology)	Portsmouth
	Queen Alexandra Hospital (Audiological Medicine)	Portsmouth
	Royal Berkshire Hospital	Reading

Table 11.3: Centres recruited in the survey of dizzy individuals in the clinic population. 1

The second set of centres was recruited due to insufficient responses in the early stages of the survey. Recruitment of the second stage centres increased the return rate from an

average of 12 per week to 20 per week, which enabled the required number of questionnaires to be obtained in the period for the survey.

At this return rate, the expected duration of the survey was six months. Fluctuations in the questionnaire administration rate due to staff holiday, organisational changes within departments and the staggered recruitment of centres into the study resulted in the survey lasting 10 months in total from August 1998 to June 1999.

Eight of the ten test centres were Audiology outpatient departments. The exceptions were Portsmouth (Audiological Medicine) and ISVR Hearing and Balance Centre. The ISVR Hearing and Balance Centre is a specialised department based at Southampton University while the Audiological Medicine department is run by an Audiological Physician. The structure and services provided at both these centres means that they tend to attract more complex cases. Referrals to all test centres were predominantly received from ENT.

Centres were recruited based on the involvement of a specialist in vestibular assessment (i.e. an Audiological Scientist except at the Audiological Medicine department at Portsmouth where this person was an Audiological Physician), the number of patients seen and the experience of the staff involved.

Within the constraints of the previous requirements for test centres, centres were also chosen to provide a geographical spread across the UK. There was a tendency for the centres to be located in the South of England. Additional centres were approached including Nottingham and Cambridge but these centres were unable to take part in the study.

11.3.2 Services provided

Five of the centres provided a formal vestibular rehabilitation programme. For Aberdeen, ISVR Hearing and Balance Centre, Newcastle and Reading, the structure of the service meant that individuals could receive their initial assessment at the rehabilitation appointment. At Windsor although there was an established vestibular rehabilitation programme, all patients were assessed initially before entering this programme. During the study, only 16 of the 405 subjects received their initial assessment at a vestibular rehabilitation appointment.

Procedures for vestibular assessment differed between test centres. Certain minor alterations were made to the survey protocol to accommodate these differences while not affecting the validity of the study and results.

At Newcastle and Portsmouth, the majority of patients were tested by individuals with less experience in vestibular assessment and who were unqualified to assign diagnostic categories for each case. Administration of the questionnaire packs was carried out by the tester while a more qualified member of the department, usually an Audiological Scientist would review the test results and history for the patients to assign the appropriate diagnostic category. Although this may affect the ability to comment on factors contributing to the dizziness, the accurate assessment of the diagnostic category was important.

11.3.3 Instructions

Each participating centre was visited prior to recruitment to explain the purposes of the research and instruct those involved in administration of the questionnaires of the protocol. This enabled a standardised data collection method to be adopted at each of the centres to ensure consistency in methodology. Possible differences between centres were identified and appropriate actions to remove any bias from these differences decided upon.

Written guidelines and protocol were provided for all centres and personnel involved. Contact was maintained with the centres mainly by telephone throughout the survey to reinforce the instructions, check for any difficulties and to encourage continued participation in the study. Feedback was also given to the centres about the return rate to encourage continued participation and put improvements or changes in place as necessary.

11.4 ETHICAL APPROVAL

Proposals were made to the Local Research Ethics Committee (LREC) for each clinic test centre to obtain approval for the survey. Proposals were made in writing and by interview

with the committees concerned. The committees responsible for each of the test centres are shown in Table 11.4.

Test centre	LREC
Aberdeen	Grampian Research Ethics Committee
Bath	Bath LREC
Hearing and Balance Centre	University of Southampton ISVR Human Experimentation Safety and Ethics Committee
Newcastle	North Tyneside Health Authority Joint Ethics Committee
Portsmouth (Audiological Medicine) Portsmouth (Audiology)	Portsmouth and South East Hampshire Ethics Committee
Reading	West Berkshire LREC
Southampton	Southampton and South West Hants LREC
Swansea	Swansea LREC
Windsor	East Berkshire LREC

Table 11.4: Local Research Ethics Committees from which ethical approval was obtained.

LREC approval was initially sought and obtained from the first stage centres. Recruitment of the second stage centres meant that approval for the survey was required from the South and West Multi-Centre Research Ethics Committee (MREC) since more than four regions were involved in the survey. Approval was required from this committee before further LRECs could be approached.

In total, ethical approval was required from 10 separate ethics committees. The infrequent meetings and administrative process of applying for ethics approval and the inherent delay meant that the average time between the recruitment of a centre and receiving ethics approval was 2 months. This does not include the additional delay due to obtaining MREC approval, which was also around 2 months.

Ethical approval was granted from all LRECs and the MREC. A number of small changes were made to the documentation provided to patients in the study to meet the requirements of the MREC. These were not considered to affect any scientific aspect of the study. Once these changes were made, all ethical committees involved approved the study.

Initial contact with responders to the original HTA survey by collaborating researchers had previously been approved through the MREC. Further approval was also obtained from the Southampton and South West Hants LREC and the University of Southampton Institute of

Sound and Vibration Research Human Experimentation Safety and Ethics Committee for further work to be carried out with the dizzy individuals in the general population.

11.5 QUESTIONNAIRE PACK

Questionnaire packs were administered to the dizzy individuals in the clinic and general populations. Although there were small differences between the packs and their administration, both samples are discussed here. The questionnaire pack contained information about the research, the questionnaires and a Freepost addressed envelope for the return of the completed questionnaires.

The questionnaire pack was contained within an A5 envelope. For the clinic sample, this was labelled with 'Research Into Balance Problems. Thank you for taking part.' All questionnaires were printed so as to maximise the readability of the print. All questionnaires contained the University of Southampton logo.

The questionnaires were folded and presented so that the first side of the questionnaires was folded outwards and that the information sheet would be the first item seen by the potential responders. The order of questionnaires was symptom questionnaire, DHI and finally the FLP. Questionnaires were coded by the centre and a questionnaire number to link responses to the individuals receiving the packs.

11.5.1 Information sheet

An information sheet was written on ISVR Hearing and Balance Centre, University of Southampton, headed paper. For the population dizzy sample, a header for the Medical Research Council's Institute of Hearing Research was also included to convey the collaborative nature of the work. In this case the information sheet was written on behalf of and signed by the researcher who made the original contact with responders. Copies of the information sheets for the two samples are found in Appendix 7.

The information sheet was designed to encourage participation in the study by providing details about the purpose of the research and what was involved. This was particularly important for the population dizzy sample since it was anticipated that the return rate may

be lower for this group. As much as possible, the style and content of the information sheet was consistent for the two samples of dizzy individuals.

Information about the questionnaires and instructions for their completion and return were also provided. It was felt that the large number of items on the FLP, many of which were not relevant to dizzy individuals, could deter individuals from taking part. It was therefore emphasised in the information sheet that responses were important even if the items were not relevant.

It was made clear that a second questionnaire pack may be received by post. This included questionnaires to follow-up non-responders and questionnaires as part of the repeatability study. A contact name and number was provided for any queries concerning the research.

Assurances were made that the responses would be kept private and confidential. It was made clear that responders were allowed to withdraw from the study at any stage without giving reason and without affecting future treatment received.

11.5.2 Questionnaires

The content of the questionnaire packs for the two samples of dizzy individuals is shown in Table 11.5. The development and selection of these questionnaires is discussed in Section 6.0.

Clinic dizzy sample	Population dizzy sample
Dizzy symptom questionnaire	HTA dizzy symptom questionnaire
Dizziness Handicap Inventory	Dizzy symptom questionnaire
Functional Limitations Profile	Dizziness Handicap Inventory
	Functional Limitations Profile

Table 11.5: Questionnaires included in the questionnaire pack for dizzy individuals.

11.5.3 Completion of the questionnaires

Individuals in the clinic dizzy sample were required to complete the questionnaires at home within a week of the appointment and return them in the enclosed envelope. This time scale was specified to control the return of the questionnaires relative to the appointment and to allow non-responders to be followed-up after a certain length of time.

It was made clear that the questionnaires should not be completed on the same day as the visit to the Audiology centre. This was to avoid any bias on the responses due to an adverse reaction to the vestibular testing. When attending for the assessment of dizziness, patients are routinely requested not to take medication on the day of testing. This may also have an effect on the symptoms experienced on that day and hence bias the responses.

In the population dizzy sample, questionnaires were to be completed as soon as possible. No time scale was specified because of the restriction this imposes on a sample that was anticipated to be less motivated than the clinic dizzy sample to complete the questionnaires.

In both samples, all questionnaires were to be completed on the same day to enable the relationship between the responses on the different questionnaires to be examined. Patients were asked to fill in the date on which they completed the questionnaires. Although this question was positioned at the top of the symptom questionnaire, it was not always completed.

The order in which the questionnaires should be completed was not specified. All questionnaire packs were packed in the same way. However it cannot be assumed that the questionnaires were completed in the same order as they were presented. It cannot be determined whether the order of completion of the questionnaires had an effect on the responses given to the questionnaires. Since each questionnaire considered a distinct aspect of dizziness, it is assumed that the order of completion had no effect on the responses given to the questionnaires.

11.5.4 Administration of the questionnaire pack

The questionnaire pack was given to individuals in the clinic dizzy sample in person at the appointment to maximise the response rate for the questionnaires.

Guidelines for instructions to the dizzy individuals were summarised on the diagnostic questionnaire attached to each questionnaire pack.

Verbal instructions to the patients included the following.

- an explanation of the research

- that the research was being carried out at the University of Southampton
- what the patient needed to do
- that the patient did not have to take part and that if they did not this would not affect any treatment they received in the department in the future
- that a Freepost addressed envelope was provided to return the questionnaires
- that the questionnaires would take around 30 minutes to complete.

Since this was the first contact the patients would have with the research, it was important that a positive view of the research was given to encourage participation. This was emphasised to those administering the questionnaire packs.

Written instructions for completion of the questionnaires were provided for both the clinic and population dizzy samples. Although in the population dizzy sample, questionnaire packs were administered by post, it is assumed that the method of administration of the questionnaires did not affect the completion and responses to the questionnaires in this sample.

Responders in the population dizzy sample were able to indicate that they did not want to be contacted about any further work. This was done with the inclusion of a tick box item at the bottom of the HTA symptom questionnaire.

11.5.5 Diagnostic questionnaire

The specialist completed a diagnostic questionnaire for each individual in the clinic dizzy sample receiving a questionnaire pack. This questionnaire is found in Appendix 8. This questionnaire had two purposes: to provide diagnostic information about the patients and to record contact details for the patients.

Name, address and postcode, date of the assessment and the clinician involved in the appointment was recorded. In the majority of cases, the patient details were provided by the patient's hospital label attached to the questionnaire.

Response categories were defined for all of the questions on the diagnostic questionnaire to enable appropriate data to be obtained to describe the clinic dizzy population. Tick boxes were provided for the response categories to each of the questions so that the questionnaire could be completed quickly in a busy clinic. Although this approach could be considered to restrict some of the information provided by the clinician, the 'Other, please specify' diagnostic category and a comments section allowed clinicians to include any additional information that was considered important.

11.5.5.1 Diagnostic categories

Patients were assigned to diagnostic categories that best described the complaint of dizziness. The categories were defined based on discussions with clinicians taking part in the pilot study and chosen to represent the most common findings from the assessment of dizzy individuals. The diagnostic categories are shown in Table 11.6. The categories were refined to reflect the medical emphasis of appointments within the Audiological Medicine Department in Portsmouth. These were based on discussions with the Audiological Physician involved at this centre.

The defined 'diagnostic' categories consisted of some clinical diagnoses as well as those based primarily on the findings from test results. Diagnostic categories were assigned based on the presenting signs and symptoms.

Diagnostic Categories	Diagnostic categories used in Audiological Medicine Department, Portsmouth
Peripheral asymmetry	Peripheral - compensated
Peripheral, no asymmetry	Peripheral - uncompensated
Meniere's like	Episodic (include. Meniere's, migranous, vestibular neuronitis)
Central	Central
BPPV	BPPV
Positional – other	Positional
NAD. on testing	Cardiovascular
Other, please specify	Cervical
	NAD on testing
	Other, please specify

Table 11.6: Diagnostic categories for dizzy individuals at initial assessment

There were two peripheral categories. The first was for the case where there was no sign of asymmetry in vestibular function as indicated either by a canal paresis or directional

preponderance on caloric testing or from the presence of spontaneous nystagmus. The second was where there were positive findings of asymmetry in vestibular function from these tests.

The category 'Meniere's like' was used by those who presented with the triad of symptoms for this disorder of vertigo and fluctuating tinnitus and hearing loss either with or without a detected asymmetry in vestibular function. Central problems were based on central findings on ocular-motor testing and symptoms.

Benign Paroxysmal Positional Vertigo (BPPV) was diagnosed by a positive[1] positional test appropriate for the semi-circular canal being tested. The diagnosis could apply to involvement of any of the semi-circular canals, although the most common is the posterior semi-circular canal.

The category of positional referred to positional problems other than those due to BPPV. The category of NAD on testing was used for those patients who presented with no signs of a disorder and whose symptoms did not clearly indicate the cause of the dizziness.

The category of other problems that could be specified was included to allow for the report of uncommon problems or those that could not be categorised using the response categories defined on the questionnaire.

The diagnostic categories were clearly explained to the clinicians involved. It was realised that in some cases it was possible that a patient could be assigned to two different categories. For example, Meniere's disease or no abnormality on testing could be used if there was yet to be a vestibular weakness as a result of the Meniere's disease. However it was made clear to the clinicians that diagnostic categories should be assigned based on signs and symptoms and therefore a patient presenting with a clear history of Meniere's like symptoms for whom there was no abnormality on testing would be categorised as 'Meniere's like' rather than 'NAD' or 'peripheral, no asymmetry' . There are also those patients who may present with two vestibular problems such as a peripheral vestibular asymmetry and BPPV. In these cases, clinicians were instructed to identify the primary

[1] That is observation of nystagmus that is torsional in direction, of delayed onset and fatigues. Any other nystagmus observed during testing for BPPV was interpreted as appropriate by the clinician.

diagnosis as the condition that was causing the main problems, and indicate the secondary diagnosis as co-existing.

It is acknowledged that there could be discrepancies between centres and clinicians on how patients were assigned to each of the categories. This was minimised by clear instructions and guidelines to the clinicians involved and by only experienced clinicians being involved in assigning the diagnostic categories.

It is possible that the diagnosis assigned to a patient at the initial assessment stage may be refined at a later stage when more information about the symptoms and the results of further tests have been obtained. The nature of the categories based predominantly on test findings rather than medical diagnoses minimises this effect.

11.5.5.2 Additional factors

The pilot study highlighted the role of additional factors beyond the diagnostic category that may play a role in the individual's response to the dizziness, the symptoms experienced and the lifestyle of the patient.

Information about the presence of anxiety, lack of confidence, neck problems and poor coping strategies for the dizziness such as visual dependence was obtained and indicated on the diagnostic questionnaire. Judgements as to whether these factors played a role in the response to dizziness were made by the clinician based on reports by the dizzy individual and by observation of the patient. The report of a neck problem was not based on a formal assessment of the neck but on the self-report by the patient and on the report of previous treatments. This was considered acceptable in the absence of physiotherapy assessment of the status of the neck in each case.

11.5.5.3 Appointment classification

The type of appointment was indicated on the diagnostic questionnaire as either a diagnostic initial assessment or a vestibular rehabilitation initial assessment. Clear differentiation between the two appointment types enabled any differences between the two groups of patients to be examined and controlled for if necessary.

11.5.5.4 Recommendations for treatment

Clinicians were asked to indicate whether they would recommend the patient for vestibular rehabilitation. This was irrespective of whether this service was available within the department.

More specific details about referrals for rehabilitation were made for dizzy individuals at the Portsmouth Audiological Medicine department. These included specific programmes of Cawthorne-Cooksey and Brandt-Daroff exercises, breathing exercises, relaxation therapy and the Epley manoeuvre.

Clinicians were encouraged to write any additional information about the patient in a comments section at the end of the questionnaire. A comment to indicate that a patient had received a treatment such as an Epley repositioning manoeuvre following a diagnosis of BPPV at the appointment was made here.

11.6 FOLLOW-UP OF NON-RESPONDERS

Individuals in both the clinic and population dizzy samples who had not returned the completed questionnaires after one month were mailed a follow-up letter and second set of questionnaires by post.

The letter again explained the research and asked the patient to complete and return the questionnaires. The letter differed from the original information sheet to reflect the fact that the patient had not responded and needed further encouragement to complete the questionnaires. Copies of these letters for the two dizzy samples are found in Appendix 9. The same questionnaires as administered as part of the original questionnaire pack were provided for completion. Written instructions for completion of the questionnaires were provided that were identical to the original questionnaire pack.

The date that the follow-up questionnaire pack was administered was recorded in the patient's details. No further contact was made with the patients if the follow-up questionnaire pack was not returned.

11.7 TEST-RETEST REPEATABILITY OF THE ADMINISTERED QUESTIONNAIRES

As part of assessing the psychometric properties of the FLP and DHI, a study of the test-retest repeatability of the questionnaires was carried out. Results of this have been presented separately in Part I of the study.

11.7.1 Test-retest period

The test-retest repeatability was assessed over one month, a period similar to the follow-up interval for vestibular rehabilitation programmes.

Patients were selected for the survey who had experienced dizziness for more than 2 months. The purpose of this selection criterion was to reduce the chance of spontaneous resolution during the survey. It is assumed that there was no significant change in the status of the patient for the duration of the repeatability study.

11.7.2. Subjects

Patients to take part in the repeatability study were selected from those returning completed questionnaires, either initially or after follow-up. Since the sample taking part in the test-retest repeatability study would be formed as the survey was being carried out, a sampling formula was established to select those patients to be included.

Sample size calculation indicated that 80 responders were required to take part in the repeatability study. This should have been achievable by sampling 25% of the patients receiving the questionnaires. The starting point for the sample was determined by randomly obtaining a number between 0 and 4. The number obtained was 1. Every patient receiving the fourth questionnaire pack after the first administered questionnaire pack at each centre who returned the questionnaires was selected.

This approach resulted in a number of non-responders selected to take part in the repeatability study. In addition, monitoring of the numbers of subjects recruited and returning questionnaires as part of the repeatability study showed that the return rate was reduced compared with that for the overall survey. Non-responders for the repeatability

study could not be followed up since this would alter the interval over which test-retest repeatability was assessed.

It was realised that the number of patients sampled in practice to take part in the study was reduced and the number of returned questionnaires was lower than expected. The sampling rate was increased so that 50% of subjects who received questionnaires and subsequently returned them took part in the repeatability study. This sampling rate continued until the completion of the survey.

11.7.3 Questionnaire pack

Those patients selected to take part in the repeatability study received a questionnaire pack administered by post. Contact details for the patients were obtained from the diagnostic questionnaire completed at the initial appointment by the clinician.

The questionnaire pack contained a letter explaining the purpose of the research and explaining why they had been selected to receive a second questionnaire pack. A copy of this letter is found in Appendix 10. The enclosed questionnaires were identical to those administered initially. A Freepost envelope was enclosed for the return of the questionnaires.

No time limit for the completion of the questionnaires was placed although patients were encouraged to complete them as soon as possible.

12.0 DIZZINESS REPORTED IN CLINIC AND GENERAL POPULATION SAMPLES

The dizziness characteristics reported by the clinic and general population samples of dizzy individuals on the symptom questionnaire are described in this chapter and comparisons are made between the two groups. Symptom characteristics for the facial pain group and normal population sample are found in Appendix 11 and 12 respectively.

12.1 RETURN RATE

12.1.1 Clinic dizzy sample

Of the 554 questionnaire packs administered during the survey at the ten participating test centres, 405 were returned at an overall return rate of 73.1%. This was achieved after re-contacting non-responders after one month. (The return rate was 60% before contacting non-responders.) Comparison of the responders before and after follow-up found no statistically significant differences in their demographic characteristics, dizziness symptoms and quality of life scores. The return rate was considered acceptable to create a representative sample of the clinic population surveyed.

Four patients were not followed up because contact details were not received until after the follow-up date. No details were completed for one patient and one was below the lower age limit. It was not considered appropriate to follow up one individual involved in litigation. In total, seven patients were not followed up during the survey.

12.1.1.1 Non-responders

Since age and sex details were obtained only on the symptom questionnaire, these were absent for non-responders. Sex was therefore determined either as indicated on the hospital label attached to the diagnosis sheet or from the name only in those cases where there was no doubt as to the sex associated with that name. Age at assessment was calculated where the date of birth was available from the hospital labels. The sex and age details of the responders and non-responders are summarised in Table 12.1. The numbers shown reflect missing data for some individuals.

Chi-squared analysis found the return of questionnaires to be independent of sex ($p>0.05$). Age was determined for 62% of the non-responders (mean age 49.0 years; N=93) and non-responders were found to be significantly younger than responders (mean age 52.5 years; Student t-test, $p<0.05$).

	Responders			Non-responders		
	N	Age (yrs)	95% CI	N	Age (yrs)	95% CI
Male	128	55.4	53.3 ; 57.6	31	48.0	42.1 ; 54.0
Female	272	51.1	49.4 ; 52.7	61	49.6	46.2 ; 53.0
Total[1]	401	52.5	51.2 ; 53.9	93	49.0	46.1 ; 52.0

Table 12.1: Age and sex details of responders and non-responders in the clinic dizzy sample

There was no significant age difference between males and females for non-responders although this difference was significant when examining all patients receiving questionnaire packs. Return of questionnaires was independent of the diagnostic category assigned to the subjects (Chi-squared, $p>0.05$).

12.1.2 Population dizzy sample

Of the 425 dizzy individuals in the general population who received questionnaire packs, 146 returned completed questionnaires at an overall return rate of 34% after follow-up at one month. Before follow-up the return rate was 23%. There were no significant differences in the demographic characteristics, symptoms and quality of life scores between those who responded initially and those who responded after follow-up. A second follow-up to obtain reasons for non-response resulted in the return of additional completed questionnaires despite no further questionnaires being administered.

Return of completed questionnaires was independent of sex (Chi-squared, $p>0.05$) and there was no difference in age between those who responded and those who did not (Student t-test, $p>0.05$).

12.1.2.1 Reasons for non-response

[1] Not all responders in the total sample of responders (N=405) indicated their sex or age on the symptom questionnaire

Reasons for non-response in the population dizzy sample were obtained at the second follow-up two months after the initial administration of the questionnaires.

The return rate for this further follow-up questionnaire was 32%. Return of the reason for non-response was not dependent on sex (Chi-squared, $p>0.05$). Those who gave a reason were significantly older than those who did not give a reason (Student t-test, $p<0.01$).

The reasons given for non-response are shown in Table 12.2. Just over half of those providing a reason for non-response to the original questionnaires indicated this was because they did not have a dizziness problem and were not interested in the research. This percentage of non-responders without a dizziness problem is similar to the percentage of those who did return the questionnaires and reported no dizziness nowadays (47%).

Reason	Percentages of patients
Have dizziness problem but not interested in research	2.3%
Have dizziness problem that is being treated by someone else	5.7%
Do not have a dizziness problem - not interested in research	53.4%
Person moved away/unavailable	10.2%
Did not receive questionnaires	4.5%
Other	
Returned after this follow-up	8.0%
Can't see need to/did not want to	3.4%
Deceased	1.1%
Did complete and return	2.3%
Dizziness now gone	3.4%
Feels no one is interested in problem	1.1%
No time	2.3%
Questionnaire too long	2.3%

Table 12.2: Reasons for non-response (N=88).

Although there was a low return rate for the population dizzy sample, no material differences have been found between responders and non-responders. It is therefore considered that the results presented for the characteristics and later, the quality of life of the sample of dizzy individuals in the general population are representative of all individuals with dizziness in the general population.

12.2 COMPARISON OF CENTRES TAKING PART IN CLINIC DIZZY POPULATION SURVEY

The ten test centres were chosen to form a reasonably representative sample of dizzy individuals attending audiology outpatient departments for the initial assessment of dizziness. The centres were spread across England, Scotland and Wales.

12.2.1 Return rate

The return rates and number of questionnaires received from each centre are shown in Table 12.3. The three centres with the lowest return rate were those where technicians administered the questionnaires and who were unfortunately not involved during the recruitment of the centre.

The return rate of 58% at the Audiology centre at Portsmouth was considerably lower than all other centres. This centre was recruited in the latter stages of the survey. A large number of individuals was involved in administration of the questionnaires and it was not possible to inform all of those involved about the survey. This is likely to explain some of the reduction in return rate.

Centre	VR available	Return rate (%)	Number of questionnaires
Aberdeen	Yes*	75	54
Bath		74	43
Hearing and Balance Centre	Yes*	75	30
Newcastle	Yes	68	19
Portsmouth (Audiological Medicine)	Yes	69	63
Portsmouth		58	18
Reading	Yes*	68	19
Southampton		74	25
Swansea		79	85
Windsor	Yes	74	49

Table 12.3: Return rates for the participating centres (*- centres where it was possible that the initial assessment for dizziness was carried out at the first appointment for vestibular rehabilitation).

There was a wide range in the number of completed questionnaires received from each test centre ranging from 18 in Portsmouth to 85 in Swansea. This is mainly explained by the differences in the number of patients seen at each centre and the stage in the survey at which the centres were recruited.

At the three centres indicated by asterisks in Table 12.3, it was possible that the initial assessment for dizziness was carried out at the first appointment for vestibular rehabilitation. Other centres offered vestibular rehabilitation at a later date following the results of the initial assessment. Only 4% of those returning questionnaires (N=16) were initially assessed at the vestibular rehabilitation appointment. It is assumed that this small group of patients is no different to those who are referred for vestibular rehabilitation based on the results of assessment. All patients surveyed were therefore entered into the analysis.

12.2.2 Socio-economic background of survey areas

The level of deprivation was obtained from aggregate Jarman scores for local authority areas corresponding to each of the test centres in England and Wales. Information was not available for Scotland in the available data source. The Jarman score is based on prevalence of unemployment and overcrowding, numbers of lone pensioners and single parents, numbers born in the new commonwealth, numbers of children under five years of age, prevalence of low social class and numbers of one year migrants. Information is obtained from the census, usually presented for electoral wards of residence. Scores are ranked in deprivation order and split in to quintiles of equal source group size.

Although the Jarman scores and quintiles presented here for the England and Wales centres are not based on the survey individual, they provide information about the typical level of deprivation for each of the centres rather than the actual area where each responder lives. Table 12.4 shows the Jarman scores and quintiles for the local authority areas encompassing the test centres for this current survey.

The quintiles are based on the mid-1998 population estimates. The four quintiles split the authorities into five bands, each containing 20% of the authorities. The first quintile relates to the top 20% of authorities with the highest deprivation level and so on. All deprivation

scores for the authorities including the test centres in the current survey were less than 30 which is interpreted as no deprivation apart from Newcastle which has low deprivation.

Local authority	Jarman score	Quintile
Bath and North East Somerset UA	-4.91	4
Newcastle upon Tyne	30.46	1
Portsmouth UA	23.23	1
Reading UA	17.52	2
Southampton UA	23.27	1
Swansea	5.47	3
Windsor and Maidenhead UA	-15.96	5

Table 12.4: Jarman scores and quintiles for local authorities to 1998 boundaries

It can be seen that those centres with the lower return rates (see 12.2.1) were generally in the highest deprivation level quintile. There is a large spread in the deprivation levels across the test centres.

12.2.3 Descriptive characteristics

There was no statistically significant difference in the ratio of male to female responders between centres (Chi-squared, $p>0.05$). The ratio ranged from 80% female responders at Windsor to 50% at Bath. This is compared with an overall percentage of female responders of 68%.

Significant differences[1] were found in the mean age of responders between centres (Student t-test, $p<0.01$). Responders at Aberdeen were significantly younger than those at Bath and the two centres at Portsmouth. No other differences were significant.

Males were not significantly older than females at any individual centre although there was a tendency for males to be older than females as seen in Figure 12.1.

[1] p value for significance at the 5% level adjusted for multiple comparisons (see Appendix 6)

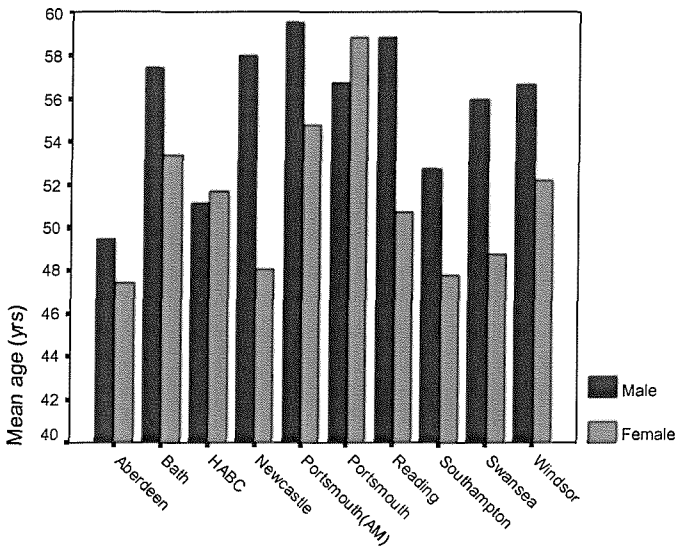


Figure 12.1: Mean age of males (N=128) and females (N=272) at each participating centre.

The small numbers of patients at the individual centres, in particular males, is likely to explain the failure for the age difference to reach significance. The exceptions are Portsmouth where females were older than males and HABC where the ages were approximately the same. It should be remembered that Portsmouth had the smallest number of responders and the influence of random sampling effects is stronger on the mean age for this group. Calculation of median ages showed more males to be older than females at all centres except HABC where males and females had the same median age.

12.2.4 Symptom characteristics

A significant effect of test centre on the duration of dizziness problems as reported on the symptom questionnaire was found (Kruskal-Wallis, $p<0.05$). The waiting time for assessment within both Audiology and ENT is likely to be responsible for some if not all of this difference. Other factors may include GP awareness of dizziness in the different areas and time spent within ENT before being referred for assessment.

There was no difference in the length or frequency of dizziness attacks between the centres (Kruskal-Wallis, $p>0.05$). A significant difference in the symptom severity ratings for both nowadays and today between test centres was also found (Kruskal-Wallis, $p<0.05$).

A significant difference in the factors provoking the dizziness attacks across the centres was found (Chi-squared, $p<0.05$). The specialist centres of HABC and Portsmouth (Audiological Medicine) had more than expected patients with attacks brought on by head and body movements. This is in contrast to centres within traditional ENT departments where more patients with spontaneous attacks were assessed. These differences may reflect differences in the approach for the assessment of dizzy patients. It is likely that the specialist centres may assess the more complicated uncompensated peripheral deficits whereas ENT based departments may assess those with a wide range of disorders.

Only small numbers of responders were assigned to the diagnostic categories at each test centre. This meant that differences in diagnoses between centres could not be assessed reliably. Recoding diagnostic categories into, for example, peripheral and non-peripheral diagnoses did not resolve this problem. It was therefore not possible to examine differences in patient diagnoses between the centres.

12.2.5 Discussion

Significant differences between centres were only found for mean age of responders, duration of dizziness problems, symptom severity ratings and provoking factor. The significant differences only occurred between small numbers of the total number of centres taking part. Combining the information from all test centres is therefore assumed to form a reasonably representative sample of dizzy individuals attending audiology outpatient departments for the initial assessment of dizziness.

12.3 COMPLAINT OF DIZZINESS IN THE GENERAL POPULATION SAMPLE

Individuals in the general population sample were identified from responses to the Health Technology Assessment (HTA) survey of ENT problems administered 9 months previous to the present survey. Those selected to take part reported dizziness at the time of the HTA survey with or without hearing loss and tinnitus but with no nose, throat or voice problems (NT problems) in the last 12 months.

As part of the current survey, responses to the selection criteria were re-established on the HTA symptom questionnaire (see Section 6.2.4). There was a large number of discrepancies in the report of dizziness and ear, nose and throat problems between the two surveys. The delay between the two surveys may explain some of the discrepancy in the reports.

After return of the questionnaires in the current survey, only 51% (N=74) of responders still complained of dizziness nowadays. Of those who no longer made a complaint of dizziness nowadays, 26% (18) gave details of a history of dizziness. Of these, seven actually gave a symptom severity rating of greater than 1 to indicate some experience of symptoms either today or nowadays. Of the responders who had previously reported no NT problems, 18% now reported problems. Of the 74 who still experienced dizziness, 26% now reported NT problems.

Analysis was therefore performed for the 55 subjects whose responses on the HTA symptom questionnaire still met the original selection criteria of dizziness nowadays with or without hearing loss and tinnitus but with no NT problems in the last 12 months.

12.4 DEMOGRAPHIC DETAILS

12.4.1 Age and sex characteristics

The Komogorov-Smirnov test showed age could be assumed to be normally distributed and parametric statistics were therefore used. Mean age of responders in the clinic dizzy sample was 52.5 years while that in the population dizzy sample was 52.8 years (no significant difference). The sex and age details of the clinic and population dizzy individuals are shown in Table 12.5.

	Clinic dizzy sample			Population dizzy sample		
	Male	Female	Total	Male	Female	Total
Number[1]	128	272	401	19	35	54
Mean age (years)	55.5	51.1	52.5	61.1	48.2	52.8
SD (years)	12.4	13.9	13.6	13.7	19.4	18.5
Range (years)	24-86	18-82	18-86	42-87	19-88	19-88
95% CI	53.3 ; 57.6	49.4; 52.7	51.2 ; 53.9	54.5;67.7	41.6;54.9	47.7;57.8

Table 12.5: Age and sex details for clinic (N=405) and population (N=55) dizzy samples

[1] Not all responders in the samples indicated their sex or age on the symptom questionnaire

Of those who responded in the clinic dizzy sample, 32.0% were male and 68.0% were female. This ratio of females to males was also present in the total sample of dizzy patients receiving the questionnaire pack. A similar preponderance of females complaining of dizziness has been reported in other studies in a clinical setting (e.g. Yardley and Putman, 1992; Mendel *et al.,* 1999). The preponderance of females to males was also present in the current population dizzy sample and those originally identified with dizziness by the HTA survey in the general population. Studies have also reported a similar ratio in general population samples (Grimby and Rosenhall, 1995; Davis, 1997) and in a randomised controlled trial of exercise therapy in primary care (Yardley *et al.,* 1998b). A survey of a general practice community sample of working age people found that women were more likely to report dizziness than men (Yardley *et al.,* 1998a).

Figure 12.2 illustrates the ratio of males to females for different age groups in the clinic dizzy sample. It can be seen that there is a strong preponderance of females up to the age of 50 years after which the preponderance is less marked. This has previously been found for a Dizziness Unit population (Nedzelski *et al.*, 1986) particularly for the group diagnosed with psychogenic dizziness. In the overall sample for this previous study, the preference for females was found for the younger and older groups and not in the middle age groups.

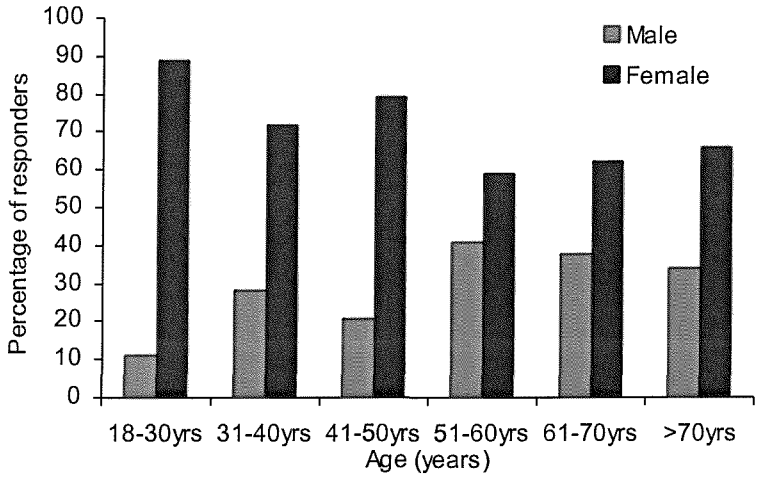


Figure 12.2: The ratio of males (N=128) to females (N=272) with age in the clinic dizzy sample.

Males were significantly older than females (Student t-test, $p<0.05$) for both dizzy samples and for those receiving (not necessarily returning) questionnaires in both samples. This

difference has not been reported elsewhere. This is partly due to the failure to present age details for the sexes separately in previous studies. However, a Swedish study reported male and females ages to be 55 and 54 years respectively (Mendel *et al.,* 1999).

There was no significant difference in age between the clinic and population dizzy samples.

12.4.2 Socio-economic characteristics

Information about occupational status was obtained for both the patient and spouse on the symptom questionnaire. This has been discussed previously in Section 6.2.1.6. The information obtained was of poor quality with insufficient detail to classify patients accurately according to the full Registrar General's Classification of Occupations. Occupations[1] were therefore classified simply as manual or non-manual following the guidelines in the classification scheme. The percentages of manual and non-manual workers in each of the dizzy samples are shown in Table 12.6.

		Percentage of responders		
	N	Manual	Non-manual	Not classified
Clinic dizzy sample				
Aberdeen	54	35%	57%	8%
Bath	43	45%	40%	15%
HABC	30	37%	53%	10%
Newcastle	19	47%	32%	21%
Portsmouth (AM)	63	41%	43%	16%
Portsmouth	18	39%	56%	5%
Reading	19	11%	84%	5%
Southampton	25	36%	52%	12%
Swansea	85	37%	41%	22%
Windsor	49	25%	63%	12%
Total	405	36%	50%	14%
Population dizzy sample				
Total	55	22%	48%	32%

Table 12.6: Percentages of manual and non-manual workers in the clinic and population dizzy samples.

Overall, excluding those unclassified in each of the dizzy samples, 58% of responders in the clinic dizzy sample and 70% in the population dizzy sample were non-manual workers.

[1] In those cases where the female responder indicated that she was a housewife, the occupation of the husband was classified.

This supports previous work from the National Study of Hearing that found a greater prevalence of dizziness in non-manual workers compared with manual workers (Davis, 1997). The percentage of non-manual workers for all responders in the National Study of Hearing was 48%.

At Newcastle there was a noticeable large proportion of manual compared to non-manual workers. This centre also had a lower return rate and was in the highest deprivation level quintile (see 12.2.2). It should be noted that the occupation of 20% of responders could not be classified. Other centres where there was a lower return rate do not show any material difference in the proportion of manual to non-manual workers.

12.5 PREVALENCE OF HEARING DIFFICULTIES AND TINNITUS

12.5.1 Hearing difficulties

The prevalence of hearing difficulties in the clinic and population dizzy samples is shown in Table 12.7.

In both groups, the report of hearing difficulties was independent of sex. In the clinic sample, those with hearing difficulties (mean age 54.1 years) were significantly older than those without hearing difficulties (mean age 51.3 years) (Student t-test, $p<0.05$). There were no significant age differences between those in the population dizzy sample with and without hearing difficulties.

	Clinic dizzy sample		Population dizzy sample	
	N	Hearing difficulties (%)	N	Hearing difficulties (%)
Male	127	52%	15	47%
Female	267	43%	34	32%
Total sample[1]	397	46%	50	36%

Table 12.7: Prevalence of hearing difficulties in the clinic and population dizzy samples.

Hearing difficulties were significantly more prevalent (Chi-squared, $p<0.05$) in the clinic sample than the general population sample.

[1] Not all responders indicated their sex and not all responders indicated whether they had hearing difficulties or tinnitus difficulties

12.5.2 Tinnitus

The percentages of individuals reporting tinnitus in the two dizzy samples are shown in Table 12.8. There was no association between the report of tinnitus and sex in either sample.

	Clinic dizzy sample				Population dizzy sample			
	N	No	Some of time	Most/all of time	N	No	Some of time	Most/all of time
Male	125	32%	32%	36%	16	69%	12%	19%
Female	260	36%	39%	25%	34	73%	18%	9%
Total sample[1]	387	35%	36%	29%	51	72%	16%	12%

Table 12.8: Prevalence of tinnitus in the clinic and population dizzy samples.

There was no significant difference in age between those who did and who did not report tinnitus in either the clinic or population dizzy samples. There was a highly significant difference in the report of tinnitus between the two dizzy samples (Chi-squared, $p<0.001$). Tinnitus was more prevalent in the clinic compared with the population dizzy sample.

There was a highly significant dependence of tinnitus on hearing status in the clinic dizzy sample (Chi-squared, $p<0.001$) with those patients reporting hearing difficulties 8 times more likely to report an experience of tinnitus at least some of the time (Odds ratio 8.07; 95% CI: 4.81:13.55).

12.6 DIAGNOSIS OF CLINIC DIZZY INDIVIDUALS

Individuals in the clinic dizzy sample were assigned to diagnostic categories at the time of the appointment. All audiology centres used the same diagnostic categories shown in normal typeface in Table 12.9. Revised categories as discussed previously in Section 11.5.5.1 were used at the Audiological Medicine department, Portsmouth and are shown in italics.

Although the discussion is based on responders to the survey, the distribution of subjects across the diagnostic categories was the same for those who received the questionnaires, which includes non-responders (Chi-squared, $p>0.05$).

Diagnostic Category	Percentage of responders (N=405)	Percentage of those surveyed (N=554)
Peripheral		
Asymmetry	19.3%	94 (17.0%)
Uncompensated	*3.7%*	*20 (3.6%)*
no asymmetry	6.4%	42 (7.6%)
compensated	*0.7%*	*3 (0.5%)*
BPPV	14.8%	13.7%
Positional – other	4.7%	4.0%
Meniere's like	6.2%	5.6%
Episodic	*2.7%*	*3.8%*
Central	3.7%	4.3%
NAD	25.0%	27.5%
Bilateral hypofunction	1.2%	1.1%
Acoustic neuroma	1.0%	1.3%
Not given	8.6%	7.6%
Other	2.0%	2.7%

Table 12.9: Diagnostic categories assigned to responders and those surveyed (categories in italics are those used in the Audiological Medicine Department, Portsmouth).

Just under a third of patients (30%) presented with a peripheral vestibular problem. The diagnosis of BPPV for 15% of patients is similar to previous reports in vestibular clinics of 17% (Nedzelski *et al.,* 1986) and 18% (Beynon, 1997).

The combined percentage of Meniere's like cases including those classified as episodic of 8.9% is similar to a previous report of 9.8% for Meniere's disease including atypical presentations in a dizziness unit (Nedzelski *et al.,* 1986).

Other diagnoses included visual, middle-ear and vascular problems and multifactorial including the adverse effects of medication. A quarter of patients referred for initial assessment could not be 'diagnosed' (NAD) due to the absence of signs or positive test results. This is higher than the 18.9% reported as undiagnosed from the test findings and history in a survey of a Canadian dizziness unit (Nedzelski *et al.,* 1986).

Referral to vestibular rehabilitation was recommended for 45% of patients, irrespective of whether it was available at the test centre.

12.7 MEDICATION AND NON-MEDICAL TREATMENT

12.7.1 Medication

In the clinic and population dizzy samples, 37.9% and 14.5% of responders respectively were currently taking medication for dizziness. The medications reported are shown in Table 12.10. Of all subjects taking part, 30% were taking the commonly used medications of prochlorperazine, betahistine and cinnarizine alone or in combination. Other medications taken included diuretics and drugs for hypertension and anxiety.

Medication	Percentage in clinic dizzy sample (N=405)	Percentage in population dizzy sample (N=55)
Prochlorperazine (Stemetil) only	8.2%	3.6%
Cinnarizine (Stugeron) only	3.7%	1.8%
Betahistine (Serc) only	15.1%	1.8%
Combination of prochlorperazine, cinnarizine and betahistine	5.4%	0%
Combination + hypertensive drugs	0.2%	0%
Prochlorperazine + other	0.5%	0%
Betahistine + other	0.2%	0%
Other	2.5%	3.6%
Yes – unspecified	2.0%	3.6%
None	62.2%	85.6%

Table 12.10: Medications currently being taken for balance problems as reported by patients.

A marked difference between the two groups is that 17% of those taking medication in the clinic dizzy sample reported taking more than one medication whereas all those in the population dizzy sample reported just one. Although responders were instructed to list medications currently being taken, it is possible that some subjects reported the different medications they had tried in the past as well as those taken currently. It should also be noted that details about medications for conditions other than dizziness were not obtained. This has been discussed in Section 6.2.1.7.

12.7.2 Non-medical treatment

Only 13.8% of responders in the clinic dizzy sample had received any form of non-medical treatment for their dizziness, as detailed in Table 12.11. No individuals in the population

dizzy sample had received any non-medical treatment despite 32% having consulted their GP, which includes 7% who went on to attend a hospital for the dizziness.

Non-medical treatment	Percentage of clinic dizzy sample (N=405)
VR exercises	5.7%
Epley manoeuvre/Brandt-Daroff	3.2%
Neck treatment/physiotherapy	1.0%
Alternative therapy	2.7%
Relaxation/yoga	0.7%
Other	0.5%

Table 12.11: Non-medical treatments received in the clinic dizzy sample.

For those receiving non-medical treatment in the clinic dizzy sample, this was vestibular rehabilitation for 61%, which must have been at the time of the initial assessment. Although this number is different to the number initially assessed within a vestibular rehabilitation programme, patients assessed at the Audiological Medicine department, Portsmouth were given generic rehabilitation exercises at the time of the appointment. BPPV was diagnosed for 60 patients yet only 13 patients reported receiving the recognised treatments of Epley manoeuvre or Brandt-Daroff exercises. This difference may indicate that centres are not carrying out this simple manoeuvre on patients either at the earliest opportunity at the ENT consultation or at the initial assessment within Audiology.

The remainder had either received alternative medicines or took part in physical exercise. Although neck problems were reported by 41% of responders, only 1% of subjects had previously been seen by a physiotherapist. Future referral to physiotherapy may result from the initial assessment of the dizzy individual.

It is assumed that any treatments given at the initial assessment would have minimal effect on responses to the questionnaires made within a week of the initial appointment. This effect could be greater for patients who responded after follow-up. However those responding after follow-up who reported receiving non-medical treatment account for only 3% of the total sample and therefore are included in the analyses presented for the survey.

12.8 OTHER HEALTH PROBLEMS

Other health problems were reported by 78% of dizzy individuals in the clinic dizzy sample and by 73% in the population dizzy sample. The health problems reported are shown in Table 12.12. The problems listed include those problems specified in the item and additional problems reported by more than 1% of responders in either dizzy sample. There are multiple entries in the table for individuals reporting more than one health problem. As discussed previously, items within the list can represent the secondary symptoms of vestibular disease.

Other health problems reported by small numbers of responders included cystic fibrosis, Parkinson's disease, sinusitis and stress.

Health Problem	Responders in clinic dizzy sample (N=405)	Responders in population dizzy sample (N=55)
Lower limb problem	4%	4%
Head injury with loss of consciousness	3%	0%
Raised blood pressure	17%	13%
Neck problems	41%	20%
Arthritis of lower joints	27%	24%
Depression/anxiety	34%	25%
Other		
Back problems	6%	4%
Hypothyroidism	3%	
Diabetes	2%	
Angina	2%	
Headaches/migraine	1%	5%
Visual problems	1%	
Irritable Bowel Syndrome	1%	
Panic attacks		2%
Multiple sclerosis		2%

Table 12.12: Health problems reported in the clinic and population dizzy samples.

Of those reporting other health problems, 60% reported more than one in the clinic dizzy sample and 27% in the population dizzy sample. The small numbers of subjects reporting each health problem on its own meant there was insufficient statistical power to look at the effects of individual health problems.

As would be expected, those reporting other health problems in addition to dizziness in the clinic dizzy sample were significantly older than those who did not report other health

problems ($p<0.001$). Although those with other health problems in the population dizzy sample were older, this difference did not reach significance likely due to the small numbers involved. The ages of those with and without other health problems are summarised for the two samples in Table 12.13.

	Clinic dizzy sample		Population dizzy sample	
	Health problems	No health problems	Health problems	No health problems
Number[1]	313	88	39	15
Mean age (years)	54.1	47.0	54.5	48.1
SD (years)	13.0	14.5	18.7	18.0
Range (years)	19-77	18-86	20-88	19-86
95% CI	52.6 ; 55.5	43.9 ; 50.0	48.5 ; 60.6	38.2 ; 58.1

Table 12.13: Age details for those with and without other health problems in the clinic and population dizzy samples.

There was no difference in the report of other health problems between males and females for both the clinic and population dizzy samples.

The total percentage of responders indicating other health problems in the population and clinic dizzy samples was similar. There are differences in the health problems reported although these differences could not be investigated in a meaningful way because of the small subject numbers for the population dizzy sample. The main differences are for the greater prevalence of neck problems and depression/anxiety in the clinic dizzy sample with twice as many responders reporting neck problems in the clinic as the population dizzy sample.

12.8.1 Factors contributing to the response to dizziness in the clinic dizzy sample

Clinicians were instructed to indicate additional factors contributing to the individual's response to the dizziness in the clinic dizzy sample, these are summarised in Table 12.14. More than one factor could be indicated for each individual. Factors were indicated for 32% of responders and for 7% of responders more than one factor was indicated.

Neck problems were thought to be an issue by the clinician for only 16% of patients compared with 41% of patients who reported neck problems. Only 14% of patients were

[1] The numbers included are less than the total sample sizes as age was not reported by all responders.

assessed to be anxious by the clinician, compared with 34% who made a self-report of depression or anxiety on the symptom questionnaire. In these comparisons however it should be pointed out that the clinicians were asked to indicate which factors played a part in the dizziness rather than what health problems the patients had. However the differences between clinician and self-report suggest that clinicians find it difficult to identify other factors that could play a part in the dizziness experienced and the patient's response to the dizziness.

Factor	Percentage of patients (N=405)
Neck problems	16%
Anxiety	14%
Lack of confidence	5%
Poor coping strategies	7%

Table 12.14: Factors indicated as contributing to the response to dizziness in the clinic dizzy sample.

Lack of confidence and poor coping strategies were indicated for the smallest numbers of responders.

12.9 SYMPTOM CHARACTERISTICS OF DIZZY INDIVIDUALS IN CLINIC AND GENERAL POPULATION SAMPLES

Characteristics of the symptoms experienced by the dizzy individuals in the clinic and population samples were obtained from the symptom questionnaire administered to both groups.

12.9.1 Duration of dizziness problems

The duration of dizziness problems reported by the dizzy individuals are shown in Figure 12.3.

The median duration of problems in both the clinic and population samples was 1-2 years. There was a significant dependence of the duration of balance problems on the dizzy sample (Chi-squared, $p<0.05$). From the figure this difference appears to be due to the

small number of individuals experiencing dizziness problems for 6 to 12 months in the general population. The reason for this is not clear.

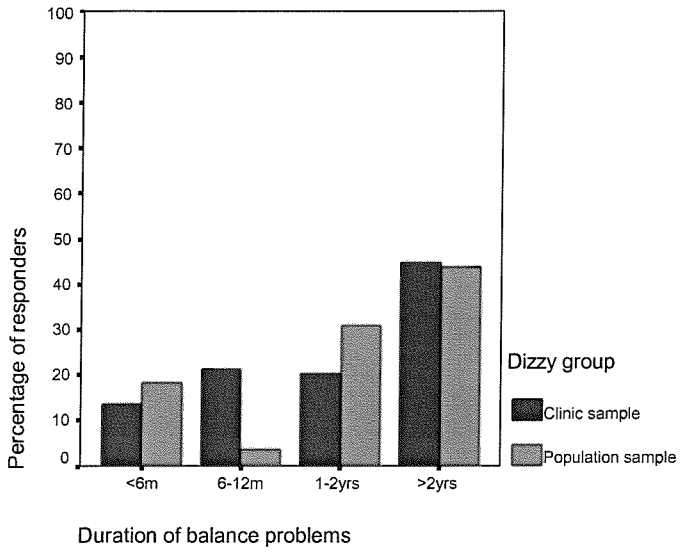


Figure 12.3: Duration of balance problems in the clinic (N=404) and population (N=53) dizzy samples.

The duration of problems is affected to a certain extent by waiting times for assessment initially within ENT and following further referral within Audiology. However, waiting time cannot explain all of the length of time dizziness problems have been experienced. It is likely that these figures also reflect the amount of time before referrals are made from the primary care level and the amount of time patients experience problems before they seek help. It would also have been interesting to obtain information about the duration of problems before patients consulted their GP about the dizziness but unfortunately this issue was not recognised until the analysis stage.

Since all subjects in the population dizzy sample were selected based on a complaint of dizziness in the original HTA survey that was carried out 9 months previously, no subjects should have experienced dizziness for less than 6 months. The report seen is likely therefore to be influenced by incorrect responses by the subjects.

12.9.2 Length of dizziness attacks

The length of attacks of dizziness reported by the clinic and population dizzy samples are shown in Figure 12.4.

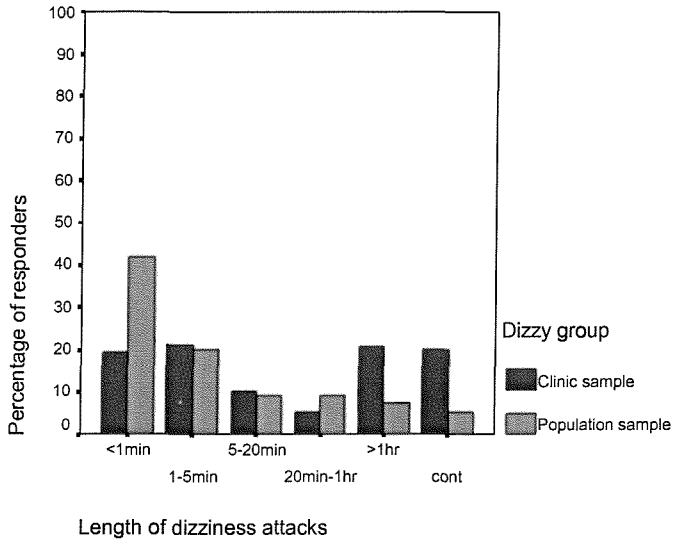


Figure 12.4: Length of dizziness attacks in clinic (N=394) and population (N=51) dizzy samples.

There was a significant difference between the length of attacks reported by the two dizzy samples (Chi-squared, $p<0.001$). Shorter attacks were reported in the population dizzy sample compared with the clinic dizzy sample with more than twice as many individuals in the population dizzy sample with attacks less than one minute. This report may reflect normal postural hyptension rather than vestibular causes of short duration attacks as found in the clinic dizzy sample. Attacks lasting more than one hour or continuously were mainly reported in the clinic dizzy sample. Continuous dizziness was reported by a fifth of individuals in the clinic dizzy sample.

Medium duration attacks lasting between 20 minutes and an hour were experienced by the smallest number of responders. These attacks may be associated with episodic vertigo such as Meniere's disease, which was diagnosed as the cause in only 9% of responders.

12.9.3 Frequency of attacks

The frequencies of attacks reported by the two dizzy samples are shown in Figure 12.5. Dizziness attacks at least a few times per week, including dizziness all the time were reported by 67% of the clinic dizzy sample. The distribution of responses to this question

can be considered to divide clinic patients in to two groups; one group who experience frequent attacks at least a few times per week and one group who experience episodic attacks which occur once a month or less.

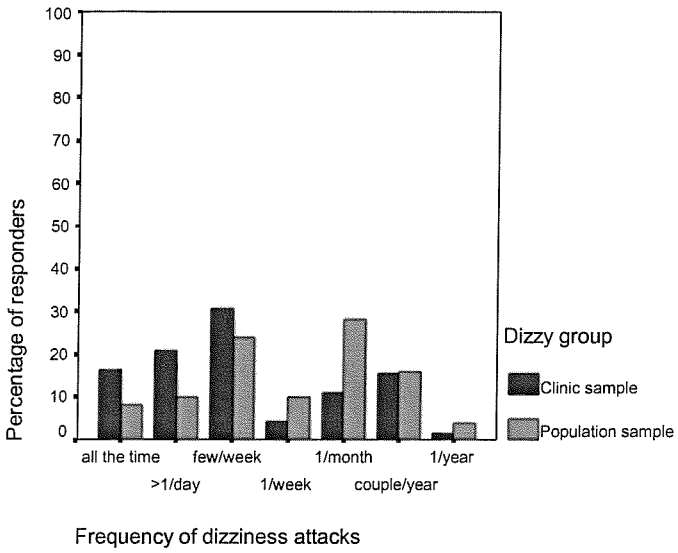


Figure 12.5: Frequency of dizziness attacks in clinic (N=392) and population (N=50) dizzy samples.

It should be noted that not all patients who reported dizziness continuously indicated that they had the problems all the time, as would be expected for the frequency of attacks. This illustrates the difficulties patients have in describing their symptoms reliably by questionnaire.

There was a significant difference in the frequency of attacks between the dizzy samples (Chi-square, $p<0.01$). Individuals in the population dizzy sample reported more infrequent attacks than those in the clinic dizzy sample although 40% still reported attacks occurring at least a few times per week or all the time.

Those reporting attacks lasting less than 5 minutes were twice as likely to complain of attacks occurring at least a few times per week (Odds ratio: 1.94; 95% CI: 1.23 to 3.03). This was not significant for those in the population dizzy sample.

12.9.4 Disabling effect of dizziness

Assessment of the disabling effect of dizziness was based on the self-report of being incapacitated by the dizziness. Responses to this item are shown in Figure 12.6. Dizziness attacks were reported to incapacitate two-thirds of the clinic dizzy sample but only around a quarter of those in the population dizzy sample. No effect of age or sex on this report was found.

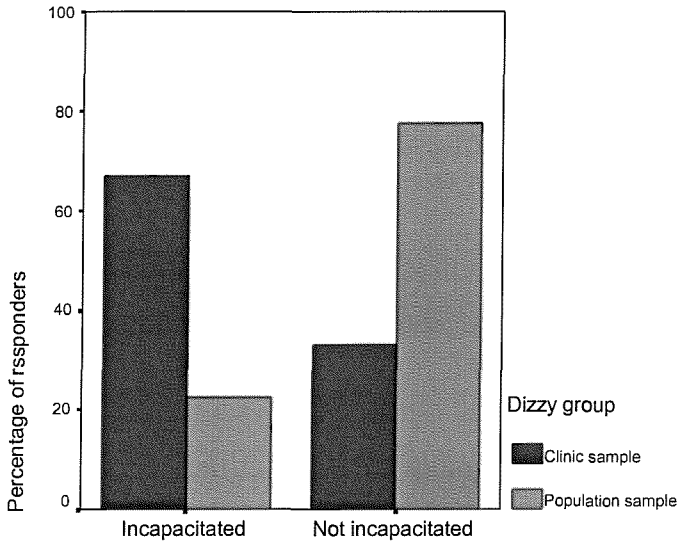


Figure 12.6: Report of being incapacitated by dizziness in the clinic (N=395) and population (N=50) dizzy samples.

Those patients in the clinic dizzy sample who reported attacks lasting longer than 5 minutes were nearly 3.5 times more likely to report being incapacitated by the attacks than those reporting attacks shorter than 5 minutes (Odds ratio: 3.44; 95% CI: 2.21,5.36).

There was a highly significant dependence for the report of being incapacitated by the dizziness on the dizzy sample (Chi-square, $p<0.001$) with those in the clinic dizzy sample seven times more likely to report being incapacitated than those in the population dizzy sample (Odds ratio 7.0; 95% CI: 3.5,14.1).

12.9.5 Symptoms described

A summary of the sensations reported in the clinic and population dizzy samples is shown in Table 12.15.

Almost all of the patients in the clinic dizzy sample reported a myriad of symptoms. The symptom reported by the largest proportion of patients was unsteadiness, which was complained of by 76% although only 6% of these complained of unsteadiness on its own. Spinning in association with unsteadiness was reported by 43% of the total sample. Spinning and/or unsteadiness were described by 90% of the responders.

In the population dizzy sample, the sensation reported by the largest proportion of responders was lightheadedness either on its own or in combination with other descriptions. Approximately 50% of these also reported unsteadiness. The symptoms of nausea and vomiting that are typically associated with peripheral vestibular disorders were only reported by a small proportion of those reporting dizziness in this sample.

Symptom[1]	Clinic dizzy sample	Population dizzy sample
Use of one term to describe sensations of dizziness	8%	36%
Report of spinning	57%	33%
Report of unsteadiness	76%	53%
Report of lightheadedness	60%	60%
Report of nausea	61%	13%
Report of vomiting	28%	2%

Table 12.15: Comparison of symptoms reported in the clinic (N=402) and population dizzy samples (N=52).

In addition to the 'dizziness' related symptoms, individuals also reported feelings of floating and walking on air, rocking, falling, visual problems, headaches, numbness, pressure, tiredness, sweating, blushing, diarrhoea and shaking.

12.9.6 Provoking factors for dizziness problems

Patients indicated the factor that brought on an attack using the responses 'nothing', 'head/body movements' and 'other'. Figure 12.7 compares the percentages of individuals indicating each of the provoking factors for the two dizzy samples.

A small number of patients in the clinic dizzy sample reported factors in addition to those specified. These factors included tiredness and stress and specific movements of getting

[1] Symptom reported either on its own or in combination with other descriptions

into or out of bed. Eleven patients indicated that they were unable to identify what brought on their dizziness.

Other sole causes of dizziness problems were the menstrual cycle, ear infections, food, being a passenger in a car, sore throat, the weather and surfacing after diving. In the population dizzy sample other factors reported included excess work and stress, low blood pressure, smoking, brushing hair and anger.

Although the majority indicated only one factor as instructed, a number indicated more than one factor. For example a small number of individuals responded that their dizziness was provoked both by nothing and head and body movements. This was interpreted as two types of dizziness occurring at the same time and is supported by comments made on the questionnaires.

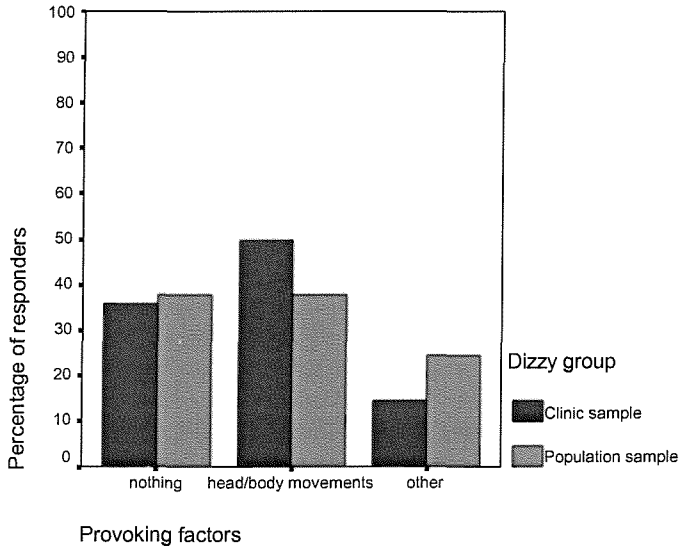


Figure 12.7: Provoking factor for attacks of dizziness in clinic (N=403) and population (N=53) dizzy samples.

The provoking factors specified in the response categories resembled factors relevant to dizzy patients attending audiology clinics with predominantly vestibular causes for the dizziness. Although it was expected that there would be a difference compared with the factors provoking dizziness in the general population, where it is proposed there would be a higher prevalence of non-vestibular causes, no significant difference was found (Chi-squared, $p>0.05$).

12.9.7 Symptom severity rating

The severity of symptoms reported are shown in Figure 12.8 for both *nowadays* and *today* where 1 indicates no symptoms and 10 indicates the worst possible symptoms. For the clinic dizzy sample, the median severity rating for *nowadays* was 5 (Interquartile range (IQR) 4) and for *today* 4 (IQR 4). For the population dizzy sample, the median severity ratings were 3 (IQR 3) and 2 (IQR 3) respectively.

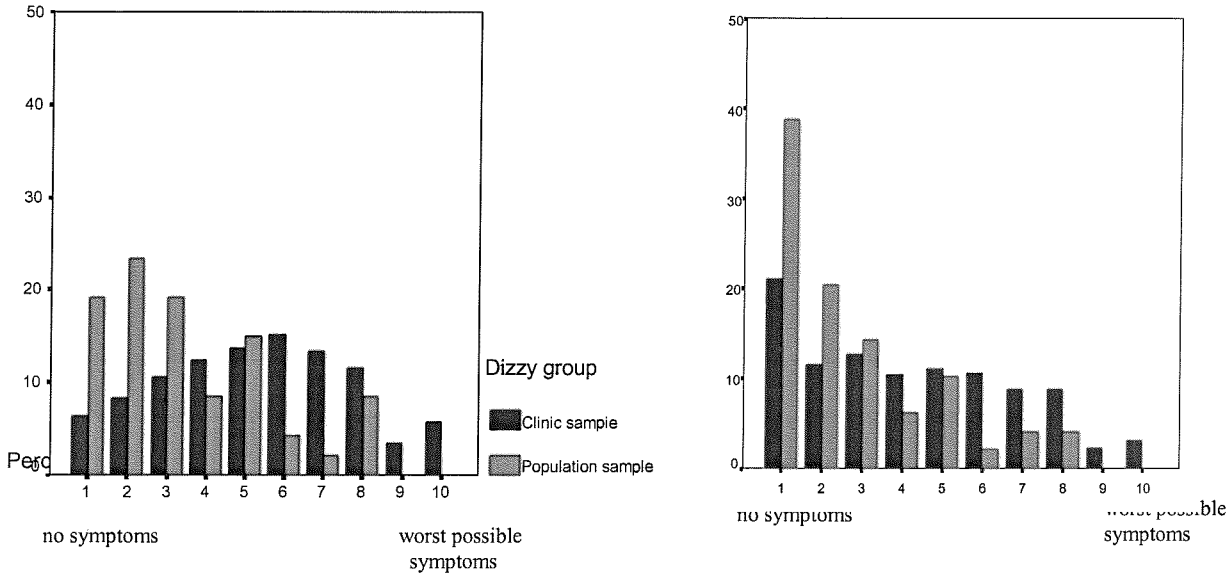


Figure 12.8: Symptom severity rating for *nowadays* and *today* in the clinic (N=390) and population (N=47) dizzy samples.

Symptom severity ratings for *nowadays* were significantly greater than for *today* in both dizzy samples (Wilcoxon matched-pairs signed-ranks test, $p<0.001$) indicating less severe symptoms *today* compared with *nowadays*. The severity of symptoms for both *nowadays* and *today* were significantly greater in the clinic compared with the population dizzy sample (Mann-Whitney U-test, $p<0.001$).

No symptoms were reported on the day of completion of the questionnaires for 20% of the clinic dizzy sample and for nearly 40% of the population dizzy sample. Fewer individuals reported no symptoms *nowadays* for the two samples. This is not surprising because of the fluctuating nature of dizziness and the frequency of attacks reported.

Of those providing symptom ratings for both *nowadays* and *today* in the clinic dizzy sample, 45% were unchanged. For 46% symptoms *today* were better compared with those experienced *nowadays*. Only 9% reported that their symptoms were worse *today* than they were *nowadays*. In the population dizzy sample, symptoms were unchanged for 60%, improved for 29% and worse for 11% suggesting dizziness which is typically less fluctuating than that found in the clinic dizzy sample.

12.9.8 Effect of dizziness on work activities

The amount of time individuals were prevented from carrying out their work or normal activities is shown for the two dizzy samples in Figure 12.9. Two-thirds of individuals in the clinic dizzy sample reported that they had been unable to carry out their usual work activities for at least one day while this was the case for only 22% of the population dizzy sample.

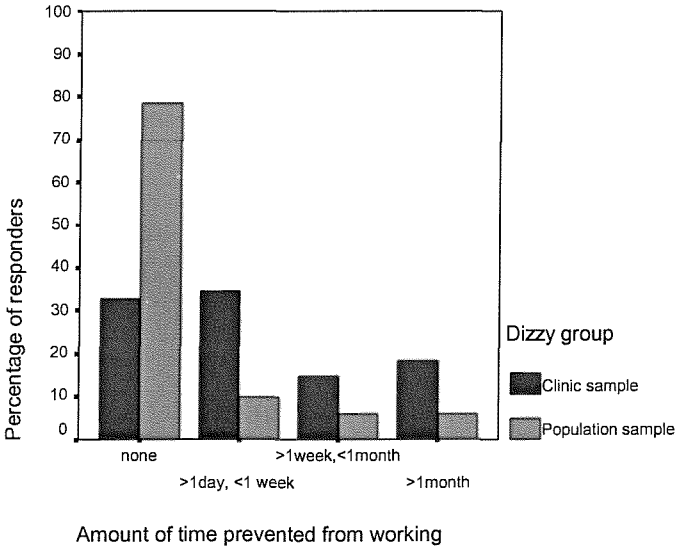


Figure 12.9: Work HTA rating responses in the clinic (N=399) and population (N=51) dizzy samples

Although the majority of the clinic dizzy sample were prevented from working for less than a week, almost one-fifth of responders were unable to perform their usual work activities for more than one month. This is compared with only 11% of those in the population dizzy sample unable to carry out these activities for more than one week.

The work rating was significantly dependent on the dizzy group (Chi-squared, $p<0.05$) with individuals in the clinic dizzy sample tending to be unable to work or carry on their normal activities for longer periods.

12.9.9 Annoyance, worry and upset associated with the dizziness

The amount of worry, annoyance and upset associated with the dizziness for the clinic and population dizzy samples is shown in Figure 12.10. As a result of dizziness, 94% of the clinic dizzy sample indicated that they were worried, annoyed or upset to some degree while 75% of the population dizzy sample also reported some degree of worry, annoyance or upset concerning the dizziness.

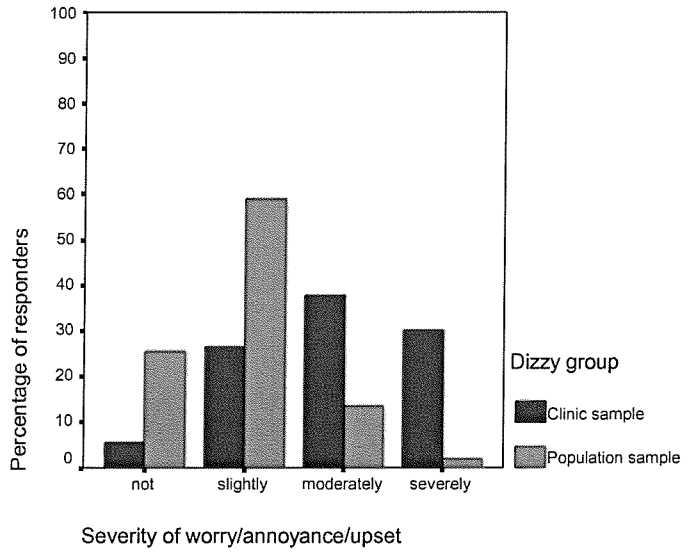


Figure 12.10: Worry, annoyance or upset HTA rating responses in the clinic (N=398) and population (N=51) dizzy samples.

Responders in the clinic dizzy sample reported a greater amount of worry, annoyance and upset compared with the population dizzy sample (Chi-squared, $p<0.05$). The median rating was for a moderate amount of worry for the clinic dizzy sample compared with a slight amount for the population dizzy sample.

12.9.11 Effect of dizziness on quality of life

The degree of impact of dizziness on quality of life was considered in terms of social activities, work, relationships and personal well-being and the responses are shown in Figure 12.11 for the two samples.

An adverse effect on quality of life was reported on the HTA rating scale by 85% of the clinic dizzy sample, with 20% reporting a severe impact on quality of life. In the population dizzy sample, just over a third of responders reported an impact on quality of life. Of those who indicated some impact, 74% reported only slight impact.

The impact of dizziness on quality of life was significantly greater in the clinic dizzy sample compared with the population dizzy sample (Chi-squared, $p<0.05$). The median impact in the clinic dizzy population was moderate compared with no impact in the population dizzy sample.

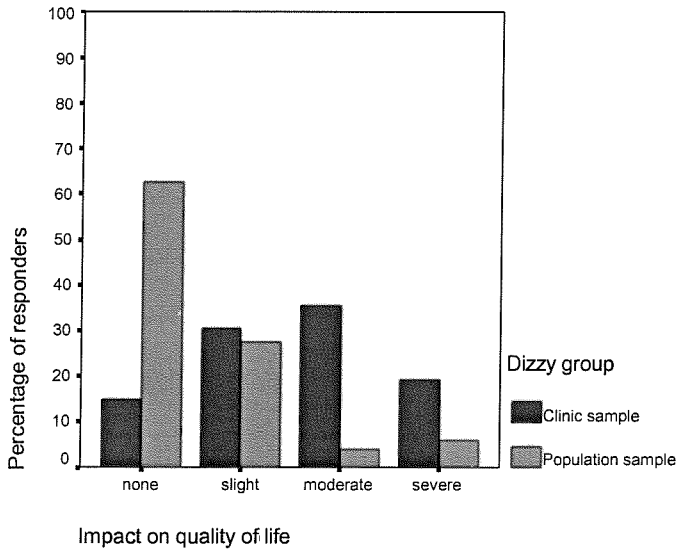


Figure 12.11: Quality of life HTA rating responses in clinic (N=399) and population (N=51) dizzy samples.

12.10 CONCLUSIONS

Dizziness has been quantified in the current survey for both clinic and population samples of dizzy individuals and has been shown to be a longstanding problem in both. Those in the clinic typically report shorter, more frequent attacks of dizziness than those in the general population. The lower prevalence of hearing difficulties and tinnitus in the general population suggests fewer vestibular causes of dizziness although there was no difference in the provoking factors for the dizziness between the two dizzy samples.

The previous finding that there is a greater report of dizziness in females than males has been supported in the current survey. What has not previously been found in those reporting dizziness is that the males are significantly older than the females. Although some of the sex difference may be explained by females more readily reporting dizziness than males, the significant difference in age suggests that there is also a physiological reason for the sex difference. In fact the male to female ratio was found to change with age. The higher proportion of females up to 50 years of age implies that there may be hormonal reasons why females experience and therefore report more dizziness problems than males.

Almost three quarters of dizzy individuals in both the clinic and population dizzy samples reported other health problems. This is compared with only a half of facial pain patients and a quarter of the 'normal' population sample (see Appendix 11 and 12 respectively). It is likely that the presence of these other health problems is characteristic of dizzy individuals and that the possible interaction between these and the dizziness is important in the reports made by individuals and for the limitations in lifestyle experienced by dizzy individuals. It may be that the high prevalence of other health problems limits the compensation processes for deficits in the vestibular system. Alternatively it may be the other health problems that cause the individual to seek help either for the dizziness or for the other health problems at which time the report of dizziness is made.

A high prevalence of neck problems and anxiety or depression was reported by responders in the clinic sample of dizzy individuals. There is however a discrepancy between these self-reports and the reports made by clinicians concerning the presence of such problems. This suggests that such problems may not be appreciated by clinicians. Recognition of these problems however is important in the successful management of dizzy individuals.

The numbers of individuals receiving treatment for their dizziness were considerably lower than those who would apparently benefit from such treatments. An example of this issue is BPPV, which was diagnosed for 60 patients although only 20% of these actually received recognised treatments for this including the Epley manoeuvre and Brandt-Daroff exercises. Vestibular rehabilitation was recommended for 45% of individuals in the clinic dizzy sample although the numbers of patients entering such programmes in clinical practice is much lower.

Dizziness has been shown to be a very common problem. Around two-thirds of those who report dizziness are female probably for hormonal reasons, especially in people under 50 years of age. The frequent occurrence of other health problems in those complaining of dizziness has important implications as it may exacerbate the consequences of dizziness. This is also an important consideration when planning treatment programmes for these individuals.

13.0 HANDICAP REPORTED IN CLINIC AND GENERAL POPULATION SAMPLES OF DIZZY INDIVIDUALS

The psychometric properties of the Dizziness Handicap Inventory (DHI) have been established in Chapter 7.0 showing it to be a reliable and repeatable measure of handicap[1]. Support for the validity of the original subscale structure of the DHI is limited and its intrinsic structure has been re-evaluated in the current survey (see Section 7.6). Despite this, it is probably the most extensively tested and adopted handicap questionnaire for dizzy individuals. Acknowledging the constraints of the structure of the questionnaire and its other limitations outlined in Section 9.0, the handicap reported in the current survey of clinic and general population samples of dizzy individuals was assessed using the DHI.

Responses to the questionnaire from the clinic and population samples of dizzy individuals are presented and discussed. The relationships between handicap as measured on the DHI and symptom characteristics of dizzy individuals in the two dizzy samples are examined.

13. 1 DHI SUBSCALE AND OVERALL SCORES

The Komogorov-Smirnov statistic showed that the responses for the DHI subscales and overall questionnaire could not be assumed to be normally distributed. The responses were therefore analysed using non-parametric statistics. This is contrary to previous published results that have used parametric statistics, often in the absence of any statement concerning the distribution of responses.

	Clinic dizzy sample (N=342)		Population dizzy sample (N=45)	
	Median (%)	IQR (%)	Median (%)	IQR (%)
Physical subscale	50.0	35.7	28.6	21.4
Function subscale	36.1	44.4	11.1	16.7
Emotional subscale	27.8	38.9	5.6	16.7
Total DHI	38.0	34.0	12.0	11.0

Table 13.1: Subscale and overall DHI percentage scores.

[1] The DHI instrument contains items that correspond to both the disability and handicap domains described by WHO (1980). For simplicity the term handicap is used here.

DHI questionnaire scores for the subscales and overall questionnaire for those completing the DHI (see Section 7.1) are presented in Figure 13.1 and Table 13.1 for the clinic and population dizzy samples. All subscale scores are presented as percentages of the maximum score. Higher scores represent a greater level of handicap.

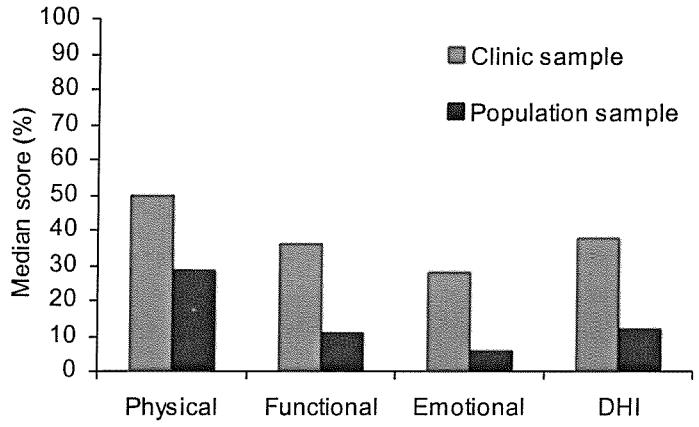


Figure 13.1: Median percentage scores for the subscales and overall DHI in the clinic (N=342) and population (N=45) dizzy samples.

The highest score was for the physical subscale and the lowest score for the emotional subscale for both dizzy samples. All subscale scores on the DHI were significantly different from each other (Wilcoxon matched-pairs signed ranks test, $p<0.05$). DHI scores for the clinic dizzy sample were significantly higher than for the population dizzy sample (Mann-Whitney U-test, $p<0.001$) indicating greater handicap.

DHI Scale	Newman and Jacobson, 1990		Robertson and Ireland, 1995		Present study	
	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)
Physical subscale	106	39% (24%)	101	48% (28%)	342	48% (23%)
Function subscale	106	32% (26%)	101	39% (28%)	342	39% (26%)
Emotional subscale	106	29% (24%)	101	32% (24%)	342	32% (24%)
Total DHI	106	33% (22%)	101	39% (23%)	342	39% (22%)

Table 13.2: Comparison of mean and standard deviation percentage scores with published results.

This profile of handicap as measured on the DHI has been found in previous studies (Jacobson and Newman, 1990; Robertson and Ireland, 1995) although results have been reported using mean scores. A comparison of the mean scores and standard deviations

(SD) obtained in the present clinic dizzy sample with previous results is shown in Table 13.2; mean scores are identical to those previously obtained by Robertson and Ireland (1995).

13.2 HANDICAP AND PATIENT CHARACTERISTICS

13.2.1 Age

Inspection of scatterplots of age plotted against DHI scores showed no clear or meaningful relationship between the two for either the clinic or population dizzy samples. After recoding age into approximately 10 year age bands (18-30 years, 31-40 years, 41-50 years, 51-60 years, 61-70 years, 71-80 years, >80 years), there was no significant effect of age on the three subscales or overall score in either sample (Kruskal-Wallis, $p>0.05$). The absence of an age effect on the DHI is in agreement with previous findings (Jacobson and Newman, 1990).

13.2.2 Sex differences

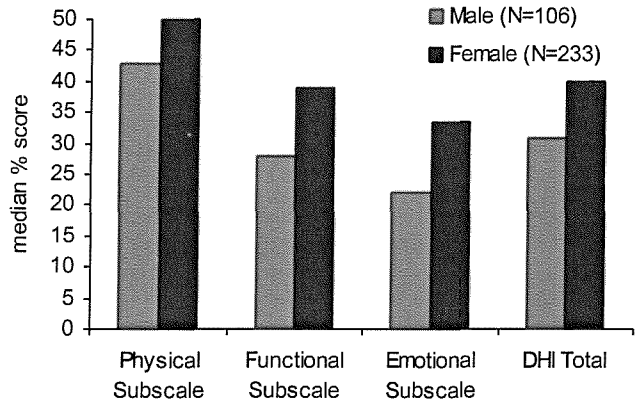
The median DHI scores for males and females in the clinic and population dizzy samples are shown in Figure 13.2.

In the clinic dizzy sample, females reported greater handicap on the DHI than males. This difference was significant[2] only for the DHI overall score ($p<0.01$). For the subscales, the differences were significant before correcting the p value for multiple comparisons. For the population dizzy sample there was no consistent pattern in the differences between males and females. No differences were significant ($p>0.1$).

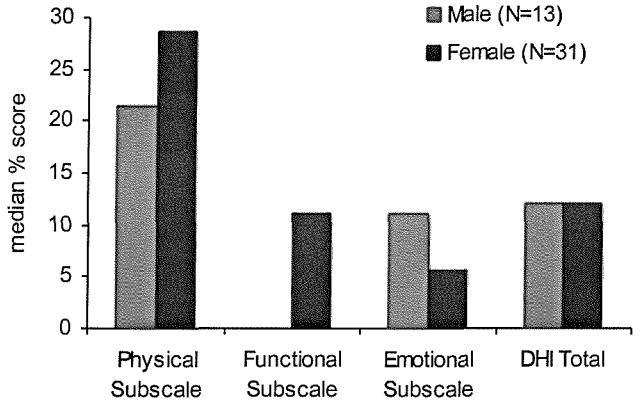
Females have previously been shown to have greater handicap than males in all of the subscales and for the total DHI score (Robertson and Ireland, 1995). Although the differences were reported to be significant for the total DHI score and the physical subscale, this was not adjusted for multiple comparisons. Adjusting their p values for multiple comparisons would mean that these differences did not reach significance.

[2] p value adjusted to 0.01 for significance at the 5% level for multiple comparisons (see Appendix 6)

Differences between males and females in the handicapping effects of dizziness cannot be explained by the activities contained within the DHI items. Although there was a significant age difference between males and females, there was no effect of age on responses to the DHI. The reason for these differences is not clear and no reason was proposed by Robertson and Ireland (1995).



(a) Clinic dizzy sample



(b) Population dizzy sample

Figure 13.2: Median DHI percentage scores for males and females in the clinic (a) and population (b) dizzy samples.

13.3 HANDICAP AND SYMPTOM CHARACTERISTICS

Relationships between DHI scores and the symptom characteristics included on the symptom questionnaire were examined for both the clinic and population dizzy samples. Unfortunately the number of responders in the population dizzy sample currently reporting

dizziness and completing the DHI was small (N=45). As a result, the number in each of the groups defined by the response categories for the symptom characteristics was very small in some instances. Results for the population dizzy sample are only presented and discussed where the relationship between handicap and symptoms reached significance. Unless otherwise stated, the absence of a significant relationship for the population dizzy sample cannot be considered as meaningful due to the low power for such analysis.

13.3.1 Duration of balance problems

There was no effect of duration of balance problems on the DHI and subscale scores in the clinic dizzy population (Kruskal-Wallis, $p>0.05$). Although the effect was measured to be significant (Kruskal-Wallis, $p<0.05$) in the population dizzy sample for the overall score and the functional and emotional subscales, no meaningful trend in the questionnaire scores was evident.

13.3.2 Length of attacks

The median subscale and overall scores on the DHI for subjects falling into each of the length of dizziness attacks bands are shown in Figure 13.3 for the clinic and population dizzy samples.

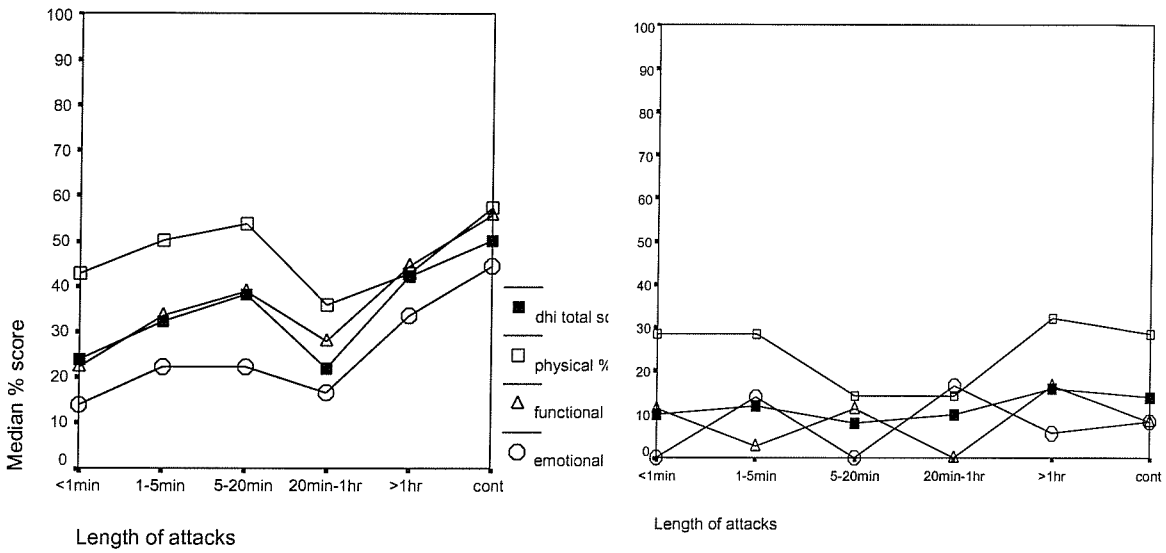
There was a significant effect of the length of attacks on the functional and emotional subscales and the overall score (Kruskal-Wallis, $p<0.01$) and on the physical subscale (Kruskal-Wallis, $p<0.05$). The effect was not significant for the population dizzy sample (Kruskal-Wallis, $p>0.05$).

Despite this significant effect for the clinic dizzy sample, as can be seen in Figure 13.3, there is no overall consistent trend in the median scores with increasing length of attack. The greatest numbers of significant differences[3] between scores were for comparisons involving short attacks lasting less than 1 minute and for comparisons involving continuous attacks.

What is interesting to note from the figure for the clinic dizzy sample is the high level of physical handicap reported by those with attacks lasting less than 1 minute compared with

[3] p value adjusted to 0.01 for significance at the 5% level for multiple comparisons (see Appendix 6)

the emotional and functional handicap. The difference between handicap on the three subscales reduces and moves closer towards high level handicap on all subscales for the attacks longer than 20 minutes. However, scores for the three subscales are significantly different from each other for all length of attacks bands. This compression of scores at the higher overall levels of handicap is evident in a number of different aspects of the questionnaire and its properties.



(a) Clinic dizzy sample (N=342)

b) Population dizzy sample (N=45)

Figure 13.3: Median scores on DHI against length of attacks in the clinic (a) and population (b) dizzy samples.

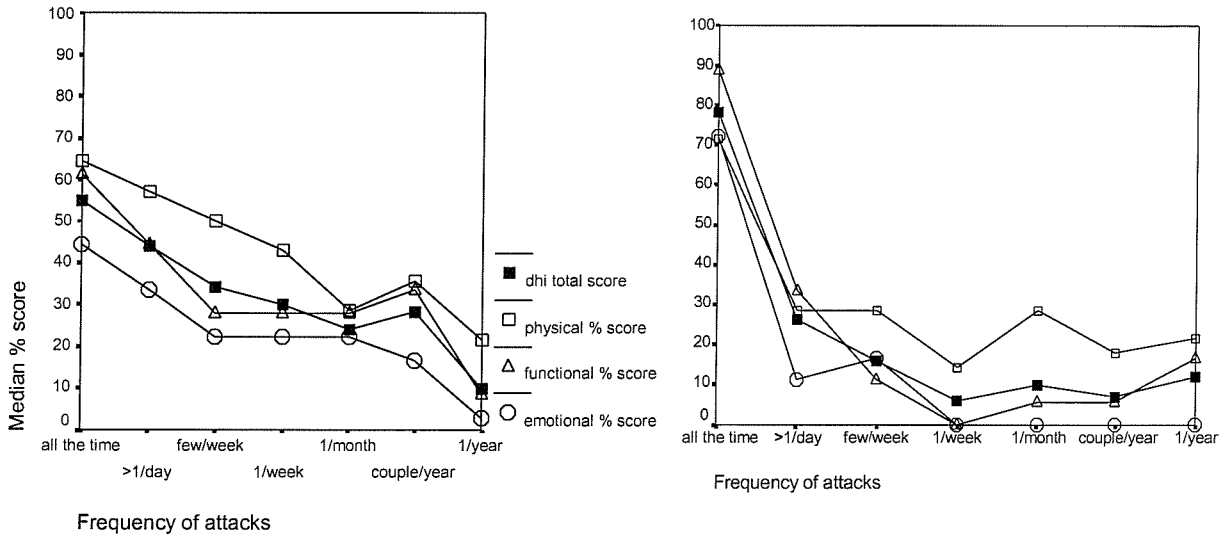
It may be that the observed relationship between the lengths of attacks and the measured handicap is due to the effect of two disorder types: short intermittent attacks (less than 20 minutes) and longer duration attacks. This may arise from the emphasis of the physical subscale items causing a high report of handicap in the physical subscale, even if the more global limitations are only minimal. Of the seven items forming the physical subscale, five consider physical activities that can provoke short duration attacks of dizziness associated with for example uncompensated vestibular deficits or BPPV.

13.3.3 Frequency of attacks

The median scores for the three subscales and the overall score for each of the groups defined by frequency of attacks are shown in Figure 13.4 for the two dizzy samples. There was a highly significant effect of frequency of attacks on all DHI scores (Kruskal-Wallis,

$p<0.001$) in the clinic dizzy sample. The effect was significant for the physical subscale and the overall scores in the population dizzy sample (Kruskal-Wallis, $p<0.05$).

As can be seen in Figure 13.4, the relationship of DHI scores is stronger with the frequency compared with the length of attacks for both dizzy samples. As frequency of attacks decreases, median scores on the subscales and overall questionnaire tend to decrease towards lower handicap scores. The effect was strongest for the DHI overall score and the physical subscale for which more pairs of frequency groups demonstrated significant differences[4]. Those with dizziness all the time had significantly greater DHI scores compared to all other frequency groups except for those with attacks more than once per day where the difference for the physical subscale did not reach significance.



(a) Clinic dizzy sample (N=342) (b) Population dizzy sample (N=45)

Figure 13.4: Median DHI scores against frequency of attacks for the clinic (a) and population (b) dizzy samples.

This is in contrast to previous reports that frequency of attacks did not appear to affect the level of physical handicap on the DHI, although closer examination of this previous result shows their significance level to be borderline ($p=0.06$) (Jacobson and Newman, 1990). The number of responders in this previous study was small and the frequency of attacks was only divided into occasional, frequent and continuous.

[4] p value for significance at 5% level adjusted to 0.01 for multiple comparisons (see Appendix 6)

For the population dizzy sample, it can clearly be seen that the greatest effect on DHI scores was for those with dizziness all the time. In fact, the median scores in this group are greater than the corresponding group in the clinic dizzy sample. The level of handicap was similar across the remaining frequency bands and there were fewer significant differences in the scores between these groups. It is interesting to note that for those with attacks less than a few times per week, material physical handicap is still reported while emotional and functional handicap are zero and near zero respectively. This may be explained by the item content of the physical subscale resulting in high handicap scores despite only minimal functional and emotional limitations arising from the attacks.

13.3.4 Symptom severity scores

Figure 13.5 shows the median scores on the DHI for each of the groups in the clinic dizzy sample defined by the symptom severity rating for both *nowadays* and *today*. As symptom severity ratings increase from 1 indicating no symptoms to 10 indicating worst possible symptoms, median scores for the subscales and overall questionnaire also tend to increase towards greater handicap.

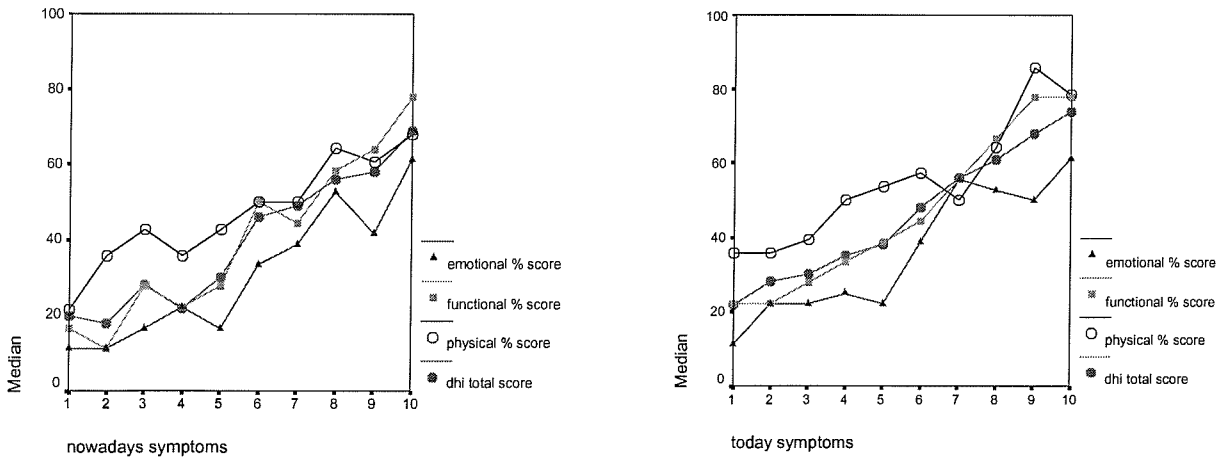


Figure 13.5: Median DHI and subscale scores for groups defined by symptom severity rating for *nowadays* and *today* in the clinic dizzy sample (N=342)

The effect of both *nowadays* and *today* symptom severity on the subscale and total scores for the DHI was highly significant in the clinic dizzy sample (Kruskal-Wallis, $p<0.001$). In the population dizzy sample, the effect was only significant (Kruskal-Wallis, $p<0.05$) for the emotional subscale for the symptoms both *nowadays* and *today*. However there was no

clear trend in the DHI scores with increasing symptom severity and the results are not illustrated for the population dizzy sample.

The magnitude of the correlation coefficient was greatest for symptom severity rating for *today* rather than for *nowadays*. This is surprising since the instructions were for the DHI questionnaire to be completed for dizziness experienced *nowadays*. However, nothing is known about the time frame over which responders consider their symptoms when instructed to consider *today* or *nowadays*. Responses on the DHI may be influenced by the most recent events despite instructions to consider dizziness *nowadays*. This may be more of an issue for the DHI since it considers activities during which symptoms of dizziness are provoked.

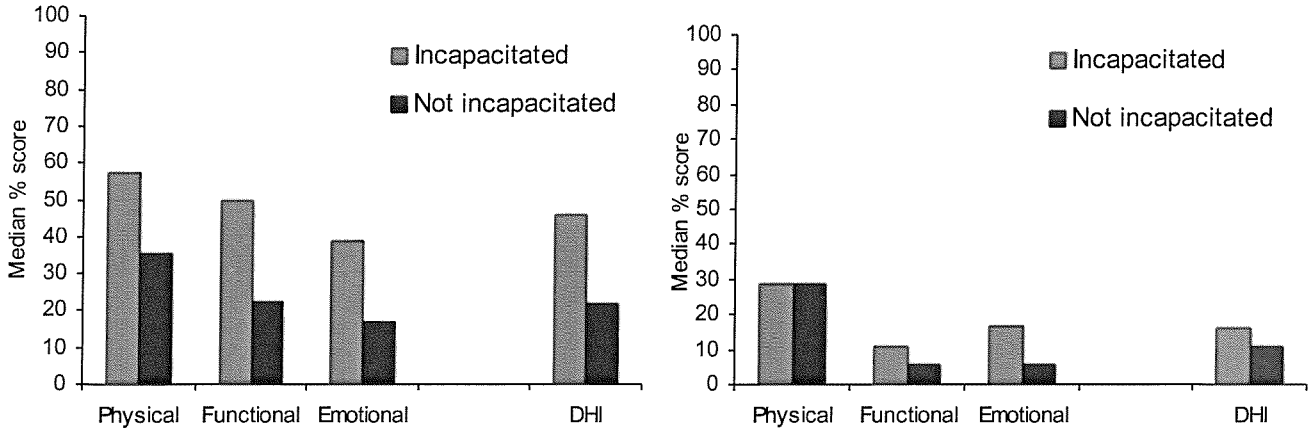
13.3.5 Provoking factor for dizziness

In the clinic dizzy sample, there was a significant effect of the factor causing the attacks on the physical subscale (Kruskal-Wallis, $p<0.001$); there was no significant effect on either the functional or emotional subscales. Those with dizziness brought on by head and body movements had significantly greater scores on the physical subscale than those with dizziness brought on by nothing (Mann-Whitney U test, $p<0.001$). This is not surprising since the content of the physical subscale is biased towards activities involving such provoking movements.

In the population dizzy sample, there was no effect of the factor provoking the dizziness attacks on the DHI scores (Kruskal-Wallis, $p>0.1$).

13.3.6 Disabling effect of dizziness

The median DHI scores for those who reported that they were incapacitated by the dizziness and those who were not are shown in Figure 13.6. Those who reported that they were incapacitated in the clinic dizzy sample scored significantly higher (Mann-Whitney U-test, $p<0.001$) on all of the subscales and total DHI scores indicating greater handicap.



(a) Clinic dizzy sample (N=342)

b) Population dizzy sample (N=45)

Figure 13.6: DHI scores for those incapacitated and not incapaciated in the clinic (a) and population (b) dizzy samples

There was no difference in the DHI scores in the population dizzy sample (Mann-Whitney U-test, $p>0.1$) between those incapacitated and those who were not.

13.3.7 HTA rating scales

The median DHI subscale and overall scores for the groups within the dizzy samples defined by each of the HTA rating scales are illustrated in Figure 13.7.

There was a significant difference in all subscale scores and the overall score across the four groups formed by each of the HTA rating scales in the clinic dizzy sample (Kruskal-Wallis, $p<0.001$). All relationships show a general trend that as the severity of the HTA rating increases, the handicap as measured on the DHI and its subscales increases. Significant differences[5] in the DHI subscale and overall scores were found between the majority of groups of patients defined by each of the HTA rating scales.

In the population dizzy sample, significant differences in all DHI scores across the HTA rating categories were only present for the quality of life rating (Kruskal-Wallis, $p<0.05$). For the work rating, a significant effect was only found in the functional subscale and overall DHI score and for the worry rating only in the emotional subscale score.

[5] p value for significance at the 5% level adjusted to 0.01 for multiple comparisons (see Appendix 6)

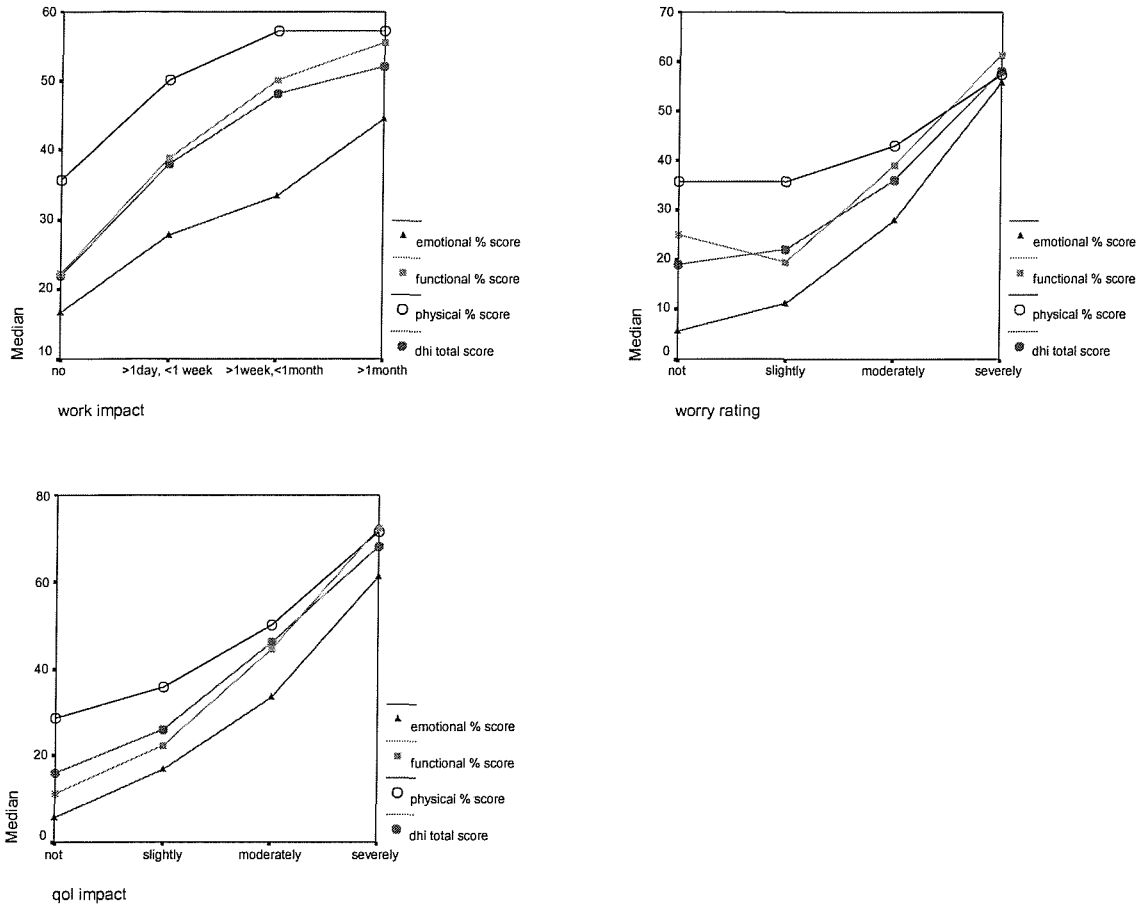


Figure 13.7: Relationship between HTA ratings and handicap scores on the DHI for the clinic dizzy sample (N=342).

For each of the HTA rating scales, the handicap reported on each of the subscales at the greatest severity ratings was similar. This was more marked for the worry and quality of life scales. Significant differences between the physical and functional subscales are not preserved. This illustrates the compression properties of the DHI, particularly on the physical subscale at the greater levels of handicap.

13.4 HANDICAP SCORES FOR THE REVISED SUBSCALE STRUCTURE OF THE DHI

Questionnaire scores were calculated using the original item scores on the DHI in the clinic and population dizzy samples for the new factor structure of the DHI presented in

Section 7.6. The profile of impact of dizziness on the three factors is shown in Figure 13.8 and the revised subscale scores are presented in Table 13.3.

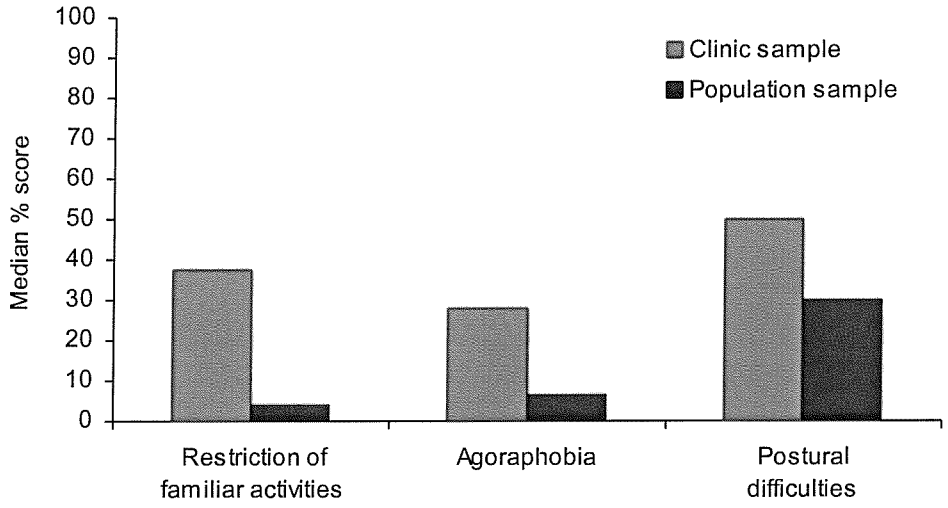


Figure 13.8: Subscale scores for the revised factor structure of the DHI in the clinic (N=342) and population (N=45) dizzy samples.

For the revised DHI, individuals in the clinic dizzy sample reported significantly greater handicap (Mann-Whitney U-test, $p<0.001$) than in the population dizzy sample. The profile shown in Figure 13.8 presents dizziness to have the greatest effect on postural difficulties, followed by restriction of familiar activities followed by agoraphobia. Although those in the population dizzy sample reported only minimal agoraphobia and restriction of familiar activities, considerable postural difficulties were reported.

Scale	Clinic dizzy sample (N=342)		Population dizzy sample (N=45)	
	Median (%)	IQR (%)	Median (%)	IQR (%)
Restriction of familiar activities	37.5	37.5	4.2	16.7
Agoraphobia	28.1	43.75	6.3	12.5
Postural difficulties	50.0	40.0	30.0	20.0

Table 13.3: Subscale scores for the revised structure of the DHI.

13.5 CONCLUSION

There is a material impact of dizziness on handicap in both clinic and population dizzy samples. The consequences of dizziness reported on the DHI were significantly greater for

the clinic compared with the population dizzy sample. The physical consequences of dizziness as measured by the DHI were found to be greatest and the emotional consequences the least.

This profile of impact on the original DHI conflicts with theoretical expectations of the consequences of dizziness from the work of Yardley and colleagues described in Section 2.3. This is true even when using the revised structure of the DHI, which shows the greatest consequences of dizziness to be the postural difficulties experienced. As can be seen from the revised subscale structure of the DHI, there is little emphasis on emotional and psychological consequences in the item content of the questionnaire.

Also, as has been suggested in the current survey, the items of the original 'physical subscale' consider specific movements that are known to provoke dizziness. This is compared with 'physical' scales found in quality of life based questionnaires that consider physical activities carried out in daily life. This emphasis in the items is in addition to the assumption within the questionnaire that activities are still carried out despite the presence of dizziness. From the work of Yardley and colleagues as reviewed in Section 2.3, this is not the case with restriction of activities a common response to dizziness. These shortcomings must be borne in mind when validating the structure of the FLP and interpreting the consequences of dizziness as represented by responses on the DHI.

While the DHI may not provide an entirely balanced measure of the associated effects and presumed consequences of dizziness, it has merit in being the most commonly used instrument to date and is adopted in the current survey.

14.0 QUALITY OF LIFE IN CLINIC AND GENERAL POPULATION SAMPLES OF DIZZY INDIVIDUALS

The Functional Limitations Profile (FLP) has been shown to be a reliable, repeatable and valid measure of the quality of life of dizzy individuals (see Section 8.0). The philosophy of the questionnaire is to measure the limitations and restrictions that an individual experiences in their daily life as a result of a health problem, in this case dizziness. The failure to assess these restrictions has been reported in the previous section to be a shortcoming of the commonly applied DHI.

The FLP was used in the current survey to assess the limitations and restrictions in lifestyle reported by dizzy individuals. The questionnaire responses for the clinic and general population samples of dizzy individuals are presented and discussed. The relationships between quality of life and symptom characteristics of dizzy individuals are examined.

14.1 REPORTING OF QUESTIONNAIRE SCORES

The Komogorov-Smirnov statistic, visual inspection of the shape of the histogram and normal probability plots show the dimension, category and overall scores of the FLP cannot be assumed to be normally distributed. The responses have therefore been analysed using non-parametric statistics throughout. Median questionnaire scores are used to present the profile of quality of life in the two dizzy samples. The median score represents the quality of life of the average (typical) dizzy individual and is not influenced strongly by outliers.

This approach contrasts with published studies that have either claimed responses to be normally distributed (Hutchinson and Hutchinson, 1995) or have not addressed the issue formally (e.g. Jenkinson *et al.,* 1997) while adopting parametric statistics to analyse the questionnaire responses.

There is a marked difference in the nature and extent of the profile of quality of life for dizzy individuals when using mean and median questionnaire scores. If inappropriate

statistics are used to demonstrate the central tendency of the responses, this can lead to misrepresentation of the quality of life. No meaningful comparisons can therefore be made with published studies using the FLP.

14.2 DISTRIBUTION OF RESPONSES WITHIN CATEGORIES

There are two issues related to the distribution of responses on the FLP that should be considered. Firstly, it was expected that certain categories would be more relevant to the quality of life of dizzy individuals than others. It was also expected that certain items within the categories would be more relevant than other items. This could mean that although a category was not generally important for dizzy individuals, the majority of responders endorsed a small number of items within that category.

The second issue was the range of item weights within the FLP categories. The item weights ranged from 25 to 141. This does not include the work item 'I do not work at all', which has an item weight of 361 to take into account that endorsing this item prevents the responder endorsing other items in the category. The majority of categories include items that cover all of this range. However, for certain categories the majority of items have similar weights. Examples of these are household management, sleep and rest, and to a lesser extent recreation and pastimes. This was not anticipated to be a problem for categories where the majority of items applied to large numbers of responders and where there was large variation in the pattern of responses within the categories between responders. This however may become a problem for those categories where only a small number of items are applicable to those who report limitations.

14.3 PREDICTED PROFILE OF QUALITY OF LIFE FOR DIZZY INDIVIDUALS

Previous surveys of dizzy patients using the SF-36 (Fielder *et al.,* 1996; Enloe and Shields, 1997) and Sickness Impact Profile (Mendel *et al.,* 1999) have shown quality of life to be reduced in dizzy individuals. It was therefore expected that there would be a significant reduction in quality of life in the clinic sample of dizzy individuals (clinic dizzy sample).

From the theoretical model of quality of life presented in Section 4.0, it was anticipated that there would be greater reduction in quality of life for the psychosocial dimension compared with the physical dimension of the FLP. In particular, limitations would be reported in the aspects of 'social interaction' and 'recreation and pastimes' as measured on the FLP.

For the population sample of dizzy individuals (population dizzy sample), the reduction in quality of life was expected to be less than that in the clinic dizzy sample. Although the limitations reported in the psychosocial dimension were still expected to be greater than in the physical dimension, these limitations were expected to be less than for the clinic dizzy sample.

14.4 FLP QUALITY OF LIFE SCORES FOR DIZZY INDIVIDUALS

The median FLP scores for the clinic and population dizzy samples are shown in Table 14.1.

FLP Categories and Dimensions	Clinic dizzy sample (N=405)			Population dizzy sample (N=55)		
	Median(%)	IQR (%)	Range (%)	Median(%)	IQR(%)	Range(%)
Ambulation	3.88	15.41	0-81.8	0	3.87	0-46.5
Body care & movement	2.44	9.03	0-55.8	0	3.43	0-40.5
Mobility	0	7.15	0-77.7	0	0	0-57.9
Household management	5.32	24.17	0-100.0	0	8.49	0-81.6
Physical dimension	4.20	11.33	0-68.8	0	4.36	0-50.1
Recreation & pastimes	8.88	28.72	0-100.0	0	8.88	0-76.2
Social interaction	6.90	16.99	0-94.2	0	9.23	0-28.2
Emotion	6.93	19.62	0-79.7	0	11.40	0-71.3
Alertness	9.99	24.61	0-100.0	0	18.85	0-71.7
Sleep & rest	13.54	25.04	0-87.8	0	14.55	0-40.3
Psychosocial dimension	9.27	18.22	0-82.5	3.03	12.84	0-40.8
Eating	0	0	0-21.1	0	0	0-12.2
Communication	0	6.86	0-81.5	0	0	0-20.9
Work	0	19.79	0-48.6	0	0	0-48.6
Overall	7.33	13.86	0-58.8	2.78	7.44	0-38.2

Table 14.1: FLP median dimension and category percentage scores for clinic and population dizzy samples.

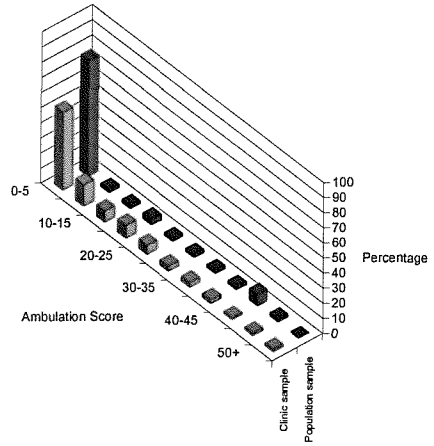
All scores are presented as percentages of the maximum possible score for that part of the questionnaire. A zero score indicates no limitations in quality of life as measured on the FLP. As scores on the FLP increase, the limitations experienced in daily life increase and

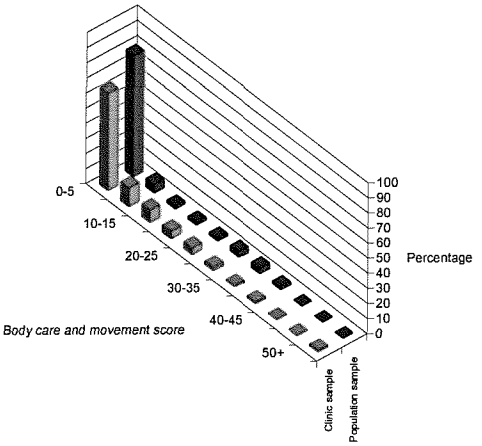
quality of life decreases. The large interquartile ranges and range of scores reflect the large variability in the report of limitations by dizzy individuals as measured by the questionnaire.

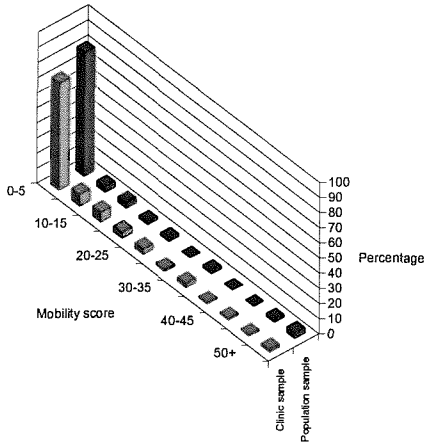
For the population dizzy sample, all median scores on the FLP were zero except for the psychosocial dimension and the overall score. However from the ranges of scores, it can be seen that certain responders in the population dizzy sample reported considerable limitations.

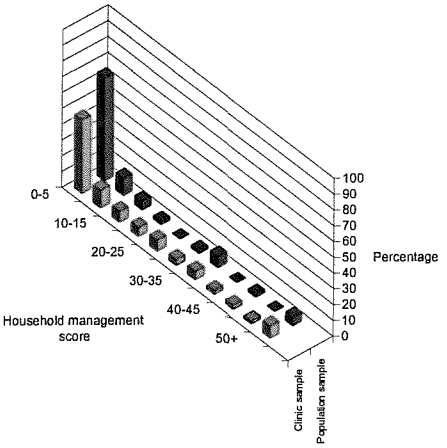
14.5 CATEGORY PROFILE OF THE QUALITY OF LIFE OF DIZZY INDIVIDUALS

Figure 14.1 illustrates the distribution of scores in each of the categories of the FLP for the two samples of dizzy individuals.









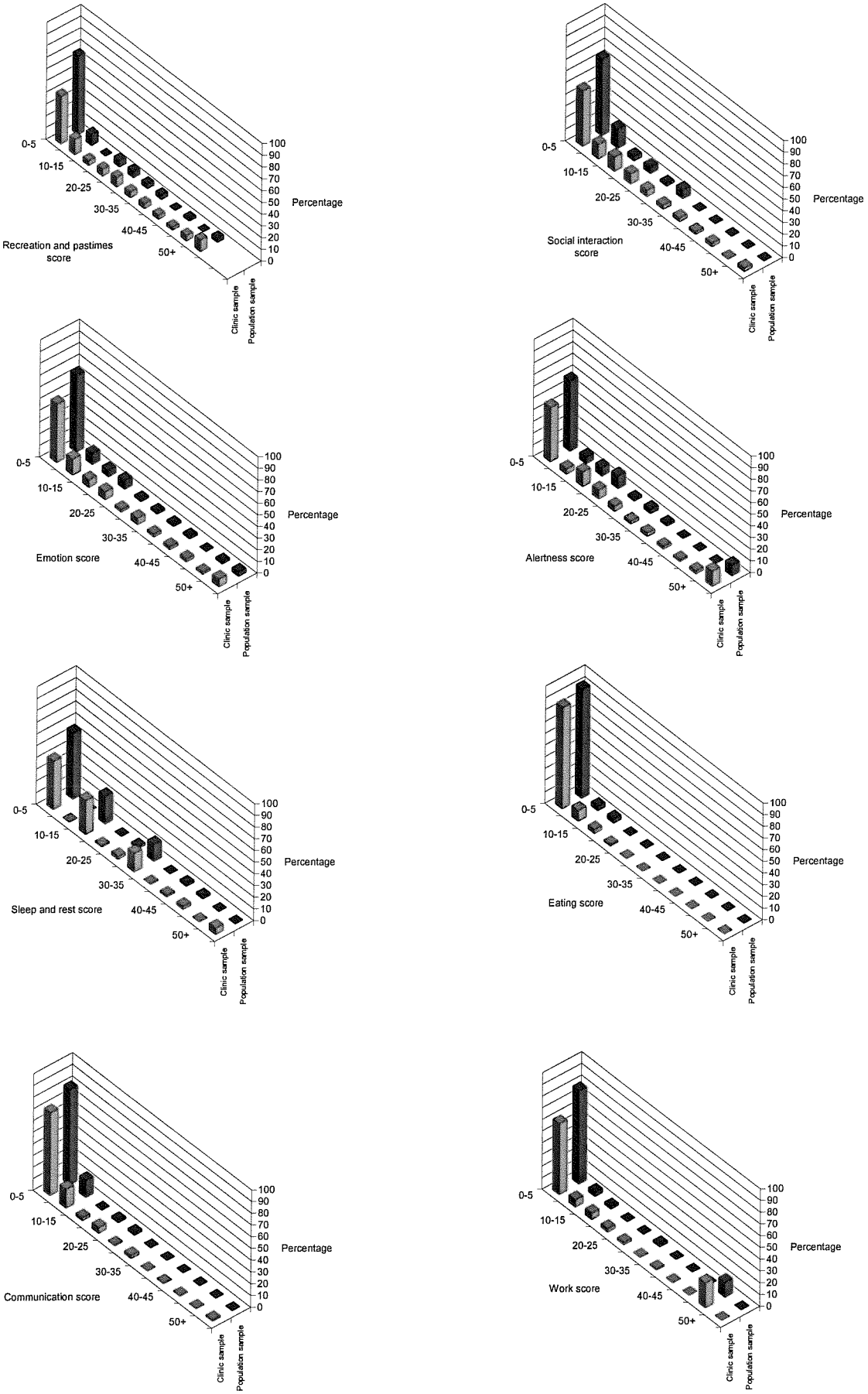


Figure 14.1: Distributions of FLP category scores for clinic (N=405) and population (N=55) dizzy samples

14.5.1 Category profile for the clinic dizzy sample

The median scores for each of the categories of the FLP for the clinic dizzy sample are shown in Figure 14.2. Although the maximum score on the questionnaire is 100%, the scale of the graph has been chosen for ease of presentation of the scores. Responses in each of the categories are discussed in decreasing order of FLP score.

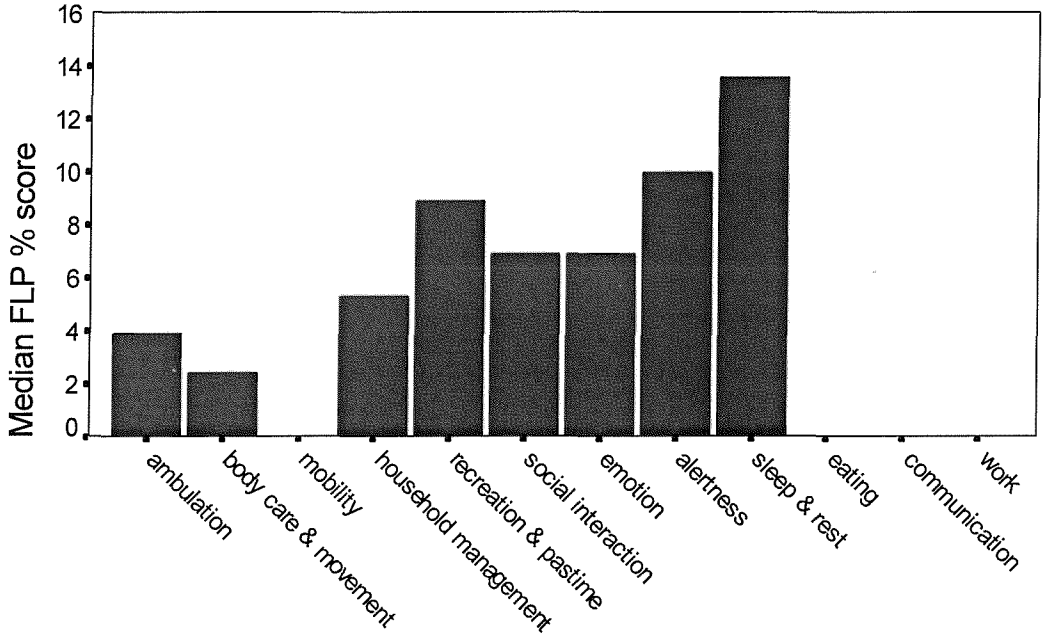


Figure 14.2: Median category scores for the FLP for the clinic dizzy sample (N=405)

Sleep and Rest

The highest median score was for the category of sleep and rest. This was initially surprising, as severe limitations in this area had not been anticipated. This is likely to be due to the effect of the distribution of responses within the category as described previously in Section 14.2.

Only just over a quarter of responders endorsed more than one item in this category. The majority of responders endorsed item SR108 (I sleep less at night) for which the item weight is equivalent to a category score of 14.5%. There is therefore a strong bias on the median category score for sleep and rest from this item. In addition, all item weights were similar and the average item weight for the category was 14.3%, which again is similar to the median category score.

Alertness

There were large numbers of responders for each of the items of the alertness category. Particular difficulties were reported for 'I have more minor accidents' (A94); 'I forget a lot' (A99); 'I make more mistakes than usual' (A101) and 'I have difficulty doing things which involve thought and concentration' (A102). The least relevant item was 'I sometimes get confused' (A98).

Recreation and pastimes

For those reporting limitations in the area of recreation and pastimes, particular difficulties were shorter time being spent on hobbies and recreation (RP56); going out less often for enjoyment (RP57); and having to cut down on some of the usual physical recreation and more active pastimes (RP62). The least affected area was inactive pastimes (RP59 and RP60), which is understandable since such activities are unlikely to involve movements to provoke dizziness.

Social interaction

The social interaction category was one of the largest categories on the FLP. Although social interaction was affected for the largest percentage of responders, not all items were relevant to individuals in the clinic dizzy sample. Particular areas of limitations were going out less often to visit people (SI64); being irritable with others (SI67); taking part in fewer social activities (SI69); decreased sexual activity (SI72) and expressing concern over health (SI73). The areas least affected for individuals in the clinic dizzy sample were making demands on others (SI75); getting angry with family (SI78); isolating oneself from the family (SI79); paying less attention to the children (SI80) and refusing contact with family (SI81).

Emotion

All items within this category were relevant to similar numbers of responders apart from having attempted suicide (EM87) and talking hopelessly about the future (EM91). Seven people (1.7%) did report that they had attempted suicide. The largest number of responders was for item EM90 indicating that dizzy individuals are irritable and impatient with

themselves. A large number of responders endorsed the items dealing with pain or discomfort (EM86 and EM89). Although this may initially not be expected in individuals with dizziness, this report may be related to the high proportion of responders indicating neck problems and arthritis.

Household management

A quarter of responders reported that they only did housework for short periods of time or rested often (HM46); did less of the household chores than they would usually do (HM47) and did not do any of the heavy work around the house (HM54). Few reported that they were completely unable to do any of the household chores (HM48); wash clothes (HM53) or take care of personal or household business affairs (HM55) or do any of the shopping that they would usually do (HM50).

Ambulation

The main limitations endorsed in this category were walking shorter distances or often stopping for rests (AMB1); walking more slowly (AMB12); using the stairs with a physical aid such as the handrail (AMB3); walking by oneself but with difficulty, for example wobbling (AMB7) and going up and down stairs more slowly (AMB9).

Body care and movement

The number of responders for each of the items in this category differed widely. The main items endorsed were 'I only stand for short periods' (BCM15); 'I do not keep my balance' (BCM16); 'I kneel, stoop or bend down only by holding on to something' (BCM19); 'I change position frequently' (BCM24) and 'I have trouble putting on my shoe, socks or stockings' (BCM29). Only 12% of responders reported that they did not keep their balance (BCM21).

Mobility

Almost three-quarters of responders did not report limitations in the mobility category. Initially it is perhaps surprising that this was the case when considering the implications of balance difficulties. However the items in this category are associated with severe limitations and reflect very restricted movement. For those who reported limitations, the

difficulties included not using public transport now (M40); staying at home most of the time (M41); only staying away from home for short periods (M44) and not getting about in the dark or places that are unlit except with someone to help (M45).

Eating

Over three-quarters of individuals in the clinic dizzy sample indicated no limitations in the eating category. Those who did mainly reported that they ate less than usual (E110) and ate special or different food (E112). This latter item includes a low salt diet that can be recommended for certain dizziness disorders. Five of the ten items in this category were not endorsed by any of the responders.

Communication

It was expected that certain aspects of communication would be limited because of the high prevalence of hearing difficulties within the clinic dizzy sample. Only 30% endorsed items in this category and the majority of these items were not related to hearing difficulties. The item with the highest number of responders was concerned with having trouble writing or typing (C119) which may be related to the prevalence of arthritis and not speaking clearly under stress (C127). Only 10% indicated that they could only carry on a conversation when very close to other people or when looking directly at them (C124) although this might be expected to be related to more severe hearing difficulties. Those with hearing difficulties had significantly higher scores on the communication category than those who did not and were over 3 times more likely to tick at least one item in the communication category (Odds ratio 3.39; 95% CI: 2.15 to 5.33).

Work

Work activities were not affected for 60% of responders. Of those who did report limitations in work, over half reported that they were not working or retired because of their health (W128). Of those who were working, only 25% reported limitations. The main difficulties were not getting as much work done as usual (W130); working shorter hours (W132) and not doing the job as carefully or as accurately as usual (W136). From the responses to the HTA rating scale for work, it is known that the majority of responders

reported that they had missed work or had not been able to carry out their usual activities because of dizziness. Items of the work category do not address this issue.

14.5.2 Category profile for the population dizzy sample

All median category scores for the population dizzy sample were zero. Examining the number of responders from the population dizzy sample to each item showed that the most relevant items were for the psychosocial categories of recreation and pastimes, social interaction, emotion, alertness and sleep and rest. This is not surprising since the psychosocial dimension median score is non-zero.

The item responses for the psychosocial dimension categories will be considered first followed by the physical dimension and the independent categories of eating, communication and work. The nature of the limitations reported in the population dizzy sample are similar to those reported in the clinic dizzy sample but are reported by proportionally fewer individuals in the population dizzy sample.

Recreation and pastimes

All items in this category were applicable to a small number of responders except the item concerning no longer doing inactive pastimes (RP59) which was endorsed by no responders. The most relevant items were going out less often to enjoy one's self (RP57) and cutting down on usual physical recreation or more active pastimes (RP62).

Social interaction

The majority of responses for social interaction concentrated on only 6 of the 20 items in this category. These were going out less often to visit people (SI64), being irritable with others (SI67), taking part in fewer social activities (SI69), reduced sexual activity (SI72), expressing concern over health (SI73) and staying alone much of the time (SI76). No responders indicated that they refused contact with their family because of their health (SI81).

Emotion

Responses for this category were evenly distributed across all of the items although a large number of subjects indicated that they were irritable and impatient with themselves (EM90).

Alertness

All items for this category were relevant to responders in the population dizzy sample although the least relevant item was not keeping attention on an activity for long (A100). The most relevant items were having more minor accidents (A94), forgetting a lot (A99) and having difficulty reasoning and solving problems (A97).

Sleep and rest

The majority of responders in this category reported sleeping less at night (SR108) and the second most relevant item was sleeping or dozing more during the day (SR109).

Ambulation

The relevant items from the ambulation category were concerned with mild limitations in walking and using the stairs. The items responded to by the greatest number of responders were walking more slowly (AMB12) and walking shorter distances or often stopping for rests (AMB1).

Body care and movement

The majority of responses in this category concentrated on restrictions in movement for example kneeling or bending down only by holding on to something (BCM19), only standing for short periods (BCM14), making difficult movements with help (BCM13), not keeping balance (BCM16) and being clumsy (BCM21).

Mobility

All items were responded to by at least one individual in the population dizzy sample, which was surprising since certain items of the mobility category were concerned with

severe restrictions in mobility. The most relevant items involved not using public transport (M40) and not going into town (M43).

Household management

The most relevant item in this category was concerned with not doing heavy work around the house (HM54). Other relevant items for the population dizzy sample were only doing housework for short periods or often resting (HM46), not doing the usual maintenance or repair work (HM49) and doing less of the daily household chores (HM47).

Eating

Only half of the items of this category were endorsed. The majority of responses were for the items concerned with eating less than usual (E110) and eating special or different food such as low salt food (E112).

Communication

The majority of communication difficulties reported by the population dizzy sample were trouble with writing or typing (C119) and only being able to carry on a conversation when very close to other people or when looking at them (C124).

Work

Only 16% of responders reported that they no longer worked because of their health (W128). The most common limitation for work was working for short periods or often stopping for a rest (W134), which was endorsed by only three responders (5%). The remaining items were relevant to only one or no responders.

14.6 DIMENSION PROFILE OF THE QUALITY OF LIFE OF CLINIC AND GENERAL POPULATION SAMPLES OF DIZZY INDIVIDUALS

The distribution of scores for each of the FLP dimensions and the overall score for both samples of dizzy individuals is illustrated in Figure 14.3.

The score for the psychosocial dimension was significantly greater ($p<0.001$) than the score for the physical dimension in the clinic dizzy sample. Scores in the clinic dizzy sample were significantly greater than in the population dizzy sample ($p<0.001$).

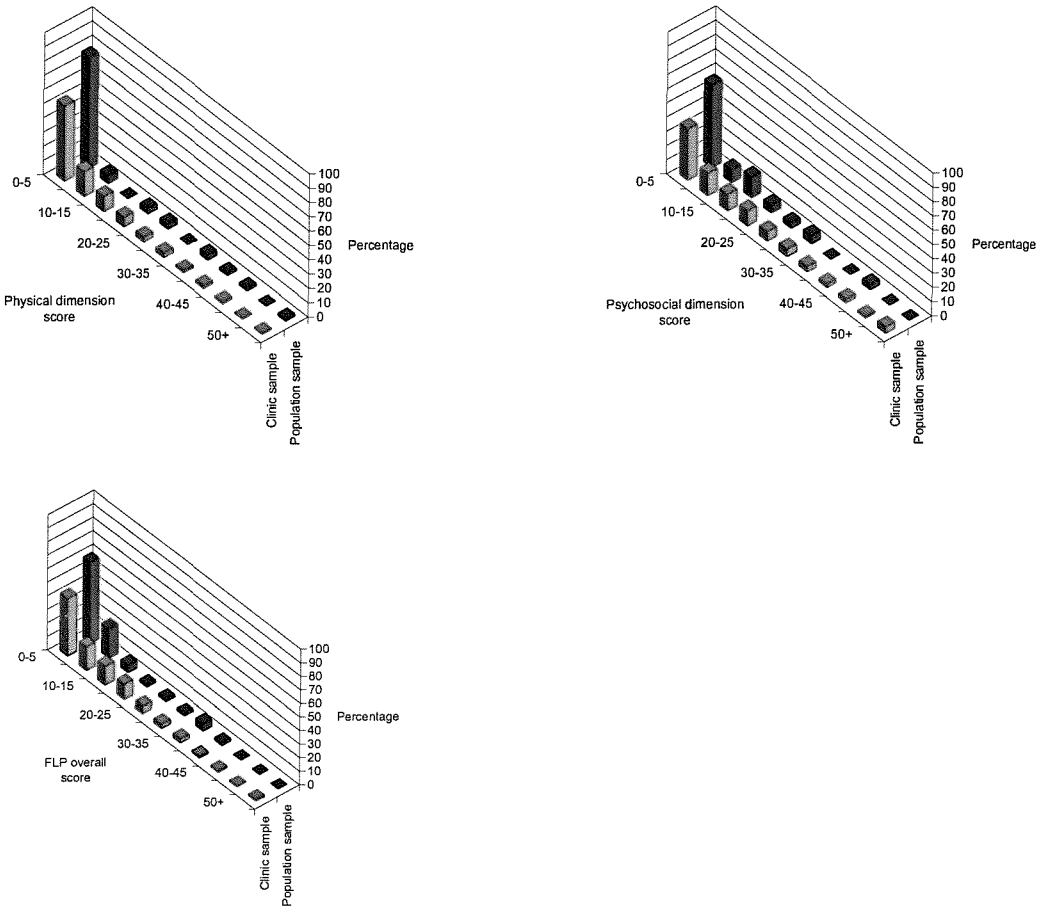


Figure 14.3: Distribution of FLP overall and dimension scores for clinic (N=405) and population (N=55) dizzy samples

14.7 AGE AND FLP SCORES

As for examining the effects of age on the DHI scores, age was recoded for both dizzy samples into six age bands - 18-30 years, 31-40 years, 41-50 years, 51-60 years, 61-70 years and 71-86 years.

14.7.1 Age effect on FLP scores in the clinic dizzy sample

There was a significant effect of age group on the median scores for the physical dimension and its category of ambulation (Kruskal-Wallis test; $p<0.05$). No effect was evident for the remaining categories in the physical dimension of body care and movement, household management or mobility.

There was no significant difference in the psychosocial dimension score between age groups. The only category of this dimension demonstrating a significant effect with age was alertness (Kruskal-Wallis, $p<0.05$). In the alertness category, scores were found to decrease after middle age (41-60 years). Although as people get older their concentration and mental ability reduces, the challenges placed on these and the global implications of such limitations are reduced due to no longer working, less demanding activities and possibly lower expectations for example. The higher score in middle age may also reflect hormonal changes occurring at this time, particularly in female responders.

The strongest effect of age in the clinic dizzy sample was evident for the physical aspects of quality of life as measured on the FLP, in particular ambulation. This is not surprising especially with the increased report of conditions such as arthritis in the older age groups of the clinic dizzy sample.

14.7.2 Effect of age on FLP scores in the population dizzy sample

In the population dizzy sample there was a significant effect of age on the FLP scores for the physical dimension and overall scores (Kruskal-Wallis, $p<0.05$). The effect was also significant for all of the categories contributing to the physical dimension. In the psychosocial dimension, the only significant effect was for the social interaction category. There was also a significant effect of age on the FLP eating category.

There was a greater effect of age on the FLP scores in the population compared with the clinic dizzy sample. The severity of dizziness symptoms in the population dizzy sample have been found to be significantly lower than in the clinic dizzy sample while there is a similarly frequent report of other health problems in both dizzy samples. In particular, approximately a quarter of individuals in the clinic and population dizzy samples reported

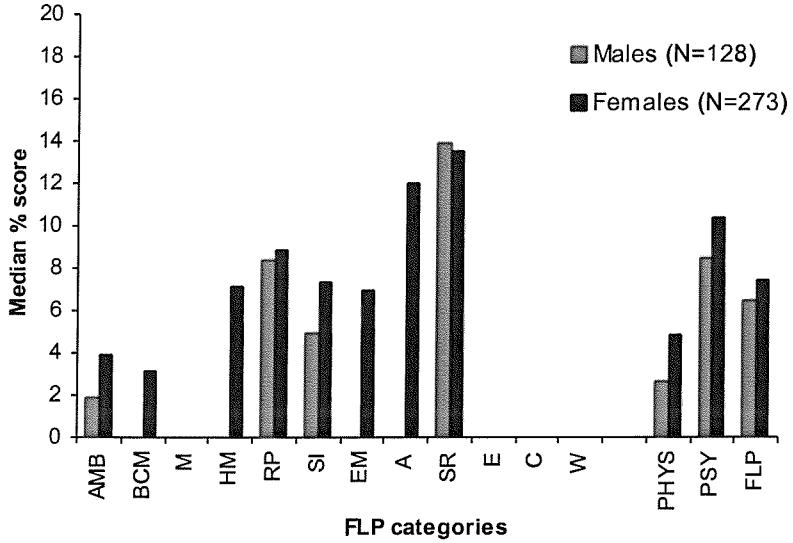
arthritis of lower limbs. This may explain the age effect observed in the clinic dizzy sample.

Since the quality of life for the population dizzy sample is significantly better, it may be that the quality of life scores measured are due to the presence of the other individual health problems in addition to the typically milder dizziness problems. It is reasonable to assume that the more severe dizziness in the clinic compared with the population dizzy sample will cause a greater reduction in quality of life in its own right and the influence of individual health problems is reduced. This may explain the stronger effect of age, especially within the physical dimension and its categories, in the population dizzy sample compared with the clinic dizzy sample.

14.8 SEX DIFFERENCES FOR FLP SCORES

Differences in scores on the questionnaire for males and females were investigated at both the dimension and category level. The median FLP scores for male and female dizzy individuals in the two dizzy samples are illustrated in Figure 14.4.

(a) Clinic dizzy sample



(b) Population dizzy sample

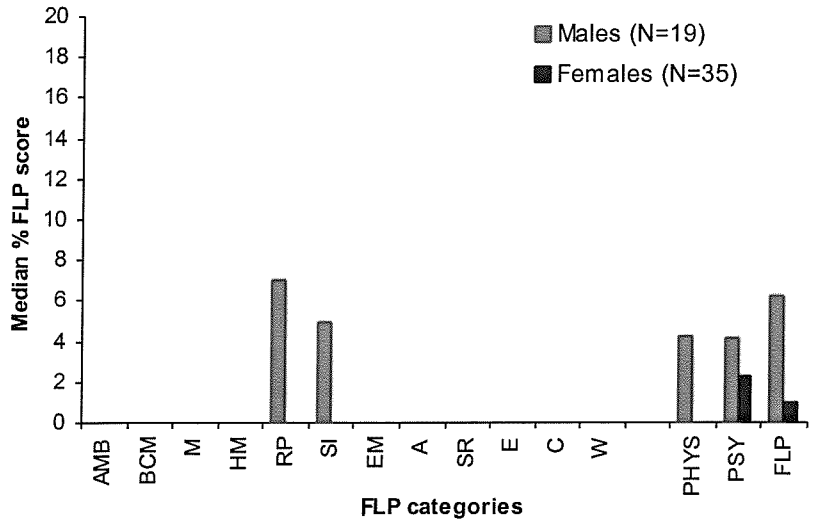


Figure 14.4: FLP category scores for males and females in the clinic (a) and population (b) dizzy samples (Key: AMB=ambulation; BCM=body care & movement; M=mobility; HM=household management; RP=recreation and pastimes; SI=social interaction; EM=emotion; A=alertness; SR=sleep & rest; E=eating; C=communication; W=work; PHYS=physical dimension; PSY=psychosocial dimension; FLP=FLP overall score)

14.9 EFFECT OF OTHER HEALTH PROBLEMS ON FLP SCORES

There was a frequent report of other health problems in addition to dizziness in the clinic and population dizzy samples. The FLP is a generic questionnaire and the instructions are written so that items are endorsed when affected by health in general. It was possible that aspects of the profile were due to the other health problems rather than due to the dizziness in its own right or due to an interaction between certain health problems and the dizziness. However since this was a survey of dizzy individuals, these other health problems were representative of the patient group and important in assessing the quality of life.

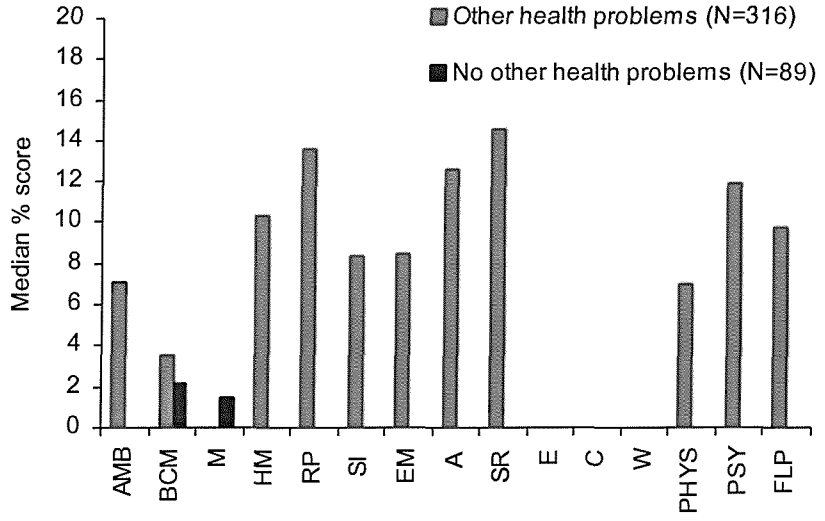
It might be expected that certain problems were more likely to cause a reduction in quality of life than others. It is also possible that certain problems reported such as anxiety or depression and neck problems were as a result of the dizziness itself. It may be that the presence of other health problems in combination with dizziness may result in individuals seeking help for the dizziness.

The format of the symptom questionnaire does not allow pre-existing health problems and those arising as a consequence of the dizziness to be differentiated. An additional

difficulty in examining the effect of other health problems on the FLP scores is that only small numbers of responders had just one other health problem. This meant that it was not possible to look at the effects of specific health problems.

The profiles for those with and without other health problems are shown for the two dizzy samples in Figure 14.5.

(a) Clinic dizzy sample



(b) Population dizzy sample

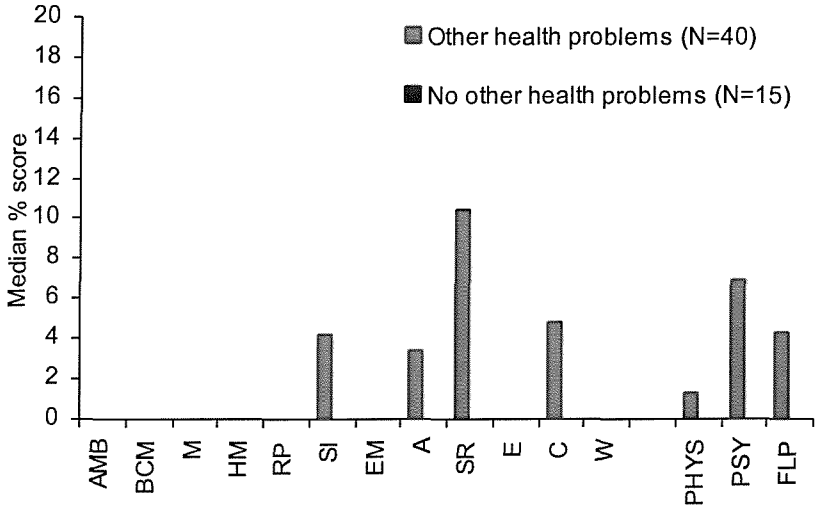


Figure 14.5: Median FLP category and dimension percentage scores for those with and without other health problems in the clinic (a) and population (b) dizzy samples. (Key: AMB=ambulation; BCM=body care & movement; M=mobility; HM=household management; RP=recreation and pastimes; SI=social interaction; EM=emotion; A=alertness; SR=sleep & rest; E=eating; C=communication; W=work; PHYS=physical dimension; PSY=psychosocial dimension; FLP=FLP overall score)

Those who reported other health problems had significantly[1] higher FLP scores than those who reported no other health problems for all dimensions and categories in the clinic dizzy sample (Mann-Whitney U test, $p<0.001$). In the population dizzy sample, those with other health problems had significantly greater scores for the psychosocial dimension, social interaction and alertness (Mann-Whitney U test, $p<0.01$).

The interaction between dizziness and other health problems is an important issue for both understanding the quality of life of dizzy individuals and for the management of these individuals in a clinic population.

14.10 RELATIONSHIP BETWEEN SYMPTOM CHARACTERISTICS AND FLP SCORES

Relationships between symptom characteristics as assessed on the symptom questionnaire and the FLP scores were examined for the clinic dizzy sample. Examination of these relationships for the population dizzy sample would not be meaningful since the majority of median scores on the FLP were zero and the number of responders in each of the symptom groups was small.

14.10.1 Duration of dizziness problems

No significant effect of duration of dizziness problems was found on either the dimensions or categories of the FLP (Kruskal-Wallis $p>0.1$).

14.10.2 Length of dizziness attacks

The median FLP scores for each dimension and category against length of attacks is shown in Figure 14.6

Graphs for the eating, communication and work categories are not shown since the majority of median scores were zero. An effect of length of attack was found on the physical dimension and overall score and for the eating and household management

[1] p value adjusted to 0.01 for significance at the 5% level for multiple comparisons (see Appendix 6)

categories (Kruskal-Wallis $p<0.05$). Further examination did not reveal a clear pattern to the significant differences[2] detected (Mann-Whitney U test $p<0.01$).

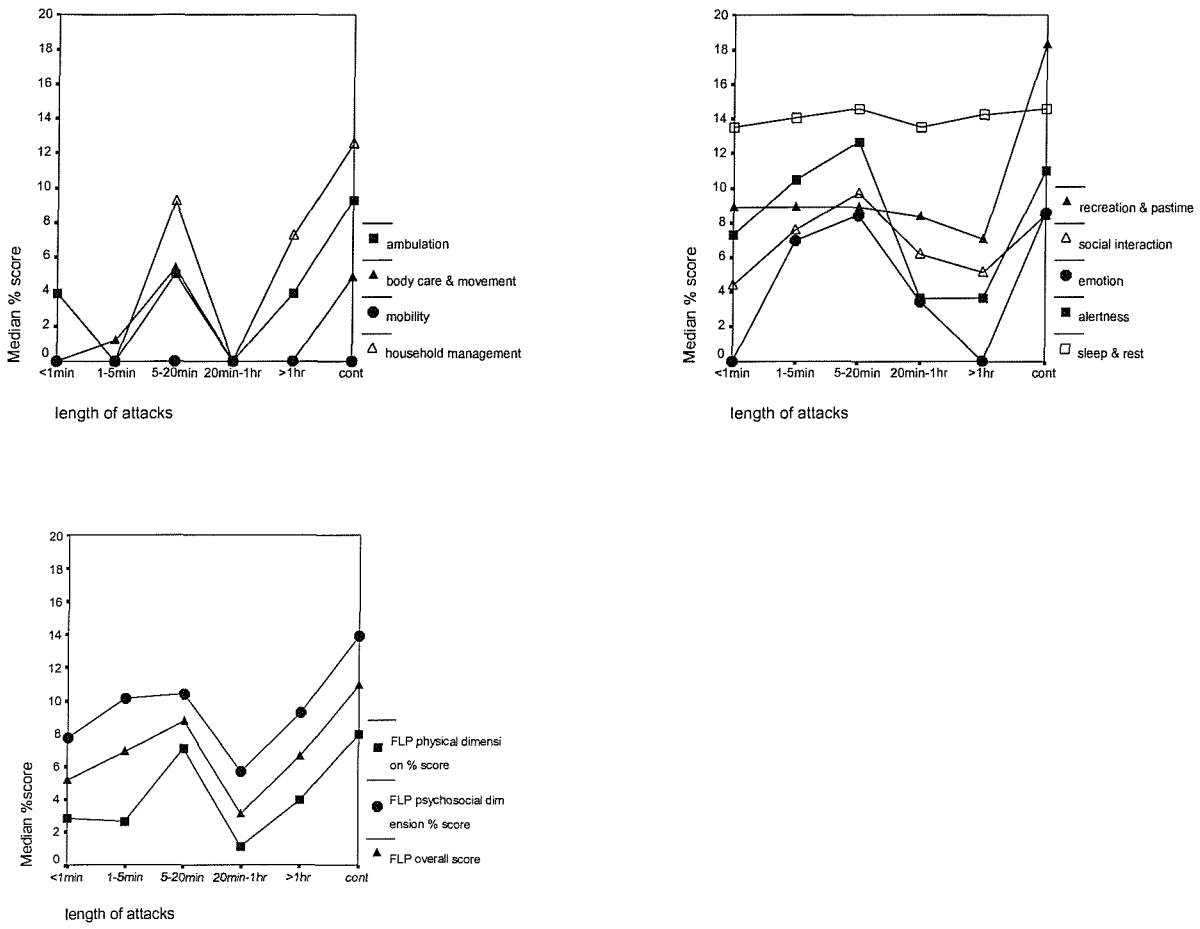


Figure 14.6: Median dimension and category scores against length of attacks in the clinic dizzy sample (N=394).

The majority of differences involved short duration attacks of less than five minutes and the longer attacks lasting more than an hour or continuously. As for the DHI, it is possible that the relationship between length of attack and the dimension scores represents the effects of two distinct disorders; one with short duration attacks (shorter than 20 minutes) and one with longer duration attacks (longer than 20 minutes).

[2] p value adjusted to 0.01 for significance at the 5% level for multiple comparisons (see Appendix 6)

14.10.3 Frequency of dizziness attacks

The median FLP dimension and category scores for each of the frequencies of attack after recoding into decreasing order of frequency are shown in Figure 14.7.

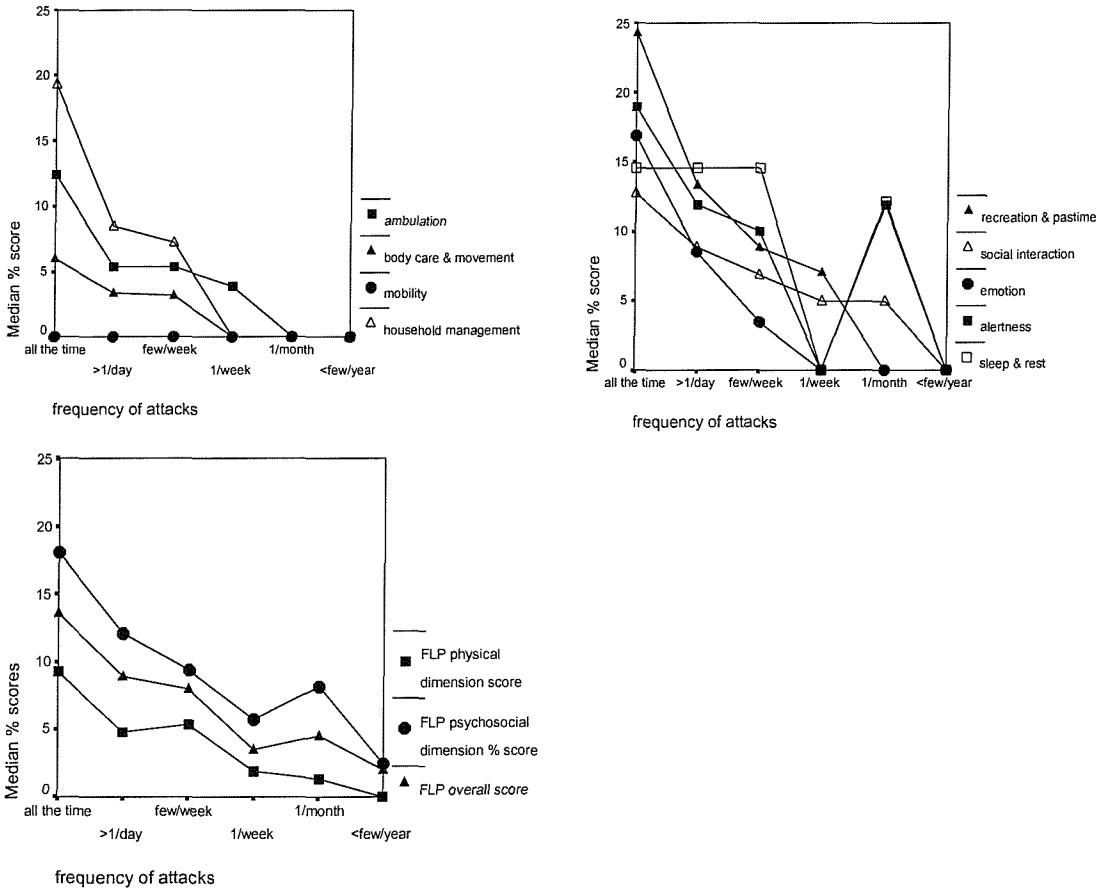


Figure 14.7: Median dimension and category scores against frequency of attacks in the clinic dizzy sample (N=392).

The groups with attacks occurring a couple of times per year and once per year were combined because of the small number of responders in each. The median scores for all frequency groups for the independent categories of eating, communication and work were zero except for the work category for those with dizziness all the time. These are not shown here.

As frequency of attacks increased, the median scores tended to increase towards worse quality of life in each of the dimensions and categories. A significant effect of frequency

of attacks was found for all dimension, overall and category scores except the eating category (Kruskal-Wallis test $p<0.05$).

The majority of significant differences were between frequent attacks occurring at least a few times per week or all the time and those occurring either once per month or only a few times per year. The closer the temporal characteristics of the attacks, the fewer significant differences between scores were observed.

Median scores for the physical categories tended towards zero for attacks around once per week and less. The exception to this was the mobility category where the median score was zero irrespective of the frequency of attacks.

The report of limitations extended to less frequent attacks for all psychosocial categories except emotion for which the median score was zero for attacks occurring less than a few times per week.

14.10.4 Provoking factors for the dizziness attacks

No effect of the provoking factor for dizziness attacks was found for any of the FLP dimension or category scores. This is in contrast to the effect of these on handicap as measured by the DHI where those attacks caused by head or body movements were found to have a significant effect on the physical handicap scale.

14.10.5 Symptom severity rating

The effect of the symptom severity rating for both nowadays and today on FLP scores was investigated. Figure 14.8 shows the median scores on the FLP for each of the groups defined by the symptom severity ratings. Again the eating, communication and work category scores are not shown. As symptom severity increased, the FLP scores for the dimensions and categories also tended to increase.

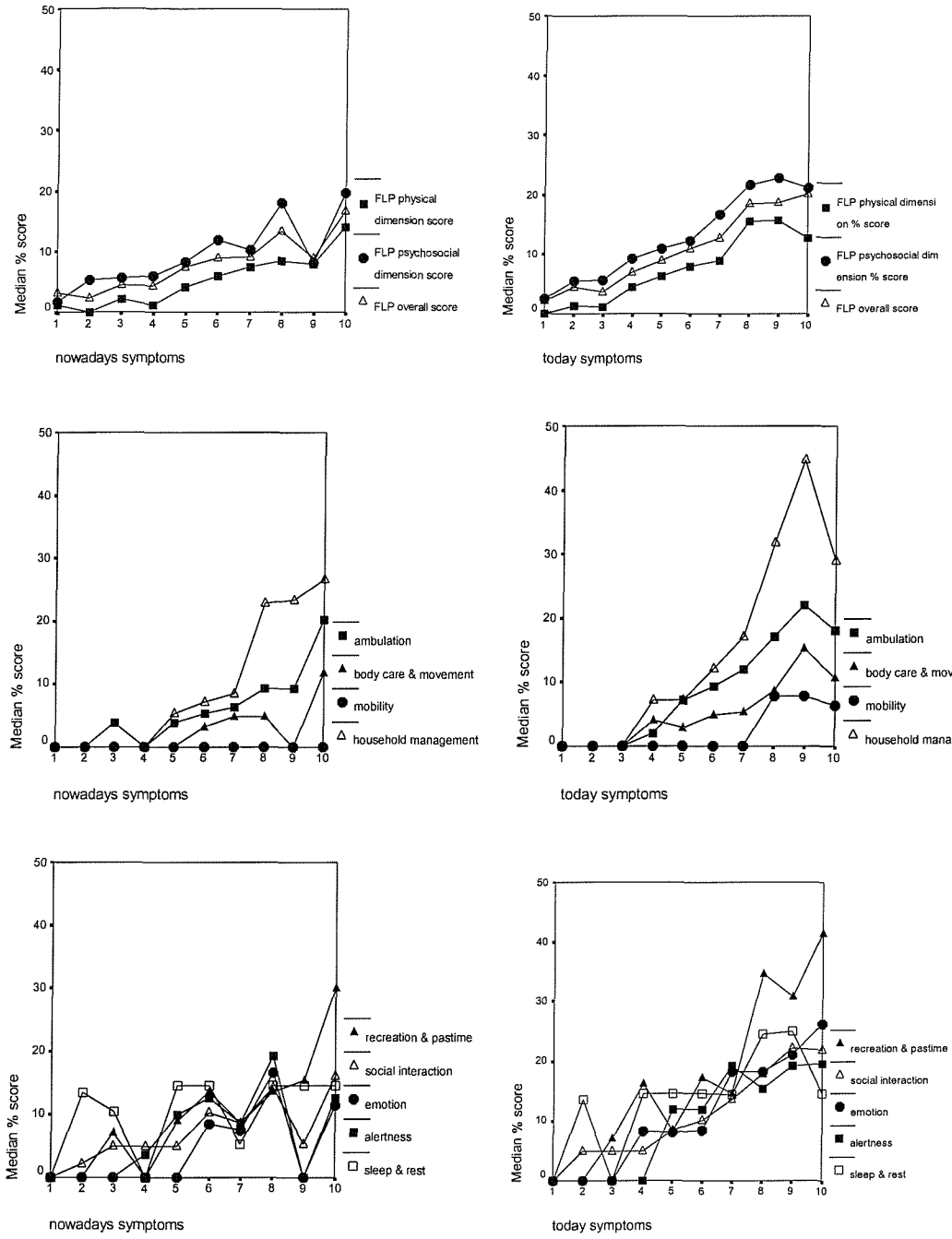


Figure 14.8: Median dimension and category scores against symptom severity rating for today and nowadays in the clinic dizzy sample (N=390).

A significant effect of symptom severity for nowadays was found for all dimension and category scores except the work category (Kruskal-Wallis test $p<0.05$) and for all dimension and category scores for symptom severity today (Kruskal-Wallis test, $p<0.01$).

14.10.6 FLP profile for incapacitated versus not incapacitated responders

It was expected that the report of being incapacitated by the dizziness attacks would be related to the ability to carry out daily activities and to a lesser extent social activities. It was not thought to be related to the emotional responses to the dizziness. Those who were incapacitated would have a greater impact of dizziness on these aspects of the FLP.

The profiles of category and dimension median scores for those who reported that they were incapacitated by the attacks of dizziness and those who were not are shown in Figure 14.9. The profile for those who reported that they were incapacitated by the dizziness attacks is similar to that for the overall sample. All median category scores for those not incapacitated were zero except for social interaction.

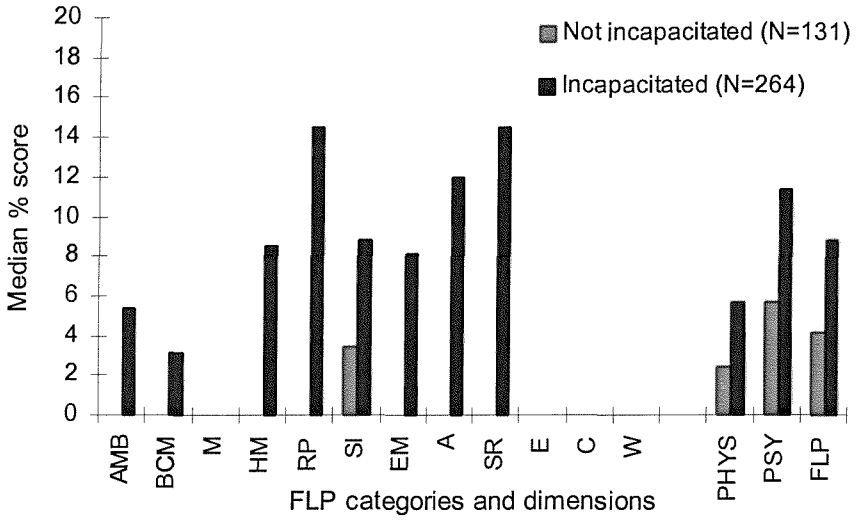


Figure 14.9: FLP category and dimension scores for those who give a self-report of being incapacitated by the attacks of dizziness and those who are not incapacitated.
(AMB=ambulation; BCM=body care & movement; M=mobility; HM=household management; RP=recreation & pastimes; SI=social interaction; EM=emotion; A=alertness; E=eating; C=communication; W=work; PHYS=physical dimension; PSY=psychosocial dimension; FLP=overall FLP score)

Those who gave a self-report of being incapacitated by the attacks of dizziness had significantly[3] worse dimension and overall FLP scores than those who were not incapacitated (Mann-Whitney U test, $p<0.01$). At the category level, all physical category scores were significantly worse while only the psychosocial categories of recreation and

[3] p value adjusted to 0.01 for significance at the 5% level for multiple comparisons (see Appendix 6)

pastimes and social interaction were significantly worse for those who reported that they were incapacitated by the dizziness (Mann-Whitney U test, $p<0.01$).

As anticipated, the pattern of significant differences found shows that the greatest reductions in quality of life are for the physical and social activities in those dizzy individuals who report being incapacitated by dizziness.

14.11 FLP SCORES AND HTA RATINGS

14.11.1 Work HTA rating

The work HTA rating was concerned with the amount of time the responder has been unable to carry out their work or normal activities because of the dizziness. This may include not only work related activities but also social activities and managing the home.

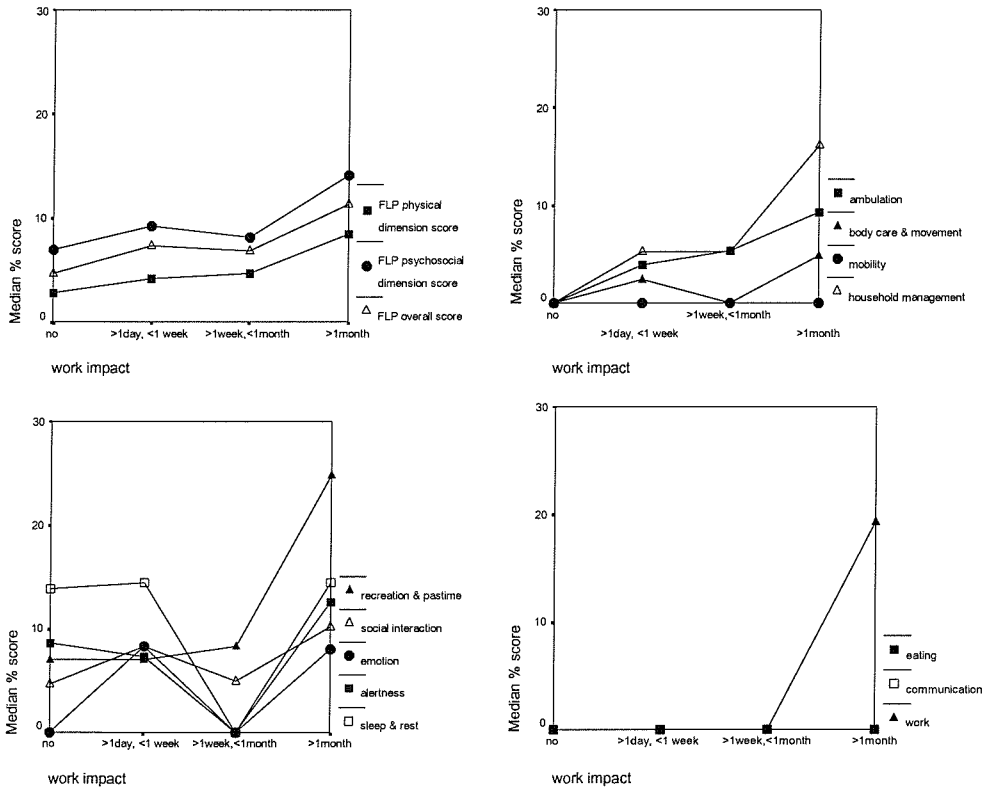


Figure 14.10: Median dimension and category scores for the groups defined by the work HTA rating in the clinic dizzy sample (N=399).

A significant relationship was therefore expected between the work HTA rating scale and the FLP categories of ambulation, mobility, household management, recreation and pastimes and social interaction in addition to the more obvious work category. The relationship with ambulation and mobility is proposed since the ability to function in these areas is needed to be able to do the other activities considered by this rating scale.

Median FLP scores for each of the groups defined by responses to the HTA rating scale are shown in Figure 14.10.

A significant effect of the HTA work rating was found on both dimensions, the overall FLP score and the categories of ambulation, mobility, household management, recreation and pastimes, social interaction and work (Kruskal-Wallis, $p<0.05$).

14.11.2 Worry, annoyance and upset HTA rating

The HTA rating was concerned with the worry, annoyance and upset associated with the dizziness. The strongest relationship was anticipated with the psychosocial dimension and its categories, in particular the emotion category. However it is also possible that increased physical difficulties may cause annoyance and upset. The combining of these three feeling states within the HTA rating means that relationships were expected with the majority of FLP categories and dimensions.

The median scores for the dimensions and categories for the four groups defined by responses to the rating scale are shown in Figure 14.11.

A significant association between the rating scale and all median dimension and category scores except the eating category was found (Kruskal-Wallis $p<0.05$). Median scores for eating, communication and work are not shown as these were zero or near zero.

Apart from the group reporting no worry where there was only a small number of responders (N=23), there was a trend towards greater median scores as greater amounts of worry, annoyance and upset were reported on the HTA rating scale.

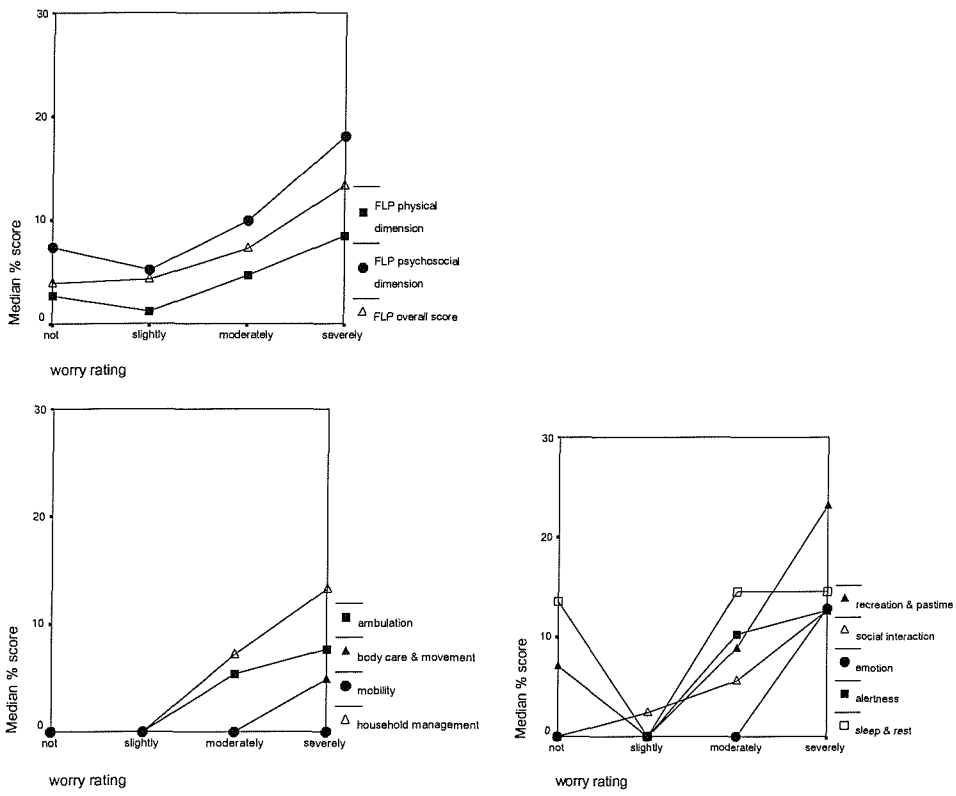


Figure 14.11: Graphs of median scores for the four groups defined by the worry HTA rating scale in the clinic dizzy sample (N=398).

14.11.3 Quality of life HTA rating

A strong relationship was expected between quality of life as reported on the FLP and that reported on the HTA quality of life rating scale. This was particularly the case for those aspects of the FLP that were important in the profile of quality of life of dizzy individuals, that is the physical and psychosocial dimensions and the categories that contribute to these.

The dimension and category median scores for each of the groups defined by the response to the HTA quality of life rating scale are shown in Figure 14.12.

The median FLP scores for those who reported that quality of life was not affected by the dizziness were non-zero for the psychosocial and overall score. FLP scores for healthy individuals are non-zero (Charlton, 1989) so this is not surprising. The physical dimension score was zero for those reporting no reduction in quality of life. For the physical categories, median scores were zero until quality of life was reported to be moderately

affected by dizziness whereas for the psychosocial categories, zero scores were only found for those who reported no impact on quality of life.

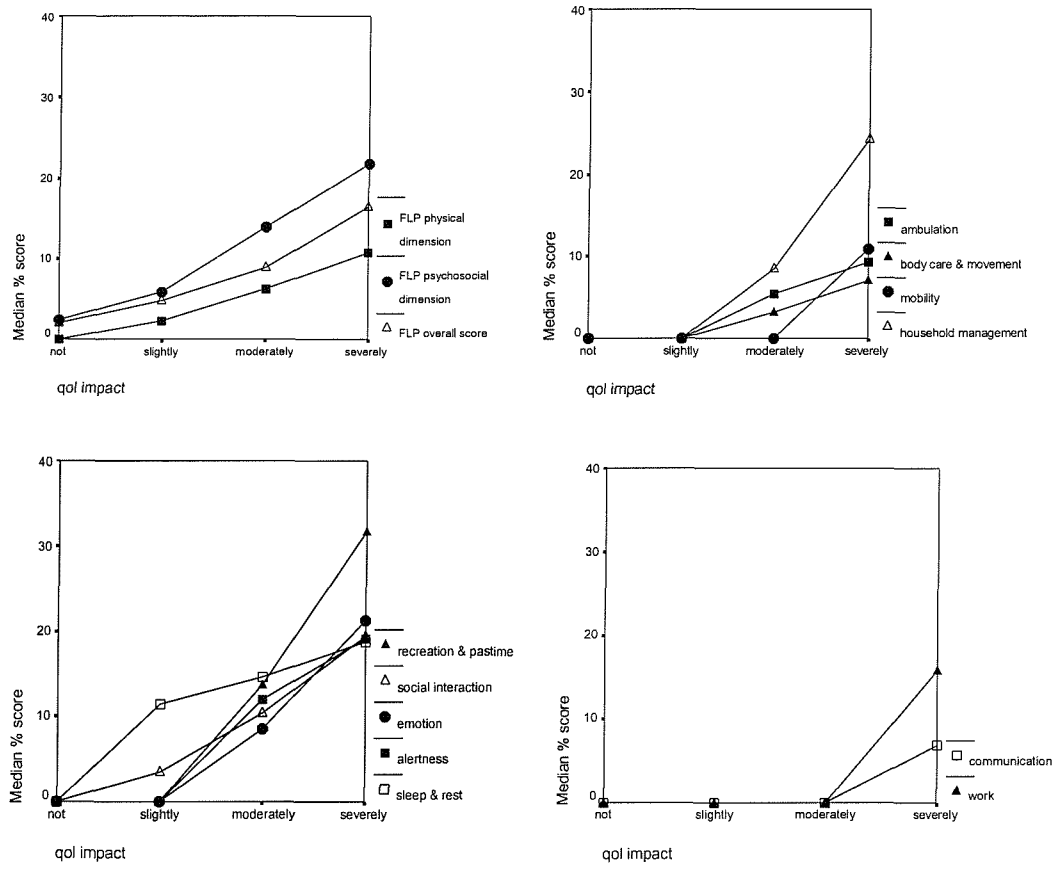


Figure 14.12: Graphs of median scores for the patient groups defined by the quality of life HTA rating scale in the clinic dizzy sample (N=399).

14.11.4 Summary

The report of quality of life as measured by the FLP provides a good representation of the self-report of performance on the HTA rating scales.

Limitations in lifestyle	FLP overall score
No limitations	0-5%
Mild limitations	5-10%
Moderate limitations	10-15%
Severe limitations	>15%

Table 14.2: Meanings of FLP overall scores for dizzy individuals

From the median and interquartile ranges for FLP scores for each of the groups defined by the quality of life HTA rating scale, the interpretations of the overall FLP score shown in Table 14.2 are proposed for dizzy individuals.

The prevalence of each category of limitations in lifestyle in both the clinic and population dizzy samples is shown in Table 14.3.

Limitations in lifestyle	Percentage of responders	
	Clinic dizzy sample	Population dizzy sample
No limitations	40%	57%
Mild limitations	16%	17%
Moderate limitations	12%	7%
Severe limitations	32%	19%

Table 14.3: Prevalence of the severity of limitations in lifestyle in clinic (N=405) and population (N=55) dizzy samples

From these results, 32% of the clinic dizzy sample was classified as experiencing severe limitations. Although nearly 60% of those in the population dizzy sample were classified as reporting no limitations, almost 20% had severe limitations.

14.12 COMPARISON WITH OTHER FINDINGS

The FLP has not previously been applied to a population of dizzy patients, although the Sickness Impact Profile has in its Swedish form (Mendel *et al.,* 1999) and the original US form (Kroeneke *et al.,* 1993).

Unfortunately limitations in the studies carried out including poor analysis and presentation of results and small subject numbers as discussed in Section 2.11 restrict the comparisons that can be made between previous results and those from the current survey. Although there are some similarities between results there are also a number of differences, which may be explained by the limitations in the studies.

14.12.1 Profile of impact on quality of life

As in the current survey, the greatest reduction in quality of life has previously been found in the psychosocial dimension in a study of vestibular outpatients using the Swedish

version of the SIP (Mendel *et al.,* 1999). It should be remembered that the category structure of the SIP psychosocial dimension is different to that of the FLP and does not contain the categories recreation and pastimes or sleep and rest but does include communication. The scores for all categories are not presented in the paper, which prevents further comparison of the profile of quality of life.

Comparison of SF-36 scores for dizzy individuals with healthy comparison data adjusted for age and sex only found significant reductions in quality of life in three of the eight dimensions of the questionnaire (Fielder *et al.,* 1996). One of these was role limitations due to physical problems which is the emphasis of the FLP questionnaire. In the current study, the quality of life of dizzy individuals in the clinic sample was significantly lower (Mann-Whitney U-test, $p<0.001$) than that in the 'normal' population sample across all categories and dimensions of the questionnaire.

A study of the activities of daily living affected by dizziness found the greatest difficulties for those activities involving ambulation and head movements (Cohen, 1992). Many of these areas of activities affected are evident from the profile of quality of life across the categories of the FLP.

14.12.2 Symptoms and dizziness characteristics

Apart from the study by Mendel *et al.* (1999), the relationship between dizziness symptoms and quality of life has not been examined, and even in that study the investigation is limited.

A negative effect of age has previously been reported on the work category and psychosocial dimension of the Swedish SIP (Mendel *et al.,* 1999). This was concluded based on examination of the correlations between age and the SIP scores. As was found for the present survey, correlations can provide a meaningless impression of the relationship between two variables, and that the statistical significance of a correlation does not necessarily mean that the relationship is clinically significant. The failure to include graphical representations of the relationships means it is difficult to interpret the clinical significance of such correlations. In contrast, the results of the current survey found the strongest effect of age to be on the physical dimension and its categories.

An effect was also reported for the duration of dizziness problems on the psychosocial dimension again using the significance of the correlation coefficient (Mendel *et al.,* 1999). This was not found in the present survey although duration was measured as a categorical rather than as a continuous variable expressed in months. An effect of the length of attacks had previously been found on the work category and overall score on the FLP (Mendel *et al.,* 1999). Although different methods of measurement for the length of attacks was adopted, in the present survey, length of attacks was found to have a significant effect on a wider range of aspects of quality of life. These were physical dimension, overall score and the categories of eating and household management. There also appears to be a different effect for short and long duration attacks of dizziness on the FLP dimension scores, which was also found when assessing handicap.

Sex differences have previously been found for the FLP work category with men indicating a worse level of work functioning than women (Mendel *et al.,* 1999). This was not found in the current study, which has a larger sample size.

14.13 PREVALENCE OF MATERIAL REDUCTION IN QUALITY OF LIFE

A material reduction in quality of life was defined as a score on the FLP categories and dimensions greater than the 10th percentile of the population 'normal' sample surveyed in Appendix 12. The 10th percentile is defined here as the FLP score exceeded by only 10% of the population 'normal' sample. The questionnaire scores for the 10th percentile in the population 'normal' sample are shown in the left hand side of Table 14.4.

The right hand side of Table 14.9 shows the percentage of individuals in the clinic and population dizzy samples with questionnaire scores greater than the 10th percentile in the population 'normal' sample.

As would be expected, there were larger percentages of individuals in the clinic dizzy sample with a material reduction in quality of life than for the individuals in the population 'normal' sample.

In the clinic dizzy sample, 65% of individuals had an overall material reduction in quality of life. From the percentages for the population dizzy sample, 45% had an overall material reduction in quality of life. A significantly greater proportion of dizzy individuals in both dizzy samples had a material reduction for the psychosocial dimension compared with the physical dimension.

FLP category or dimension	Normal population 10th percentile FLP scores	Percentage (95% CI) with FLP scores greater than the normal 10th percentile	
		Clinic dizzy sample	Population dizzy sample
Ambulation	4.18%	49% (44%; 54%)	24% (12%;35%)
Body care and movement	0.49%	52% (47%; 57%)	33% (20%; 45%)
Mobility	0%	30% (25%; 34%)	18% (8%; 27%)
Household management	0%	54% (49%; 59%)	35% (22%; 47%)
Physical dimension	2.26%	60% (55%; 65%)	35% (22%; 47%)
Recreation and pastimes	0%	60% (55%; 65%)	33% (20%; 45%)
Social interaction	4.97%	53% (48%; 58%)	35% (22%; 45%)
Emotion	0%	50% (45%; 55%)	35% (22%; 45%)
Alertness	0%	54% (49%; 59%)	40% (27%; 53%)
Sleep and rest	14.55%	30% (25%; 34%)	20% (9%; 31%)
Psychosocial dimension	4.83%	64% (59%; 69%)	42% (28%; 55%)
Eating	0%	23% (19%; 27%)	16% (6%; 26%)
Communication	0%	29% (24%; 33%)	18% (8%; 27%)
Work	0%	40% (35%; 45%)	20% (9%; 31%)
FLP overall score	3.47%	65% (60%; 70%)	45% (32%; 59%)

Table 14.4: Percentages (and 95% confidence intervals) of individuals in the clinic and population dizzy samples with material reduction in quality of life (i.e. FLP scores greater than the 10th percentile in the normal population sample)

14.13.1 Prevalence of material reduction in quality of life in the general population

14.13.1.1 Estimate of prevalence in the general population

Those returning questionnaires have been assumed to be representative of the populations from which the sample was obtained (see Section 12.3). Of the 55 individuals in the population dizzy sample reporting dizziness, 45% were found to have a material reduction in quality of life based on the overall FLP score. This sample does not include those responders from the general population with dizziness who had additional nose and throat problems. Of those who returned questionnaires in the survey of dizzy individuals in the

general population and who reported dizziness and nose and throat problems, 43% had a material reduction in quality of life.

There was no bias in the report of no dizziness nowadays between those who returned questionnaires and those who gave a reason for not returning the questionnaires. There were no age or sex differences between responders and non-responders. It was therefore assumed that there was no bias in the prevalence of the material reduction in quality of life between responders and non-responders. Although those who gave a reason for non-return were significantly younger than those who did not give a reason when asked, any effect of this is likely to result in a conservative estimate of prevalence in the general population.

Assuming no bias between responders and non-responders, of the population dizzy sample returning completed questionnaires (N=146), 22% (95% CI: 15% to 29%) reported dizziness and a material reduction in overall quality of life.

If instead a bias is supposed that three times as many individuals have a material reduction in quality of life in the responding sample compared with the non-responders, the estimate of the proportion of individuals in the general population reporting dizziness and a material reduction in overall quality of life is reduced to 12% (95% CI: 8% to 16%). This is an overcautious assumption about any possible bias but still results in a substantial proportion of dizzy individuals with material reduction in quality of life.

14.13.1.2 Conclusion

The prevalence of dizziness with a material reduction in quality of life in the adult general population is 22% (95% CI: 15% to 29%). A material reduction in quality of life is defined as an overall score on the FLP questionnaire greater than the score for the 10th percentile in the normal sample of the general population presented here.

14.14 CONCLUSION

Quality of life is reduced in dizzy individuals both in clinic and population dizzy samples. As expected, individuals in a clinic dizzy sample have significantly worse quality of life than individuals in the general population dizzy sample. An estimated 65% of dizzy

individuals in a clinic dizzy sample and 45% of dizzy individuals in the general population have dizziness with a material reduction in quality of life. It is likely that those individuals in the general population who have a greater reduction in quality of life and report more limitations are those who seek help for their dizziness. These individuals are typical of the dizzy individuals in the clinic dizzy sample who report a significantly worse quality of life than those in the general population.

Characteristics of the dizziness in the clinic dizzy sample that appear to be particularly important in their relationship with quality of life are the frequency of attacks and the severity of the symptoms experienced. The small number of dizzy responders in the general population dizzy sample means that such relationships could not be examined for the general population.

It could be argued that the other health problems[4] reported in the dizzy groups could have materially affected the measured quality of life scores rather than the primary complaint of dizziness. However, strong relationships have been demonstrated between the quality of life scores and the characteristics of the dizziness reported in the clinic dizzy sample. It is reasonable to expect that if it was the other health problems that were primarily affecting the quality of life scores, these statistically significant relationships would not be observed. Furthermore, despite a similar prevalence of other health problems in both the clinic and population dizzy samples, there are highly significant differences in the quality of life scores between the two dizzy groups. It is therefore reasonable to conclude that the differences in the characteristics (severity and nature) of the dizziness shown between the two dizzy samples (see Section 12.0) predominantly explain the difference in quality of life between the two groups.

A contribution from the other health problems is not denied and any contribution from the other health problems on the quality of life scores and interaction with the dizziness cannot be quantified in this study. Further work is needed to clarify the role played by the other health problems. In view of the arguments presented here, it is considered reasonable to

[4] It should be noted that no distinction has been made in this study between the other health problems reported that pre-existed the dizziness and those that arose because of the dizziness. Since the other health problems that arose because of the dizziness are important in terms of the individual's response to the dizziness this discussion refers to only pre-existing other health problems.

assume that the reduction in quality of life presented here is representative of the limitations experienced by dizzy individuals in both clinic and general population samples.

The score in the psychosocial dimension of quality of life was significantly worse than that in the physical dimension for the clinic sample of dizzy individuals. This profile is not observed with the DHI where the score for the physical subscale was significantly greater than in the functional and emotional subscales. It should be remembered that for the DHI, the physical subscale tends to represent the postural effects of dizziness rather than limitations in daily activities.

The profile of quality of life and report of limitations as measured on the FLP is as expected based on known consequences of dizziness (see Section 2.3). The emphasis of the questionnaire is that it considers an individual's functioning and participation in activities. This means that it allows limitations and restrictions imposed by dizzy individuals on their lifestyle to be quantified. The FLP has not previously been applied to dizzy individuals. The responses obtained on the questionnaire represent the behavioural limitations in quality of life experienced by typical dizzy individuals.

The FLP is assumed to provide a balanced measure of the quality of life of dizzy individuals. The profile of quality of life and the nature of the limitations reported as measured on the FLP in this part of the study will be used in Part III to establish the dimensions of quality of life for the dizzy individual.

15.0 COMPARISON OF FLP SCORES AMONGST DIZZY, FACIAL PAIN AND NORMAL SAMPLES

15.1 INTRODUCTION

The FLP questionnaire has been administered to four groups - dizzy patients in a clinic population (clinic dizzy sample); dizzy individuals in the general population (dizzy population sample); facial pain patients in a clinic population (facial pain sample) and individuals in the general population with no ENT problems or dizziness (population 'normal' sample). It was generally expected that the greatest reduction in quality of life as measured on the FLP would be for the clinic dizzy sample. Systematically less reduction in quality of life was expected for the facial pain sample, followed by the population dizzy sample followed with no reduction in quality of life in the population 'normal' sample. A comparison between the clinic and population dizzy samples has already been made in Section 14.0.

There were significant differences in the sex, age and report of other health problems across the four survey groups. A summary of these characteristics for the four survey groups is shown in Table 15.1. The effects of these characteristics on the individual group results have been discussed in the respective results chapters.

Characteristics	Clinic dizzy sample	Facial pain sample	Population dizzy sample	Population 'normal' sample
Mean age (yrs)	53	42	53	49
Percentage of males	32	18	36	46
Percentage of females	68	82	64	54
Percentage with other health problems	78	52	73	26
Percentage without other health problems	22	48	27	74

Table 15.1: Summary of the characteristics of the four survey groups.

Comparisons of the profile of quality of life between each of the survey groups are made in the subsequent sections. Due to the differences in age, sex and report of other health problems, the survey groups were divided into two groups based on each of these

characteristics in turn. This enabled comparisons to be made of the quality of life scores across the four survey groups.

15.2 COMPARISON OF PROFILES OF QUALITY OF LIFE FOR MALES AND FEMALES

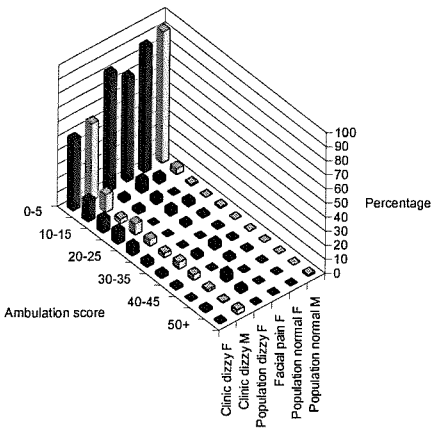
The number of responders in each survey group is indicated in Table 15.2. The sums of male and female responders in each survey group were less than the total number of responders in the groups, as the sex was not known for all responders. The median percentage scores for each of the FLP categories and dimensions for males and females in the four survey groups are illustrated in Figure 15.1.

Survey group	Number of responders	
	Females	Males
Clinic dizzy sample	273	128
Facial pain sample	45	8
Population dizzy sample	35	19
Population 'normal' sample	119	98

Table 15.2: Numbers of female and male responders in the four survey groups

There was a paucity of male responders particularly in the facial pain sample but also in the population dizzy sample. The distributions of responses for these two survey groups are therefore not shown. The small numbers of male responders also limits some of the conclusions that can be made about the differences between males in the four survey groups. Male responders in the clinic dizzy sample had significantly reduced quality of life only when compared with the population 'normal' sample.

Female responders in the clinic dizzy sample reported significant reductions compared with the facial pain and population dizzy samples in the areas of ambulation and body care and movement and household management. For the psychosocial categories, the main significant differences between the female responders in the clinic and population dizzy sample after correcting for multiple comparisons were for recreation and pastimes and social interaction. Differences for emotion, alertness and sleep and rest were significant before correcting for multiple comparisons. The significant differences between the female clinic dizzy sample and the female facial pain sample were for alertness and sleep and rest.


Ambulation score
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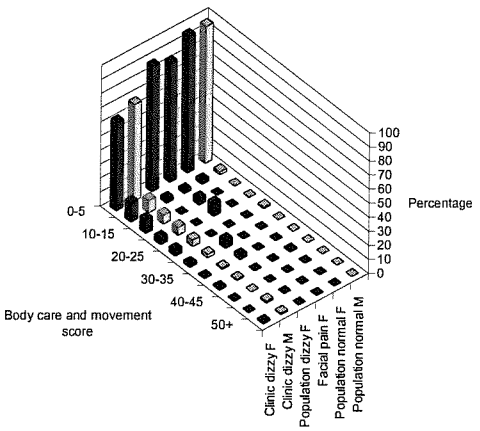
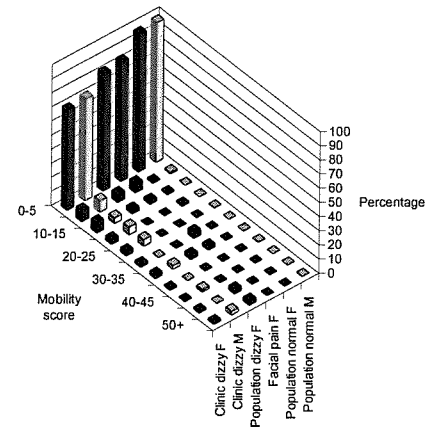
10-15
20-25
30-35
40-45
50+
Percentage
100
90
80
70
60
50
40
30
20
10
0
Clinic dizzy F
Clinic dizzy M
Population dizzy F
Facial pain F
Population normal F
Population normal M


Body care and movement score
0-5
10-15
20-25
30-35
40-45
50+
Percentage
100
90
80
70
60
50
40
30
20
10
0
Clinic dizzy F
Clinic dizzy M
Population dizzy F
Facial pain F
Population normal F
Population normal M


Mobility score
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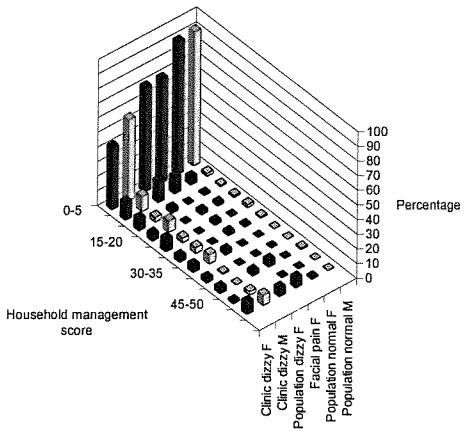
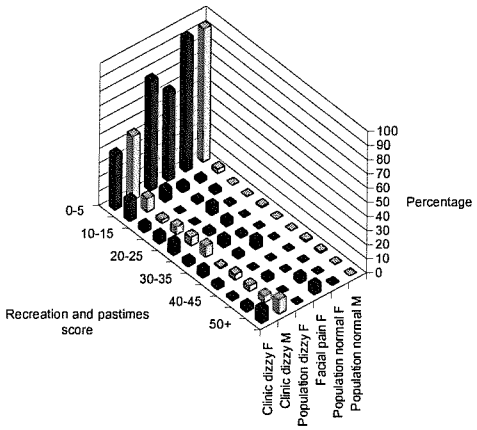
10-15
20-25
30-35
40-45
50+
Percentage
100
90
80
70
60
50
40
30
20
10
0
Clinic dizzy F
Clinic dizzy M
Population dizzy F
Facial pain F
Population normal F
Population normal M


Household management score
0-5
15-20
30-35
45-50
Percentage
100
90
80
70
60
50
40
30
20
10
0
Clinic dizzy F
Clinic dizzy M
Population dizzy F
Facial pain F
Population normal F
Population normal M


Recreation and pastimes score
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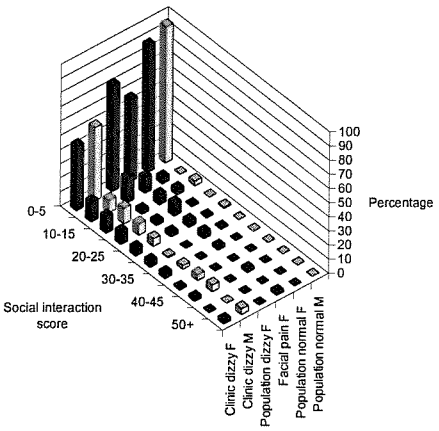
10-15
20-25
30-35
40-45
50+
Percentage
100
90
80
70
60
50
40
30
20
10
0
Clinic dizzy F
Clinic dizzy M
Population dizzy F
Facial pain F
Population normal F
Population normal M


Social interaction score
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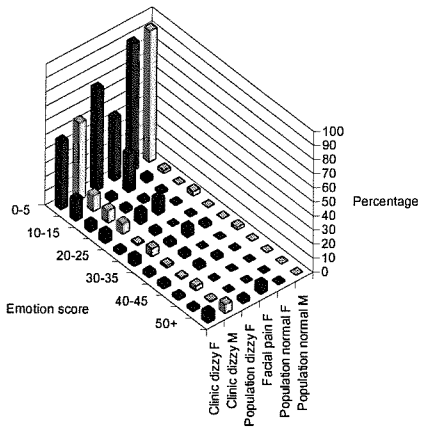
20-25
30-35
40-45
50+
Percentage
100
90
80
70
60
50
40
30
20
10
0
Clinic dizzy F
Clinic dizzy M
Population dizzy F
Facial pain F
Population normal F
Population normal M


Emotion score
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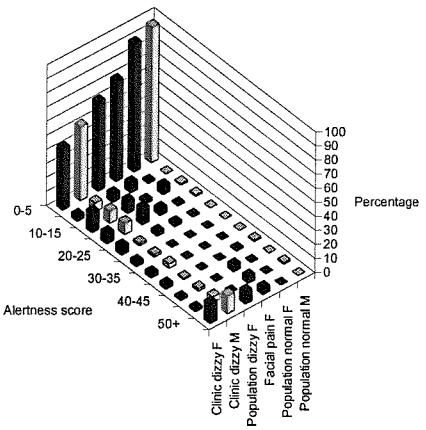
10-15
20-25
30-35
40-45
50+
Percentage
100
90
80
70
60
50
40
30
20
10
0
Clinic dizzy F
Clinic dizzy M
Population dizzy F
Facial pain F
Population normal F
Population normal M


Alertness score
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10-15
20-25
30-35
40-45
50+
Percentage
100
90
80
70
60
50
40
30
20
10
0
Clinic dizzy F
Clinic dizzy M
Population dizzy F
Facial pain F
Population normal F
Population normal M

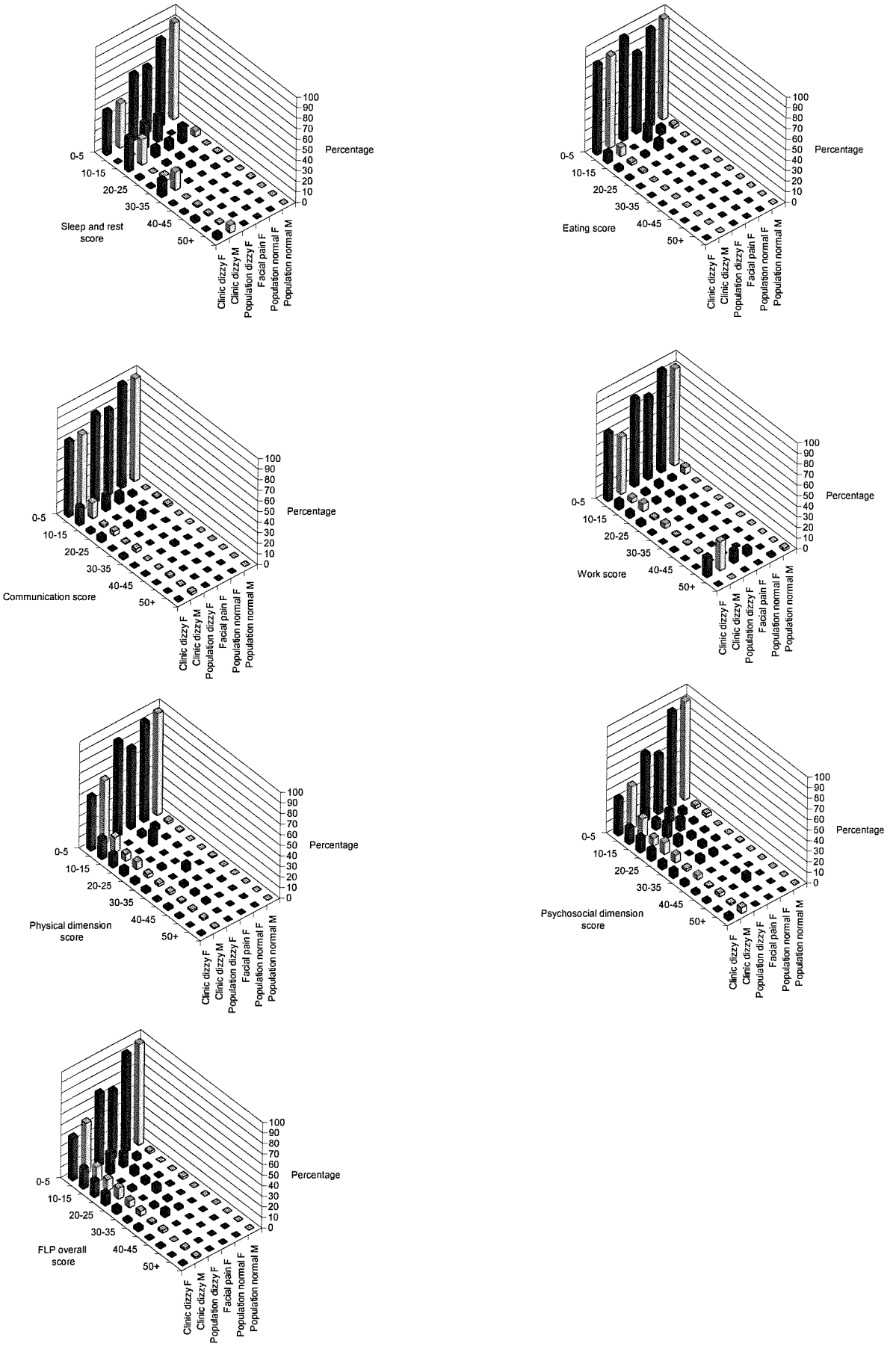


Figure 15.1: Distributions of category and dimension scores for male and female responders in the four survey groups (M=male; F=female)

This pattern of significant differences for female responders suggests that alertness and sleep and rest are particularly affected in dizzy individuals. Females in the clinic dizzy sample report significantly worse quality of life for recreation and pastimes and social interaction suggesting that limitations in these areas cause individuals to seek help for the dizziness. In contrast, the emotional aspect of quality of life is similarly affected in those individuals in clinic samples who seek help for either dizziness or facial pain.

All population normal sample median scores were zero for both males and females and individuals in the clinic dizzy sample reported significantly reduced quality of life in all categories and dimensions of the FLP compared with this 'normal' comparison group.

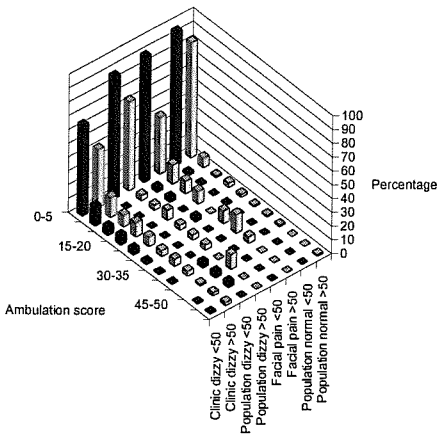
15.3 COMPARISON OF QUALITY OF LIFE PROFILES FOR 'YOUNG' AND 'OLD' RESPONDERS

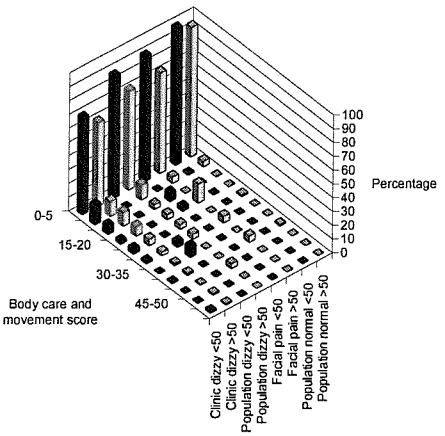
Responders in the four survey groups were divided into those aged 50 years and younger ('young' responders) and those over 50 years of age ('old' responders). The number of responders in these age bands in each of the survey groups is shown in Table 15.3. The number of 'young' and 'old' responders in each survey group is less than the total group size as not all responders indicated their age on the symptom questionnaire. The quality of life profiles for the two age bands in the survey groups are shown in Figure 15.2.

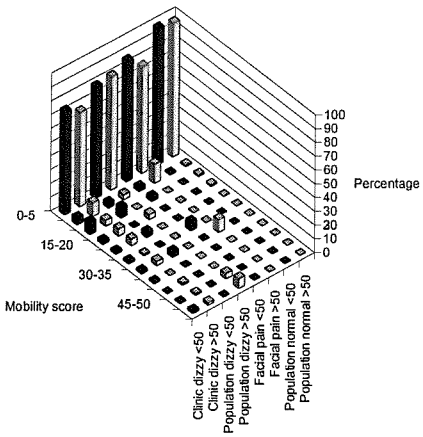
Survey group	Number of responders	
	Young	Old
Clinic dizzy sample	167	234
Facial pain sample	26	28
Population dizzy sample	32	22
Population 'normal' sample	115	102

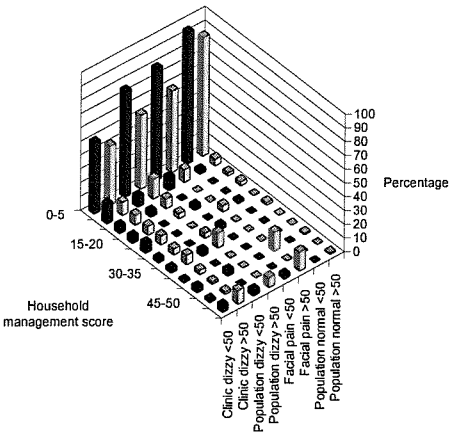
Table 15.3: Numbers of 'young' and 'old' responders in the four survey groups

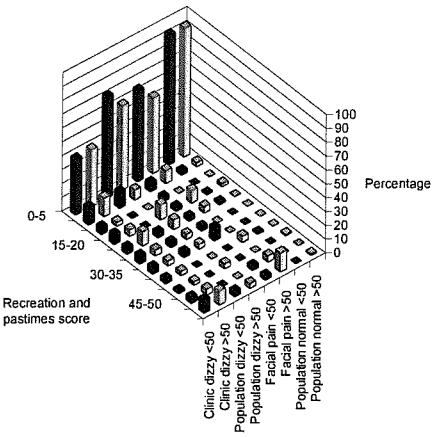
Those in the older age band tended to report more limitations than those in the younger age band in the physical dimension and its categories. There were no significant differences between the clinic and population dizzy samples and only for the sleep and rest category between clinic dizzy sample and facial pain sample.

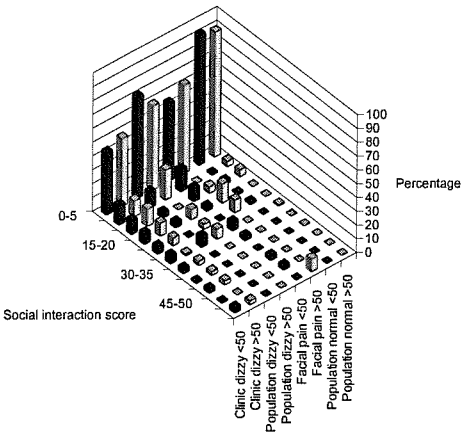

Ambulation score
0-5
15-20
30-35
45-50
Percentage
100
90
80
70
60
50
40
30
20
10
0
Clinic dizzy <50
Clinic dizzy >50
Population dizzy <50
Population dizzy >50
Facial pain <50
Facial pain >50
Population normal <50
Population normal >50

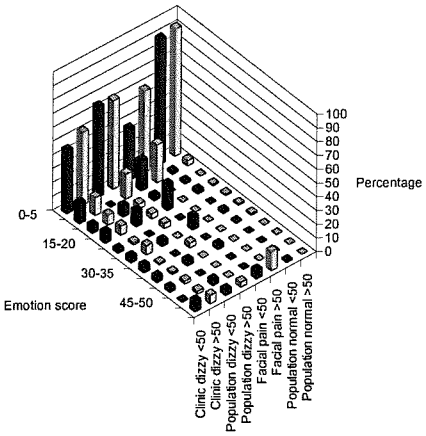

Body care and movement score
0-5
15-20
30-35
45-50
Percentage
100
90
80
70
60
50
40
30
20
10
0
Clinic dizzy <50
Clinic dizzy >50
Population dizzy <50
Population dizzy >50
Facial pain <50
Facial pain >50
Population normal <50
Population normal >50

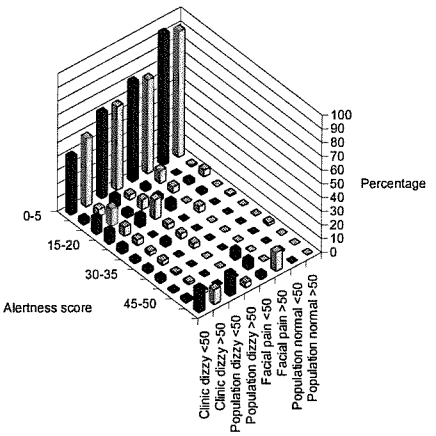

Mobility score
0-5
15-20
30-35
45-50
Percentage
100
90
80
70
60
50
40
30
20
10
0
Clinic dizzy <50
Clinic dizzy >50
Population dizzy <50
Population dizzy >50
Facial pain <50
Facial pain >50
Population normal <50
Population normal >50


Household management score
0-5
15-20
30-35
45-50
Percentage
100
90
80
70
60
50
40
30
20
10
0
Clinic dizzy <50
Clinic dizzy >50
Population dizzy <50
Population dizzy >50
Facial pain <50
Facial pain >50
Population normal <50
Population normal >50


Recreation and pastimes score
0-5
15-20
30-35
45-50
Percentage
100
90
80
70
60
50
40
30
20
10
0
Clinic dizzy <50
Clinic dizzy >50
Population dizzy <50
Population dizzy >50
Facial pain <50
Facial pain >50
Population normal <50
Population normal >50


Social interaction score
0-5
15-20
30-35
45-50
Percentage
100
90
80
70
60
50
40
30
20
10
0
Clinic dizzy <50
Clinic dizzy >50
Population dizzy <50
Population dizzy >50
Facial pain <50
Facial pain >50
Population normal <50
Population normal >50


Emotion score
0-5
15-20
30-35
45-50
Percentage
100
90
80
70
60
50
40
30
20
10
0
Clinic dizzy <50
Clinic dizzy >50
Population dizzy <50
Population dizzy >50
Facial pain <50
Facial pain >50
Population normal <50
Population normal >50


Alertness score
0-5
15-20
30-35
45-50
Percentage
100
90
80
70
60
50
40
30
20
10
0
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Clinic dizzy >50
Population dizzy <50
Population dizzy >50
Facial pain <50
Facial pain >50
Population normal <50
Population normal >50

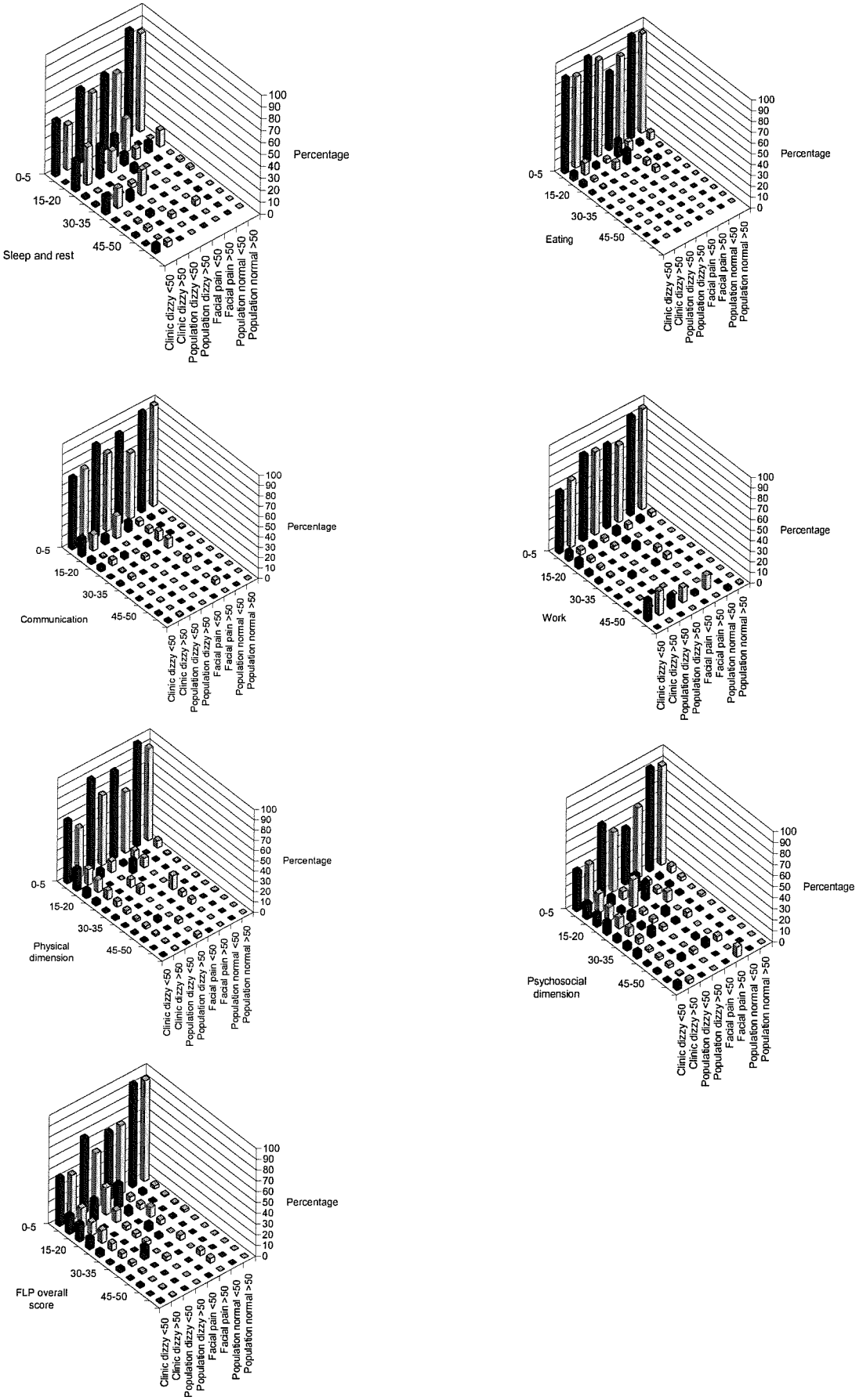


Figure 15.2: Distributions of category and dimension scores for 'young' (<50 years) and 'old' (>50 years)

For the younger age band, the clinic dizzy sample had significantly worse quality of life compared with the facial pain sample in the categories of ambulation, household management, alertness, sleep and rest, physical dimension and the overall score. When comparing the quality of life of clinic and population dizzy samples, those in the clinic dizzy sample had significantly worse quality of life for recreation and pastimes and social interaction and both the physical and psychosocial dimensions and the overall FLP score.

The typically higher report of limitations in the categories of emotion and alertness for the younger compared with the older age band may be explained by older responders being more stoical about their health and having lower expectations.

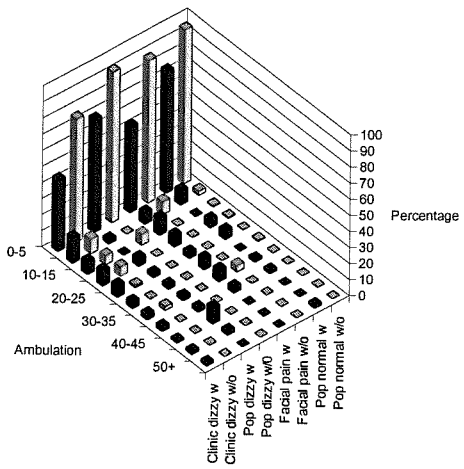
All category and dimension scores for both age bands were significantly greater in the clinic dizzy sample compared with the population 'normal' sample.

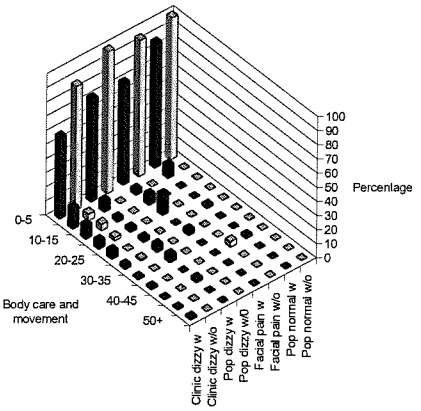
15.4 COMPARISON OF PROFILES FOR RESPONDERS WITH AND WITHOUT OTHER HEALTH PROBLEMS

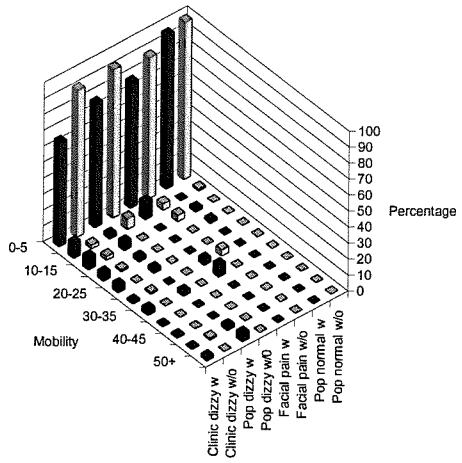
The numbers of responders with and without other health problems in each of the survey groups are shown in Table 15.4. Comparison of the profiles for those with and without other health problems illustrated in Figure 15.3 show dramatic differences. All median category scores for those reporting no other health problems were zero except the emotion category for the facial pain sample. This high score, which is almost identical to that for the group with other health problems, is likely due to the items in this category specific to the sensation of pain.

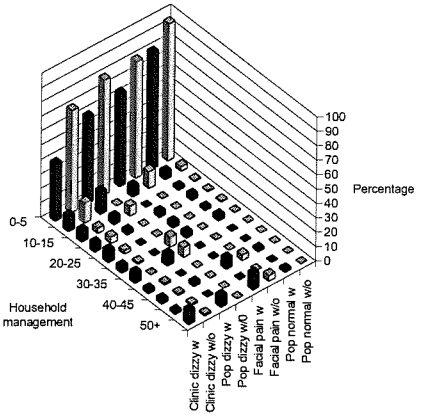
Survey group	Number of responders	
	With other health problems	Without other health problems
Clinic dizzy sample	316	89
Facial pain sample	28	26
Population dizzy sample	40	15
Population 'normal' sample	57	160

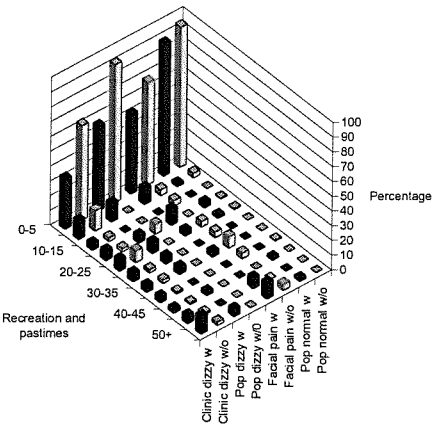
Table 15.4: Numbers of responders with and without other health problems in the four survey groups

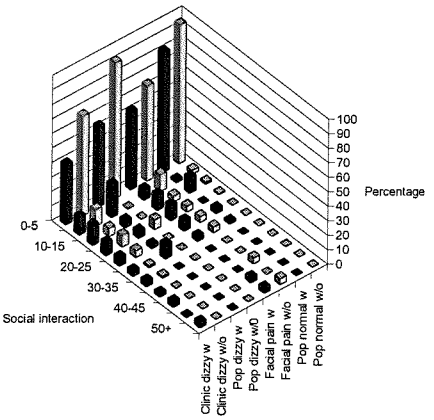

Ambulation
Percentage
0-5
10-15
20-25
30-35
40-45
50+
Clinic dizzy w
Clinic dizzy w/o
Pop dizzy w
Pop dizzy w/0
Facial pain w
Facial pain w/o
Pop normal w
Pop normal w/o

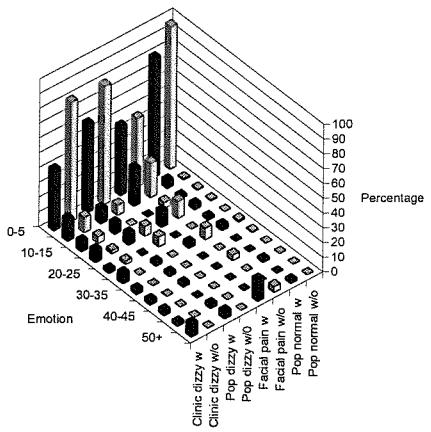

Body care and movement
Percentage
0-5
10-15
20-25
30-35
40-45
50+
Clinic dizzy w
Clinic dizzy w/o
Pop dizzy w
Pop dizzy w/0
Facial pain w
Facial pain w/o
Pop normal w
Pop normal w/o

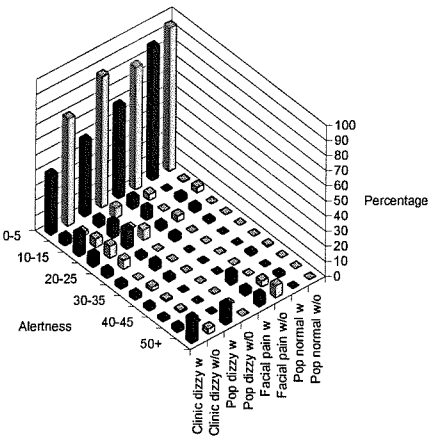

Mobility
Percentage
0-5
10-15
20-25
30-35
40-45
50+
Clinic dizzy w
Clinic dizzy w/o
Pop dizzy w
Pop dizzy w/0
Facial pain w
Facial pain w/o
Pop normal w
Pop normal w/o


Household management
Percentage
0-5
10-15
20-25
30-35
40-45
50+
Clinic dizzy w
Clinic dizzy w/o
Pop dizzy w
Pop dizzy w/0
Facial pain w
Facial pain w/o
Pop normal w
Pop normal w/o


Recreation and pastimes
Percentage
0-5
10-15
20-25
30-35
40-45
50+
Clinic dizzy w
Clinic dizzy w/o
Pop dizzy w
Pop dizzy w/0
Facial pain w
Facial pain w/o
Pop normal w
Pop normal w/o


Social interaction
Percentage
0-5
10-15
20-25
30-35
40-45
50+
Clinic dizzy w
Clinic dizzy w/o
Pop dizzy w
Pop dizzy w/0
Facial pain w
Facial pain w/o
Pop normal w
Pop normal w/o


Emotion
Percentage
0-5
10-15
20-25
30-35
40-45
50+
Clinic dizzy w
Clinic dizzy w/o
Pop dizzy w
Pop dizzy w/0
Facial pain w
Facial pain w/o
Pop normal w
Pop normal w/o


Alertness
Percentage
0-5
10-15
20-25
30-35
40-45
50+
Clinic dizzy w
Clinic dizzy w/o
Pop dizzy w
Pop dizzy w/0
Facial pain w
Facial pain w/o
Pop normal w
Pop normal w/o

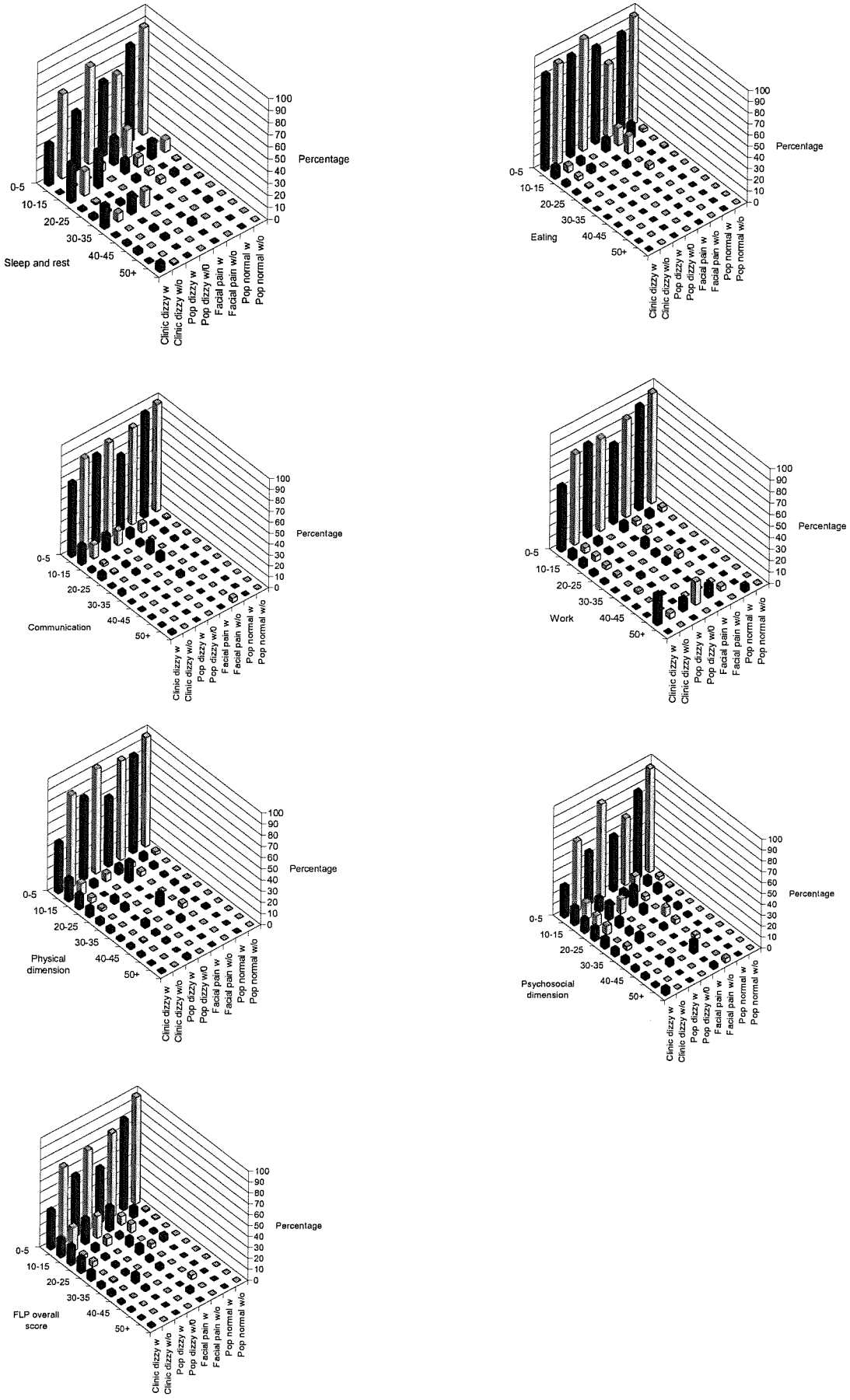


Figure 15.3: Distributions of category and dimension scores for those with (w) and without (w/o) other health problems

When comparing the profiles across the four survey groups for those with other health problems, only the clinic dizzy sample reported limitations in the physical categories of ambulation, body care and movement and household management. Even though the report of other health problems is similar in the two dizzy samples, the physical category scores for those in the dizzy population sample with other health problems are significantly lower. It is proposed that the health problems reported are characteristic of the clinic and population dizzy samples and are important when considering the quality of life of dizzy individuals and the limitations in lifestyle experienced.

All category scores in the psychosocial dimension for the clinic dizzy sample were greater than the other survey groups except emotion, which was equal with that for the facial pain sample. Although those in the facial pain sample had worse quality of life than the population dizzy sample for social interaction and emotion, the reverse was true for the categories of alertness and sleep and rest. The quality of life in the population dizzy sample for sleep and rest was approaching that for the clinic dizzy sample.

The quality of life for dizzy individuals was worse than all other groups for the physical and psychosocial dimensions and overall score. The dimension and overall scores were similar for the facial pain and population dizzy samples. There was no material reduction in quality of life for the population 'normal' sample despite the report of other health problems.

15.5 CONCLUSIONS

The quality of life of dizzy individuals in clinic and general population samples and in the comparison groups of facial pain patients and a general population sample with no dizziness or ENT problems has been compared. From the comparisons made as detailed in the preceding sections, typically dizzy individuals in the clinic sample reported the worst quality of life, followed by the facial pain patients and then dizzy individuals in the general population. All reported lower quality of life than the normal general population sample, as expected.

The facial pain comparison group was chosen to compare the quality of life scores with those of dizzy individuals as a comparably 'help-seeking' group. Further details on the justification for this comparison group can be found in Section 3.3. Ideally a comparison

group would be identical to the group of interest in all respects except the condition of interest. In practice this is difficult, if not impossible to achieve. Unfortunately the exact nature of the characteristics of the groups is not known in advance. In this study it had been expected from discussions with clinicians involved with the facial pain patients, that this group would be similar to the group of dizzy individuals apart from the complaint of dizziness. Unfortunately, this did not prove to be the case. There were differences between the facial pain and clinic dizzy individuals in the ratio of male to female responders, the age of responders and the report of other health problems. These differences between the group of interest (clinic dizzy individuals) and facial pain patients makes any conclusions that can be drawn less strong. In this respect, the comparisons are informative rather than conclusive.

When discussing the contrasting reports of limitations and reductions in quality of life for the patients with dizziness and facial pain, assumptions need to be made about any underlying differences between the two groups. In the statistical analysis it has been possible to control for certain differences. However, other underlying differences may be important. Taking the scientifically parsimonious position that all other things are equal, the contrasting reports of limitations and reductions in quality of life between patients with dizziness and those with facial pain shows that the FLP is specific. In other words, it differentiates between the characteristic limitations experienced by individuals with the two different health problems.

The above assumption may not be valid and the differences seen between the two groups may be due to underlying differences not controlled in the statistical analysis rather than the health problem of interest. To unravel the possible causative factors, a further study is needed, where the distributions of sex, age and report of the other health problems are the same in the clinic dizzy group and comparison group.

Differences in the profile and magnitude of the reduction in quality of life for the remaining comparison groups (apart from the facial pain patients) were also found, after taking into account differences in the age, sex and report of other health problems. These three groups are more homogeneous and it is assumed that the comparisons are valid. In such comparisons, it is assumed therefore that the differences in quality of life scores arise

from the health status[1] of each survey group rather than other underlying factors. The contrasting profile of quality of life between dizzy individuals in clinic and general population samples across the comparisons made shows that the FLP is specific to the differing severities of problems.

It is therefore reasonable to assume that the FLP assesses the quality of life of dizzy individuals and is a representative measure of the limitations in lifestyle reported by dizzy individuals. Despite this conclusion here, the influence of the other health problems cannot be fully determined without carrying out a further survey of individuals without dizziness but the same health problems as those reported by the dizzy individuals in this current survey.

Acknowledging the limitations in the assumptions made, the FLP appears to be specific to the differences in quality of life as reported by the different survey groups. This is important for the questionnaire to be used to assess the extent and characteristics of the limitations reported by dizzy individuals in daily life. Although the study did not investigate changes within individuals, this property implies that the FLP may be sensitive to specific changes within individuals, such as the severity of the dizziness and the limitations and in lifestyle experienced.

[1] Health status here refers to the primary complaint of the survey groups, that is dizziness in the clinic sample, dizziness in the general population sample, and no ENT problems.

PART III

MODEL AND QUESTIONNAIRE OF THE QUALITY OF LIFE OF THE DIZZY PATIENT

17.0 INTRODUCTION

For the current study, quality of life has been defined as the self-report of functioning in the areas of physical function, psychological function, social interaction and somatic sensation. Based on this definition, consideration of quality of life research and known consequences of dizziness, a model of quality of life of the dizzy individual has been proposed. The model was presented in Section 4.0 but is recalled here in the context of development of a data-driven model and consequent questionnaire of quality of life of the dizzy individual.

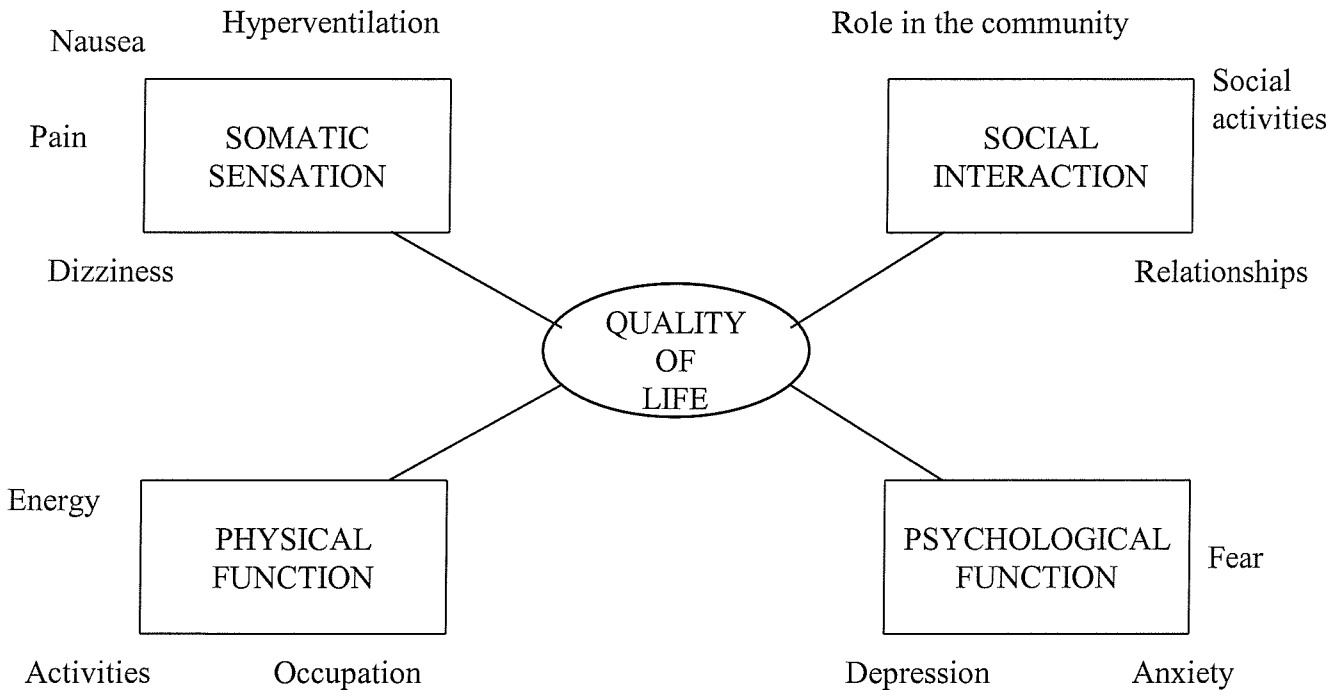


Figure 17.1 Theoretical model of the quality of life of the dizzy individual developed in Section 4.0

18.0 DIMENSIONAL STRUCTURE OF HEALTH-RELATED QUALITY OF LIFE OF DIZZY INDIVIDUALS IN A CLINIC POPULATION

Quality of life has been shown to be reduced in dizzy individuals (e.g. Kinney *et al*, 1996; Enloe and Shields, 1997; Fielder *et al,* 1997; Mendel *et al,* 1999). The studies have been published using established quality of life measures that have assumed the structure of the adopted questionnaire (Kinney *et al*, 1996; Enloe and Shields, 1997; Fielder *et al,* 1997; Mendel *et al,* 1999). Although this approach is important to demonstrate the limitations reported by dizzy individuals relative to those with different health problems on a generic measure, it only offers limited understanding of the limitations in lifestyle reported by dizzy individuals.

The dimensions of quality of life have been defined for the current survey, based on quality of life research for health problems in general rather than for a specific problem such as dizziness. There is little information about the quality of life of dizzy individuals and the dimensions of quality of life that are important for dizzy individuals. The report of limitations in lifestyle by dizzy individuals in different dimensions of quality of life will be referred to as (multi-) dimensional limitations.

The original two-dimensional structure of the FLP questionnaire was developed for the study of general health problems (Patrick *et al,* 1989). The adoption of the FLP for specific health groups has assumed that this dimensional structure of quality of life remains consistent across all healthcare groups. Within the constraints of the methods available to assess the psychometric properties of questionnaires, the FLP has been shown to be a valid measure of the quality of life of dizzy individuals (Section 8.0).

In this chapter, a model of the quality of life, as represented by responses on the FLP, of dizzy individuals in a clinic population (clinic dizzy sample) is developed based on the survey of quality of life within the clinic dizzy sample surveyed in Chapter 14.0. Development of the model aims to identify the difficulties encountered by the clinic dizzy sample and hence the multi-dimensional limitations reported by dizzy individuals. The final model was to be used as the basis of a new questionnaire of the quality of life of dizzy individuals.

The aim was not to represent the FLP questionnaire or its responses but to extract the major dimensions of quality of life for the dizzy individual using the FLP as the measure of quality of life. The analysis adopted to develop the model is factor analysis using the principal components method. It is discussed in detail in Appendix 6.

18.1 DATA SET

Scores on the FLP were initially calculated using the weights assigned to each item as used previously throughout the study. These weights had been determined by a panel of judges for the original FLP (Patrick *et al*, 1985) and based on judgements of the relative impacts of the items for all health problems rather than for a specific disorder such as dizziness. Since the aim was to identify a dimension structure of quality of life that was grounded in data from dizzy individuals rather than from the opinions of 'judges', it was important not to make pre-assumptions about the importance of the items for dizzy individuals. The decision was made not to use the original item weights for the items for any of the analysis carried out in this part of the study.

Previous work on FLP responses has involved multi-variate analysis on the binary values created from item endorsement (de Bruin *et al,* 1994a). In such an approach, questionnaire scores are simply the summation of the number of items endorsed. The presence of a high correlation between this revised and original scoring scheme has been used to support the approach. It however has been cautioned that it is likely that such a correlation is due to the statistical properties of the comparison rather than the validity of the method (Smith, 1998).

The analysis in the current work was carried out on the data set formed by the binary questionnaire responses.

18.2 SAMPLE SIZE CALCULATION

The sample size calculation described in Section 11.2 indicated that 385 responders from the clinic dizzy sample were required to carry out the principal component analysis (PCA). The calculation was based on an estimate of the number of items on the FLP that would be

relevant to the dizzy individual. This process estimated that 77 of the original 136 items would be relevant to the dizzy individual. In the survey of the clinic dizzy sample, questionnaires were returned from 405 responders.

The final number of responders for each item on the FLP is shown in Figure 18.1. Item reduction was to be achieved by removing items responded to by few and most responders. No item was endorsed by more than 50% of responders. This means that only items applying to a small number of responders would be removed from the analysis.

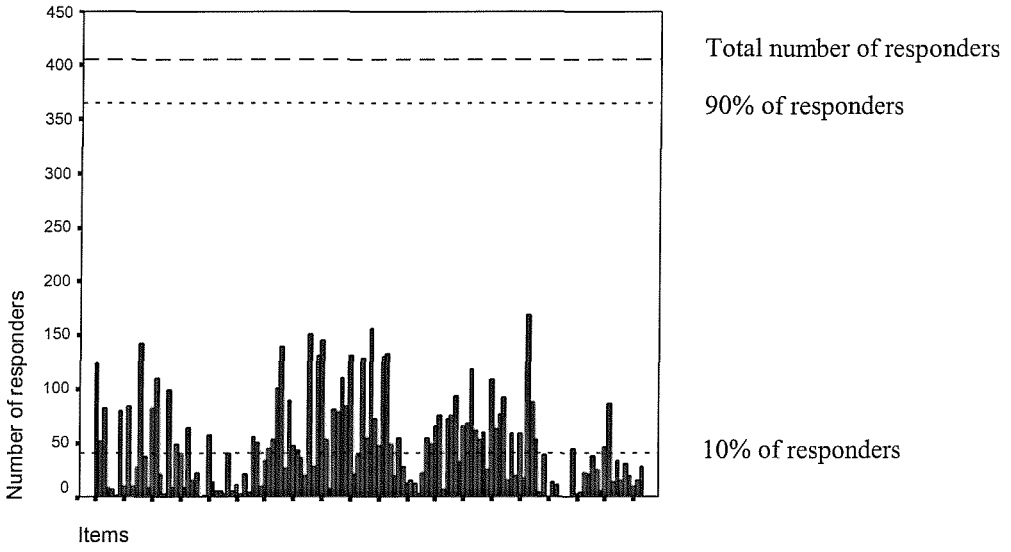


Figure 18.1: Number of responders for the items of the FLP.

Removing items endorsed by less than 40 responders (10%) reduced the data set by 65 items, leaving a total of 71 items for the PCA analysis. From the distribution shown in Figure 18.1, there were a number of items that had been endorsed by just under 10% of responders. A lower criterion of 7.5% would include these borderline items in the final data set while removing the 61 items responded to by less than 30 responders (7.5%).

Results are reported here for the two data sets formed by the two cut-off criteria. The data set formed by removing items responded to by less than 10% of responders is defined as version A; that formed by removing items responded to by less than 7.5% of responders is defined as version B.

18.3 PRINCIPAL COMPONENT ANALYSIS

Principal component analysis (PCA) with varimax rotation was carried out on the correlation matrix formed by the binary responses for both version A and version B of the data set.

18.3.1 Component extraction

The eigenvalues for the extracted factors are shown in Table 18.1 for version A and version B. Extraction of factors with eigenvalues greater than 1 yielded 16 factors for version A explaining 61.4% of the variance. For version B, using this criterion 19 factors were extracted explaining 62.6% of the variance.

Factor	Version A			Version B		
	Eigenvalue	% of variance	Cumulative % of variance	Eigenvalue	% of variance	Cumulative % variance
1	16.273	25.036	25.036	17.556	23.408	23.408
2	4.358	6.705	31.741	4.863	6.484	29.892
3	2.067	3.181	34.922	2.247	2.996	32.888
4	2.026	3.116	38.038	2.229	2.972	35.860
5	1.591	2.448	40.486	1.953	2.604	38.464
6	1.556	2.394	42.880	1.665	2.220	40.684
7	1.420	2.185	45.065	1.579	2.106	42.790
8	1.388	2.135	47.200	1.547	2.063	44.852
9	1.329	2.045	49.245	1.472	1.962	46.815
10	1.271	1.956	51.200	1.391	1.855	48.670
11	1.237	1.903	53.103	1.336	1.781	50.451
12	1.169	1.799	54.902	1.284	1.712	52.163
13	1.129	1.736	56.638	1.228	1.638	53.801
14	1.057	1.626	58.265	1.184	1.578	55.379
15	1.022	1.572	59.837	1.173	1.564	56.943
16	1.008	1.551	61.387	1.094	1.459	58.402
17				1.082	1.442	59.844
18				1.039	1.385	61.229
19				1.011	1.349	62.578

Table 18.1: Eigenvalues and percentage of variance explained for factors extracted with eigenvalues greater than 1 using dataset version A and version B.

Using an eigenvalue of 1 to extract factors results in a large amount of variance being explained. A caution has been expressed that rotation of a large number of unadjusted factors results in each factor explaining only a small amount of the variance (Howitt and

Cramer, 1997). Examination of both factor structures also showed minimal loadings of the variables on the later factors. This can lead to difficulties in interpretation of the factors.

Examination of the varimax factor rotation of this solution did not reveal an easily interpretable structure and the majority of components contained items with loadings of less than 0.3. The same situation of components with low loadings that were difficult to interpret was encountered for a majority of the solutions that explained more than 50% of the variance in the original data. Therefore, the alternative approach using a Scree plot was used.

The Scree plots shown in Figure 18.2 for both versions of the dataset indicated both three and four factors as possible breakpoints.

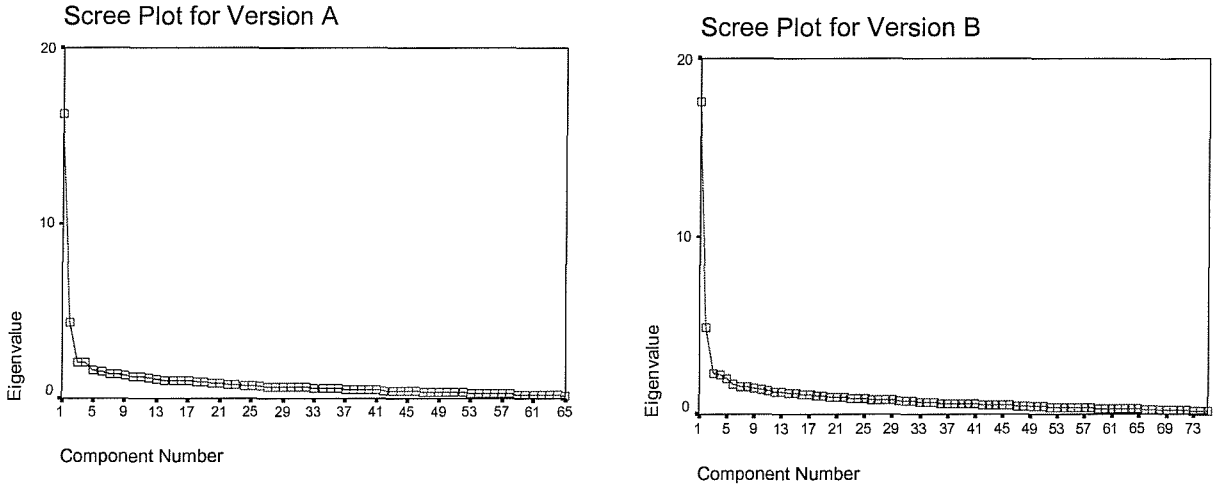


Figure 18.2: Scree plots for version A and version B

The variance explained by each of these solutions is summarised in Table 18.2 for both versions of the initial data set. Both the three and four factor solutions for version A explain a larger percentage of the variance than for version B although this difference is only marginal.

Number of factors	Version A		Version B	
	% of variance	Cumulative % of variance	% of variance	Cumulative % variance
3	3.181	34.922	2.996	32.888
4	3.116	38.038	2.972	35.860

Table 18.2: Comparison of three and four factor solutions for the two versions of the data set

Only about one third of the variance in the original questionnaire responses is explained by three or four factors. This does not mean that the solution is a poor one. The aim of the factor analysis was to simplify the correlation matrix formed by the original variables in order to identify major underlying dimensions of the quality of life of dizzy individuals as measured on the FLP.

18.3.2 Interpretation of the components

In order to develop the multi-dimensional model and the consequent questionnaire, the interpretability of the extracted components was an important issue. A structure of many components often consisting of only one or two items may not be applicable to a questionnaire to be applied in clinical practice.

Comparisons of the rotated factor structure and interpretation were carried out for the two possible solutions. In the interpretation, no items were removed because of low loading of the items onto the components. However those items with high loadings were more important for the interpretation of a factor.

18.3.2.1 Four-factor solution

Item content

The four factor solution was examined first since this was the same as the number of dimensions in the theoretical model presented in Chapter 4.0 and recalled in Chapter 17.0. A summary of the item loading values is shown for both version A and B in Table 18.3. Only items with loadings greater than 0.4 are displayed for simplification.

Factor	Version A	Version B
Factor 1	Thought & concentration	Thought & concentration
	Make mistakes	Reasoning & problem solving
	React slowly	React slowly
	Reasoning & problem solving	Make mistakes
	Confused	Confused
	Forgetful	Nervous & restless
	Nervous & restless	Poor attention
	Clumsy	Forgetful
	Poor attention	Clumsy
	Unclear speech under stress	Unclear speech under stress
	Irritable & impatient with self	Irritable & impatient with self
	Finishing things started	Finishing things started
	Laugh or cry suddenly	No joking with members of family
	No joking with members of family	Laugh or cry suddenly

Factor	Version A	Version B
	Sudden frights Irritable with those around Minor accidents Cutting down length of visits to friends Concern over health Talk less with others	Sudden frights Irritable with those around Less interest in others problems Minor accidents Cutting down length of visits to friends Talk less with others Concern over health Avoid having visitors Show less affection
Factor 2	Kneel, bend holding on to something Go up & down stairs more slowly Walk by self but with difficulty Walk more slowly Only use stairs with physical aid Walk shorter distance or stop for rests Trouble putting shoes, socks on Do not do heavy work around house Only do work in house for short periods Stand for short periods Dress self but slowly Do not keep balance Change position frequently	Kneel, bend holding on to something Get in & out of bed & chairs with support Walk by self but with difficulty Go up & down stairs more slowly Trouble putting shoes, socks on Only use stairs with physical aid Stand for short periods Make difficult movements with help Dress self but slowly Do not use public transport now Walk more slowly Change position frequently Do not keep balance Only do work in house for short periods
Factor 3	Stay at home most of time Do not do shopping usually do Stay alone most of the time Do not use public transport now Do not do any of usual cleaning Sit for much of the day Stay away from home in short periods Say how bad or useless Do not get about in dark except with help Avoid having visitors Do not do usual maintenance work Eat much less than usual	Go out less often to enjoy self Go out less often to enjoy self Shorter time on hobbies & recreation More inactive pastimes than usual ones Go out less often to visit people Fewer community activities Do not do heavy work around house Walk shorter distance or stop for rests None of usual physical recreation Do less of usual household chores Cutting down on physical recreation Do not do usual maintenance work
Factor 4	Take part in fewer social activities More inactive pastimes than usual ones Go out less often to enjoy self Fewer community activities Go out less often to visit people Shorter time on hobbies & recreation None of usual physical recreation Cutting down on physical recreation Sexual activity decreased	Stay at home most of time Do not do shopping usually do Do not go into town Stay alone most of time Do not do any of usual cleaning Stay away from home in short periods Say how bad or useless Sit for much of the day Avoid having visitors

Table 18.3: Summary of item content for the four rotated factors for version A and version B.

Comparison of item content factor by factor shows the latter two factors are reversed for versions A and B due to the amount of variance explained by each as shown in Table 18.4.

The factors from the analysis are presented in decreasing order of explained variance. For both versions of the initial data set, factors three and four explain similar amounts of variance. It is therefore not surprising that the introduction of a small number of extra items for version B may cause the last two factors to be reversed.

Factor	Version A		Version B	
	Interpretation	Variance explained(%)	Variance explained %)	Interpretation
1	Psychological well-being and anxiety	12.657	12.136	Psychological well-being and anxiety
2	Physical well-being	9.145	9.059	Physical well-being
3	Dependence, handicap and depression	8.413	7.692	Social well-being
4	Social well-being	7.823	6.973	Dependence, handicap and depression

Table 18.4: Variances explained by each of the rotated factors in the four-factor solution for version A and version B.

Factor interpretation

Interpretation of the extracted factors was based on the majority of items loading onto the factors. As can be seen from the following discussions, although there were differences in the item content and the order of the factors for the two versions, the interpretation of the factors did not differ between the two.

The first extracted factor consisted of items concerned with attention, thought, emotion, relationships with others and anxiety. This factor is labelled psychological well-being and anxiety here.

The second and third factors for version A and second and fourth factors for version B all contained items dealing with ambulation, mobility and home management. Certain items considered limitations at two differing levels. The first level considered the situation where the responder was able to do the activity such as household chores but needed to modify it for example by carrying it out more slowly or by taking rests. The second level was where the responder was unable to do the activity at all. The items were divided across the factors for the two versions into these two levels of functioning.

Factor two for both versions tended to consist of the first level of items where the physical activities were performed but in a restricted or modified way to usual. This factor was

therefore labelled physical well-being, because of the ability to carry out the activities, if in a restricted manner.

The majority of items in factor three for version A and factor four for version B consisted of the second level of items where the activities were no longer performed. These can be interpreted to assess dependence and handicap within physical activities because of the nature of the limitations. The greater level of dependence evident in factors three and four for version A and B respectively also introduces emotional response items concerned with avoiding visitors (SI71) and feeling useless (EM84) which can also represent depressed mood. Based on the majority of items, this factor is labelled dependence, handicap and depression.

The fourth factor for version A and the third for version B contained items concerned with recreation and pastimes and social interaction. The factor for version B also contained items concerned with household management and ambulation. The labelling of this factor as social well-being is not affected by the additional items since interpretation is based on the majority of items within a factor.

Discussion of four-factor solution

There are two main disadvantages with the four-factor solution. The first is that the items concerned with physical and social activities tended to be loaded onto more than one factor with values between 0.3 and 0.5. This occurred particular across the second, third and fourth factors.

Secondly, a dimensional structure for quality of life containing an extracted factor that could be interpreted as general handicap was not considered desirable. Handicap has traditionally been used to describe the effects of poor health (WHO, 1980). This is being replaced by concepts such as functioning and quality of life (WHO, 1999). It is argued here that a model structure that includes dimensions of levels of functioning across a range of activities rather than dimensions of areas of activity only provides limited information about the quality of life of dizzy individuals.

18.3.3.2 Three-factor solution

Item content

A summary of the item content of the three-factor solutions for both version A and B is shown in Table 18.5. Again only those items with loadings greater than 0.4 are shown. Items are displayed in decreasing loading value within each factor.

Factor	Version A	Version B
Factor 1	React slowly Thought & concentration Reasoning & problem solving Make mistakes Confused Nervous & restless Forgetful Poor attention Clumsy Irritable & impatient with self Unclear speech under stress Finishing things started Sudden frights No joking with members of family Laugh or cry suddenly Irritable with those around Minor accidents Cutting down length of visits to friends Talk less with others Concern over health	Reasoning & problem solving Nervous & restless Thought & concentration React slowly Confused Poor attention Make mistakes Forgetful Unclear speech under stress Clumsy No joking with members of family Irritable & impatient with self Sudden frights Finishing things started Laugh or cry suddenly Less interest in others problems Irritable with those around Cutting down length of visits to friends Talk less with others Concern over health Minor accidents Avoid having visitors Talk hopelessly about future Sexual activity has decreased Show less affection
Factor 2	Kneel, bend holding on to something Stand for short periods Do not use public transport now Walk by self but with difficulty Go up & down stairs more slowly Trouble putting shoes, socks on Dress self but slowly Only use stairs with physical aid Do not do shopping usually do Do not do heavy work around house Do not walk up or down hills Do not get about in dark except with help Do not do usual maintenance work Stay at home most of time Walk more slowly Walk shorter distance or stop for rests	Do not use public transport now Make difficult movements with help Get in & out of bed & chairs with support Stand for short periods Do not do shopping usually do Dress self but slowly Kneel, bend holding on to something Stay at home most of time Do not get about in dark except with help Walk by self but with difficulty Trouble putting shoes, socks on Do not walk up or down hills Go up & down stairs more slowly Do not do usual maintenance work Only use stairs with physical aid Do not go into town

Factor	Version A	Version B
	Stay away from home in short periods Only do work in house for short periods Do less of usual household chores Do not do any of usual cleaning Change position frequently	Do not do heavy work around house Stay at home most of time Do not do any of usual cleaning Stay away from home in short periods Do not work due to health Difficulty using hands
Factor 3	Take part in fewer social activities More inactive pastimes than usual ones Go out less often to enjoy self Go out less often to visit people Fewer community activities Shorter time on hobbies & recreation None of usual physical recreation Sexual activity decreased Cutting down on physical recreation	Go out less often to enjoy self Shorter time on hobbies & recreation Take part in fewer social activities More inactive pastimes than usual ones Go out less often to visit people Fewer community activities Walk shorter distance or stop for rests Do less of usual household chores Cutting down on physical recreation Walk more slowly None of usual physical recreation

Table 18.5: Summary of item content for the three rotated factors for version A and version B.

Table 18.6 shows the amount of variance in the original variables explained by each factor for the two versions.

Factor	Interpretation	Variance explained (%)	
		Version A	Version B
1	Psychological well-being	13.196	13.098
2	Physical well-being	12.699	12.914
3	Social well-being	9.027	6.876

Table 18.6: Variances explained by each of the rotated factors in the three-factor solution for version A and version B.

Interpretation

The item content for each of the three factors is similar for version A and version B of the solution.

As can be seen from comparison between the first factor for the four- and three-factor solutions, the item content is similar as might be expected. The inclusion of the depression items in this factor for the three-factor solution which had previously been identified within the dependence and handicap factor strengthens the first factor as assessing psychological well-being in general rather than being biased towards anxiety in particular.

The poor distinction between the loading of physical and social activity items onto the remaining factors is no longer present. Those physical and social activity items that previously overlapped across the last three extracted factors in Table 18.3 were found to fall logically into factors two and three in Table 18.5.

The division between the items is no longer based on the level of functioning but on the specific activities themselves. Factor two is labelled as physical well-being and factor three is labelled as social well-being.

Discussion of the three-factor structure

The three-factor solution removes the disadvantages highlighted in the four-factor solution discussed in the previous section. There are some differences in the exact item content for version A and B for the three factors. However these differences, particularly in the psychological and physical well-being factors do not alter the interpretation of the factors.

The differences between versions A and B are larger for the social well-being factor. However as specified in Section 18.3.2, the interpretation of factors was based on the majority of items contributing to a factor. Therefore the choice of the initial data set does not alter the interpretation of this third factor.

The different levels of functioning for the physical activities are contained within the same factor for both versions of the three-factor solution rather than in different factors. This allows the dimensional structure of quality of life for dizzy individuals to be presented in terms of three distinct areas of activities.

18.4 CONCLUSION

The dimensional structure of quality of life of dizzy individuals in a clinic sample as represented by FLP responses has been examined. The quality of life of dizzy individuals in outpatient audiology departments has been shown to conform to a logical multi-dimensional structure. The three factors in the model have been labelled psychological well-being, physical well-being and social well-being.

A multi-dimensional model of the quality of life of dizzy individuals based on this factor solution is illustrated in Figure 18.3. No assumptions have been made at this stage about the activities that contribute to the individual's well-being in these dimensions.

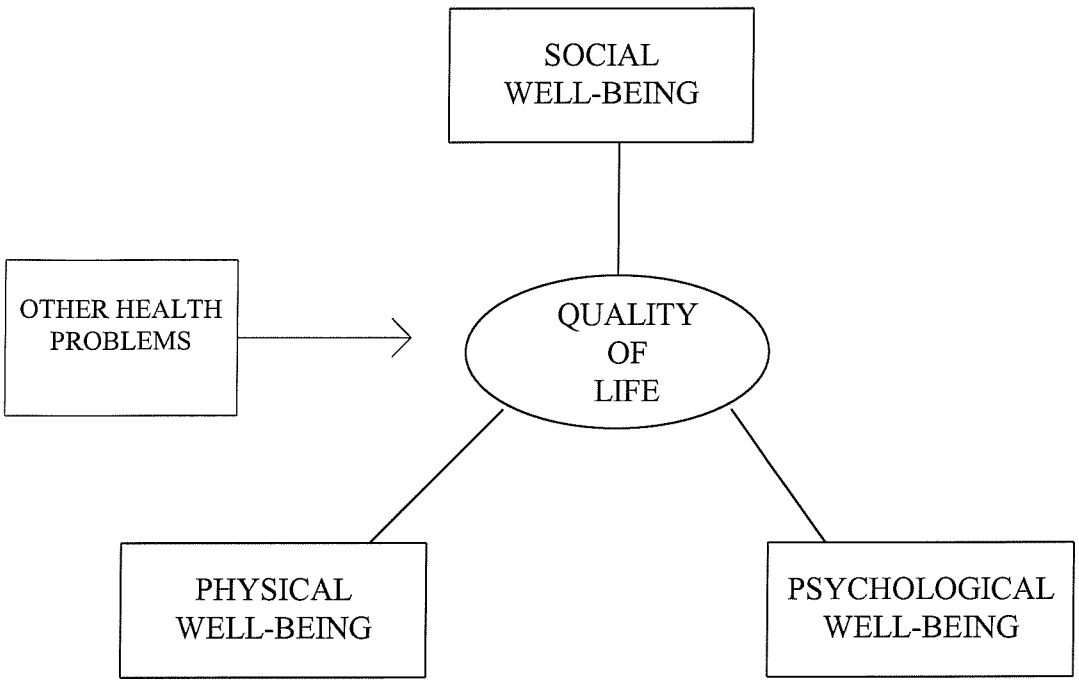


Figure 18.3: Multi-dimensional structure of the quality of life of dizzy individuals

Table 18.7 compares the dimensions for the theoretical model proposed in Section 4.0 (and recalled in Section 17.0) and the data-driven model presented here.

Theoretical Model	Data-driven model
Psychological function	Psychological well-being
Physical function	Physical well-being
Social interaction	Social well-being
Somatic sensation	

Table 18.7: Comparison of the dimensions of the theoretical and data-driven model of quality of life for the clinic dizzy individual.

There is close agreement between the dimensional structure of the two models. The three dimensions of the data driven model were also present in the theoretical model although these are described as well-being rather than function to reflect recent attitudes to health (WHO, 1999). Well-being replaces function in the data-driven model to represent both the positive and negative aspects to each dimension.

The main difference between the theoretical and data-driven model is that the aspect of somatic sensation, which had involved sensations such as pain, nausea, hyperventilation and dizziness was not included in the model. This may not be surprising based on the item content of the FLP questionnaire used to develop the model. The generic nature of the questionnaire meant that it did not address such sensations specifically apart from pain. The emphasis of the model is towards the aspects of quality of life and functioning that are affected by dizziness and any related somatic sensations.

However, the occurrence of other health problems has been confirmed to be important when assessing the limitations reported by dizzy individuals and quality of life. Significantly more individuals in the dizzy samples reported other health problems compared with the facial pain and population normal comparison groups. Also those with other health problems had significantly greater scores on the FLP that those without other health problems.

The occurrence of other health problems was not assessed by the FLP. Therefore they were not included in the factor structure of the responses on the FLP that was used as the basis of the model in Figure 18.3. Despite this, the importance of the occurrence of other health problems for the consequence of dizziness is represented by their inclusion within the revised model using dotted lines.

It is assumed that the somatic sensations in the theoretical model that arise from the autonomic responses to the dizziness are related to some extent to the psychological well-being dimension. It is also proposed that some of these sensations are related to the occurrence of other health problems reported which is included in the model although not as one of the dimensions of quality of life for dizzy individuals.

19.0 A DIZZINESS-SPECIFIC QUALITY OF LIFE QUESTIONNAIRE FOR THE DIZZY INDIVIDUAL

In this chapter, a dizziness-specific quality of life questionnaire, the Dizziness Impact Profile is developed based on the FLP questionnaire and the dimensional structure of quality of life for the dizzy individual presented in Section 18.0. Principal component analysis (PCA) was applied to develop the questionnaire for two reasons. The first purpose as has been described in the preceding chapter was to identify the items of the FLP that show variations among dizzy individuals. The second was as a data reduction technique to create a shortened version of the FLP.

Questionnaire development was based on the three-factor structure solution presented in Section 18.0. Two versions of the questionnaire are presented and the psychometric properties of both are assessed and compared with the FLP. Based on the assessment of these properties, a new questionnaire for the assessment of the quality of life of dizzy individuals, the Dizziness Impact Profile (DIP) is proposed.

19.1 ITEM CONTENT

Removal of FLP items endorsed by only a small number or the vast majority of responders had been previously assumed in the sample size calculations and intended as part of the analysis. The choice of criteria for the removal of items falling towards the extremes of the item frequency response distribution has been discussed in Section 18.2.

This has resulted in two versions of the factor structure and item content that are recalled here. Version A involved the removal of items endorsed by less than 10% resulting in 65 remaining items. Version B involved the removal of items endorsed by less than 7.5% resulting in 75 remaining items.

Although there is a difference in the loading values for the items on to the factors, interpretation of the three-factor structure is robust for the two versions of the data set. The loading values generated by the PCA will determine the final item content of the new

questionnaire. Development of the dizziness-specific questionnaire is therefore carried out for both versions.

The loading of items on to the three rotated factors for version A and B are shown in Table 19.1. Only those with values greater than 0.4 are considered to have a material contribution to the factor and these are highlighted in bold. Items are labelled using the original category code and item number from the FLP questionnaire.

Version A				Version B			
	Factor				Factor		
Item	1	2	3	Item	1	2	3
A95	**0.663**	0.207	-0.009	A97	**0.664**	0.024	0.031
A102	**0.659**	0.074	0.160	EM88	**0.647**	0.146	0.058
A97	**0.646**	0.000	0.121	A102	**0.645**	0.047	0.174
A101	**0.642**	0.201	0.126	A95	**0.643**	0.211	-0.051
A93	**0.635**	0.107	0.131	A93	**0.608**	0.070	0.182
EM88	**0.611**	0.091	0.207	A100	**0.607**	0.070	0.045
A99	**0.608**	0.092	0.025	A101	**0.604**	0.165	0.189
A100	**0.599**	0.059	0.110	A99	**0.578**	0.096	0.050
BCM21	**0.593**	0.146	0.033	C127	**0.566**	0.020	0.050
EM90	**0.564**	0.163	0.162	BCM21	**0.563**	0.136	0.051
C127	**0.559**	-0.016	0.137	SI83	**0.558**	0.027	0.198
A96	**0.557**	0.179	0.161	EM90	**0.555**	0.152	0.162
EM92	**0.532**	0.268	0.167	EM92	**0.554**	0.284	0.084
SI83	**0.512**	-0.025	0.319	A96	**0.543**	0.167	0.177
EM85	**0.508**	-0.008	0.298	EM85	**0.539**	0.025	0.215
SI67	**0.498**	0.094	0.307	SI66*	**0.520**	0.052	0.136
A94	**0.484**	0.289	0.080	SI67	**0.512**	0.102	0.286
SI70	**0.443**	0.277	**0.407**	SI70	**0.501**	0.321	0.282
SI74	**0.428**	0.053	0.266	SI74	**0.492**	0.118	0.096
SI73	**0.421**	0.131	**0.406**	SI73	**0.451**	0.130	0.375
C119	0.380	0.262	0.020	A94	**0.437**	0.239	0.175
SI68	0.374	-0.047	0.337	SI71*	**0.432**	0.206	0.133
EM86	0.339	0.274	0.288	EM91*	**0.431**	0.074	0.212
EM84	0.318	0.276	0.285	SI72*	**0.430**	0.142	0.317
SR109	0.316	0.149	0.125	SI68*	**0.421**	-0.046	0.238
EM89	0.313	0.234	0.128	EM84	0.381	0.349	0.102
SR106	0.305	0.211	0.294	C119	0.379	0.278	-0.046
RP58	0.304	0.291	0.060	EM86	0.372	0.293	0.212
BCM19	0.150	**0.655**	0.012	SR106	0.322	0.208	0.280
BCM15	0.130	**0.648**	0.154	EM89	0.316	0.230	0.111
M40	0.087	**0.638**	0.130	SR109	0.302	0.102	0.201
AMB7	0.168	**0.605**	0.008	RP58	0.298	0.253	0.084
AMB9	0.039	**0.599**	0.118	C124	0.216	0.148	0.078
BCM29	0.073	**0.598**	-0.011	M40	0.099	**0.687**	0.040
BCM34	0.047	**0.574**	0.124	BCM13*	0.094	**0.655**	0.033
AMB3	0.051	**0.563**	0.103	BCM22*	0.050	**0.650**	0.030

Version A				Version B			
	Factor				Factor		
Item	1	2	3	Item	1	2	3
HM50	0.167	**0.551**	0.274	BCM15	0.124	**0.649**	0.146
HM54	0.116	**0.550**	0.383	HM50	0.228	**0.641**	0.070
AMB2	-0.102	**0.533**	0.241	BCM34	0.047	**0.603**	0.083
M45	0.108	**0.526**	0.207	BCM19	0.095	**0.595**	0.145
HM49	0.129	**0.509**	0.417	M41	0.264	**0.591**	0.068
M41	0.178	**0.489**	0.314	M45	0.136	**0.559**	0.135
AMB12	0.084	**0.486**	0.198	AMB7	0.115	**0.559**	0.120
AMB1	0.036	**0.472**	0.318	BCM29	0.030	**0.543**	0.099
M44	0.216	**0.452**	0.309	AMB2	0.078	**0.534**	0.223
HM46^	0.204	**0.447**	0.188	AMB9	0.004	**0.533**	0.248
HM47	0.159	**0.431**	0.352	HM49	0.175	**0.520**	0.366
HM51	0.170	**0.418**	0.313	AMB3	0.017	**0.507**	0.214
BCM24^	0.302	**0.414**	0.011	M43*	0.253	**0.505**	0.049
SI76	0.295	0.398	0.227	HM54	0.118	**0.502**	**0.478**
BCM16	0.335	0.392	0.136	SI76*	0.362	**0.502**	-0.011
W128	0.099	0.387	0.321	HM51	0.232	**0.489**	0.147
E110	0.174	0.365	0.294	M44	0.273	**0.487**	0.180
SR108	0.249	0.312	0.168	W128*	0.142	**0.437**	0.210
SI69	0.231	0.228	**0.653**	HM52*	0.156	**0.429**	0.087
RP60	0.107	0.115	**0.630**	SR104	0.232	0.376	0.173
RP57	0.249	0.310	**0.614**	E110	0.217	0.374	0.222
SI64	0.310	0.277	**0.596**	BCM24	0.263	0.373	0.071
RP61	0.105	0.258	**0.595**	BCM16	0.297	0.324	0.254
RP56	0.255	0.261	**0.555**	E112	0.081	0.204	0.025
RP63	0.150	0.313	**0.503**	RP57	0.302	0.319	**0.581**
SI72	0.373	0.111	**0.417**	RP56	0.300	0.233	**0.580**
RP62	0.101	0.208	**0.414**	SI69	0.294	0.276	**0.572**
SI71	0.336	0.102	0.381	RP60	0.182	0.149	**0.561**
SR104	0.162	0.302	0.354	SI64	0.368	0.288	**0.540**
				RP61	0.172	0.291	**0.525**
				AMB1*	0.018	0.371	**0.508**
				HM47*	0.165	0.377	**0.430**
				RP62	0.135	0.220	**0.408**
				AMB12*	0.050	0.380	**0.406**
				RP63	0.208	0.373	**0.400**
				HM46	0.160	0.332	0.387
				W132	0.046	-0.120	0.347
				SR108	0.226	0.244	0.277
				W130	0.133	-0.187	0.263

Table 19.1: Loadings of items onto the 3 rotated factors for version A and version B

[* indicates items with loading values greater than 0.4 that contribute to Version 2 and not on Version 1; ^ indicates items with loading values greater than 0.4 that contribute to Version 1 and not on Version 2. Key - AMB - ambulation; BCM - body care & movement; M - mobility; HM - household management; RP - recreation & pastimes; SI - social interaction; EM - emotion; A - alertness; SR - sleep & rest; E - eating; C - communication; W - work.]

19.2 COMPARISON OF ITEM CONTENT

The most striking difference in the item loadings for the two versions shown in Table 19.1 was for the items concerned with ambulation (AMB1, AMB12) and household management (HM47). For version A these loaded onto the physical well-being factor with a loading value greater than 0.4. For version B these items loaded onto the social well-being factor with a value greater than 0.4.

The reason for this discrepancy in loadings of these items between two distinct factors for the two versions is not clear. Common sense may suggest that the items were more relevant to physical function and related to the items within the physical well-being factor compared with the item content of the social well-being factor.

The contribution of the items concerned with ambulation and household management for version B on to the social well-being factor was considered inappropriate for the dimensionality of the quality of life of dizzy individuals. Removal of two of these three items from the version B solution could be achieved by selecting only those items with loading values greater than 0.5. The decision was therefore made to only consider item content for version B with loading values greater than 0.5 when making comparisons against version A to develop the questionnaire.

As can be seen from Table 19.1, many of the differences between the two versions occur between the lower loading items in the range 0.4 to 0.5. Since these would not feature in the item content obtained from version B, the possible advantage gained from a solution from PCA based on a larger initial data set is reduced.

Having made the decision only to consider items for version B with loading values greater than 0.5, comparisons of item content were made between items of version A with loadings greater than 0.4 and items of version B with loadings greater than 0.5. The use of a loading cut off of 0.4 or 0.5 for items of version A was not an issue at this stage of the comparison. This choice is discussed in Section 19.3.

The only difference in the psychological well-being factor between version B after the removal of items with loading values less than 0.5 and version A is the introduction of a new item SI66 (I show less interest in other people's problems) in version B. Aspects of

relationships with others are addressed by existing items loading onto both versions. The majority of these items have loading values in the range 0.4 to 0.5.

Three new items from the body care and movement and mobility categories (BCM13, BCM22, M43) are introduced into the physical well-being factor for version B. However the items of ambulation (AMB12) and household management (HM47) that were removed from version B because of their inappropriate loading onto the social function factor are present for version A. The inclusion of only items with loading values greater than 0.5 for version B also means that 2 additional items assessing household management (HM51, HM52) are removed. A significant limitation in household management for dizzy individuals has been reported in Section 14.4. Failure to take this into account by adopting a structure that excludes all items assessing household management would result in exclusion of an important area for the limitations reported by dizzy individuals.

It is possible that the inclusion of items that were responded to by fewer subjects as in version B could introduce items affected by other health problems prevalent in the patient group, such as arthritic conditions. Examples are body care and movement items (BCM13, BCM22) and household management items (HM43) introduced into physical well-being factor for version B. These items were endorsed by 38, 40 and 33 subjects respectively. Two thirds of responders to the first two items also reported arthritis, limb or back problems. For the third item, half of responders reported these additional problems. This is compared with approximately a third of all responders to the original survey reporting arthritis, limb or back problems.

After exclusion of items with loading values less than 0.5, only 6 items remained in the social well-being factor for version B. One of these items was the ambulation related question 'I walk shorter distances or often stop for a rest' (AMB1). Although a certain level of physical ability is required to be able to carry out some of the social well-being activities included, it would still be expected that this item would be correlated more strongly to other items concerned with ambulation and mobility that are present in the physical well-being factor.

The social well-being factor for version B also failed to include items concerned with physical recreation activities (SI62, SI63). Since dizziness is known from reports from

individuals in the clinic dizzy sample to restrict carrying out such activities (84 and 110 subjects endorsed items SI62 and SI63 respectively), the exclusion of these items is a failure of this version.

Once the decision had been reached that only those items with loading values greater than 0.5 could realistically be selected for version B, differences in item content between the two versions were minimal.

Based on the differences described above and their impact on the item content of the extracted factors, it was decided to use the data set obtained by removing those items endorsed by less than 10% of responders (version A) for the development of the Dizziness Impact Profile. The 65 remaining items of the data set were entered into the analysis to develop the questionnaire.

19.3 ITEM LOADING CRITERIA

The next stage of the data reduction involved the removal of items with loading values less than a specified criterion. The loading values for the chosen data set (version A) are shown in Table 19.1.

A commonly adopted cut off criteria for significant item loadings (Smith, 1998; High, 1998) is to remove items with loading values less than 0.4. There are examples of recent applications of this criterion for both dizziness (Hazlett *et al.*, 1996) and other related research (de Bruin *et al.*, 1994a). In addition, a value of 0.5 was also proposed as a possible criterion to achieve greater data reduction.

Of the original 65 items entered into the analysis, fifteen had loading values less than 0.5 and five of these had values less than 0.3. Although a criterion of 0.3 can be adopted for such analysis (High, 1998) this would achieve only minimal data reduction and such loadings indicate only low correlation with functioning in that factor.

Comparisons were made between the loading cut off values of 0.4 and 0.5 in terms of item content (both items included and excluded), psychometric properties of the questionnaires

created from the two item structures, and the ability of the questionnaires to discriminate between the survey groups. This comparison is made in the following section.

19.4 ITEM CONTENT OF THE PROPOSED VERSIONS OF THE DIZZINESS IMPACT PROFILE

Two versions of the Dizziness Impact Profile (DIP) are presented in Table 19.2. The items of the two questionnaires are presented in order of decreasing loading value. The descriptions of the items are summarised in the table. The versions are referred to as version I and version II for the 0.4 and 0.5 loading cut off criteria respectively.

Version I Item	Version II Item	Item Description
Psychological well-being		
A95	A95	React slowly
A102	A102	Difficulty with things involving thought and concentration
A97	A97	Difficulty with reasoning and solving problems
A101	A101	Make more mistakes than usual
A93	A93	Confused and start more than one thing at a time
EM88	EM88	Behave nervously or restlessly
A99	A99	Forget a lot
A100	A100	Do not keep attention on any activity for long
BCM21	BCM21	Clumsy
EM90	EM90	Irritable and impatient with self
C127	C127	Do not speak clearly when under stress
A96	A96	Do not finish things that are started
EM92	EM92	Get sudden frights
SI83	SI83	Do not joke with members of family as much as usually do
EM85	EM85	Laugh or cry suddenly
SI67		Often irritable with those around
A94		More minor accidents
SI70		Cutting down on length of visits to friends
SI74		Talk less with other people
SI73		Express concern over what might be happening to health
Physical well-being		
BCM19	BCM19	Kneel, stoop or bend down by holding on to something
BCM15	BCM15	Only stand for short periods of time
M40	M40	Do not use public transport now
AMB7	AMB7	Walk by self but with some difficulty
AMB9	AMB9	Go up and down stairs more slowly
BCM29	BCM29	Have trouble putting on shoes, socks or stockings
BCM34	BCM34	Dress self, but do so very slowly
AMB3	AMB3	Only use stairs with physical aid
HM50	HM50	Do not do any of shopping that I would usually do
HM54	HM54	Do not do heavy work around the house
AMB2	AMB2	Do not walk up or down hills

Version I	Version II	Item Description
M45	M45	Do not get about in the dark unless someone to help
HM49	HM49	Do not do any maintenance work that I would usually do
M41		Stay at home most of the time
AMB12		Walk more slowly
AMB1		Walk shorter distances or often stop for a rest
M44		Only stay away from home in short periods
HM46		Only do work around the house for short periods or rest
HM47		Do less of the daily household chores than usually do
HM51		Do not do any of the cleaning that would usually do
BCM24		Change position frequently
Social well-being		
SI69	SI69	Take part in fewer social activities than I used to
RP60	RP60	Doing more inactive pastimes instead of her usual activities
RP57	RP57	Go out less often to enjoy self
SI64	SI64	Go out less often to visit people
RP61	RP61	Take part in fewer community activities
RP56	RP56	Spend shorter periods of time on hobbies and recreation
RP63	RP63	Not doing usual physical recreation and active pastimes
SI72		Sexual activity has decreased
RP62		Cutting down on physical recreation and active pastimes

Table 19.2: Item content of the versions of the Dizziness Impact Profile obtained from the two loading cut off values

19.5 COMPARISON OF ITEM CONTENT OF VERSION I AND VERSION II

Neither version I nor version II contained items from the work category of the FLP. From the responses of the clinic dizzy sample, 60% of responders did not endorse items within this FLP category. Of those who did, just over half indicated they did not work due to their health. The generic nature of the original FLP questionnaire means that responders may not have been able to work due to health problems other than dizziness. Only 19% of all responders indicated limitations on their work due to their health. Only one work item, W128 was included in the initial data set and was found to have a loading of 0.387 onto the physical well-being factor. Despite *a priori* reasonings that may be applied to include work items, the aim to have a data-driven structure meant that they were not included in either version of the DIP. Inclusion of work item(s) might be considered where application necessitated this and could easily be added to the questionnaire if needed.

Neither version included items from the sleep and rest, eating and communication categories, although 4,1, and 2 items from these categories were in the initial data set. The

exclusion of eating and communication items is not surprising since the median FLP scores for each of these categories was zero. However, the sleep and rest category had the greatest median score. The items from this category (SR104, SR106, SR108, SR109) loaded across the three extracted factors with loadings of the order of 0.3. This indicates that they were poorly correlated to each of the dimensions assessed by the factors. As has also been discussed previously, this high median score is likely to be due to the scaling properties of the category.

Although the inclusion of a greater number of items in version I means that more aspects of functioning are assessed in each of the extracted factors, their lower loading value and therefore lower correlation with the factor may mean that their inclusion is not an advantage. However there were clear benefits from the inclusion of some of the additional items in that they were important in understanding the limitations reported by dizzy individuals. The decision as to the final version of the DIP therefore could not be made based solely on a comparison of the item content between the two versions.

19.6 DIZZINESS IMPACT PROFILE

To decide between the two possible versions of the DIP, their performance was compared in terms of the questionnaire scores, the psychometric properties and the discrimination between the survey groups.

19.6.1 Calculation of questionnaire scores

Scores for the DIP could be calculated either by performing a second survey of a clinic sample of dizzy individuals using the DIP itself or by using the responses on the FLP questionnaire from the original survey reported in Section 14.0.

It is possible that there may be interference with the responses to the DIP items as a result of their inclusion in the FLP, although the magnitude of the effect cannot be determined. There are two possible sources of bias. The first is the effect of a longer questionnaire on the reliability of the response to the DIP items. The second is the effect of items that can

be assumed to not be relevant because of their exclusion from the DIP upon those items that are relevant to the dizzy individuals.

The adoption of the original data to assess the questionnaire's performance may result in it appearing to be 'better' than it would be if a new survey had been carried out. The term 'better' used here refers to its discriminability and psychometric properties.

Although a new survey using the DIP would be the preferred choice, as the primary aim was to compare two versions of the DIP questionnaire with each other, the effect of any possible biases was considered to be small and comparable on each. The decision was made to use the original responses obtained on the FLP to calculate what might have been obtained as DIP scores. In this way, the available data were used as a proxy for full independent evaluation.

19.6.2 Scoring scheme of the Dizziness Impact Profile

A requirement for the DIP scoring scheme was that scores could be calculated easily in clinical practice. Each factor within the questionnaire is referred to as a dimension and its score the dimension score.

Two possible methods for scoring the item responses were identified. The first was to use the original binary scores for endorsement entered into the original PCA analysis. This approach would create a simple scoring scheme involving the summation of the number of endorsed items within each dimension.

The second option was to use the factor scores reported by PCA. Although data driven and indicating the relative importance of items within a dimension, applying the weights from the PCA would involve a more complicated scoring scheme. In addition, the range of scores from 0.41 to 0.66 is not large and it is doubtful whether using such values for the item weights would introduce any more information beyond simple summation of endorsed items within each dimension. It has been suggested that item weights provide little additional information in those cases where the weights do not differ greatly (Bruin *et al.*, 1994a).

It was decided to use the binary score method as the scoring scheme for the DIP. Dimension scores were calculated simply by summing the number of items endorsed in each dimension. Scores were represented as the percentage of the total number of items in that dimension. This allowed for comparison of quality of life between the dimensions.

19.6.3 Scores for the Dizziness Impact Profile

The Komogorov-Smirnov test showed scores could not be assumed to be normally distributed and non-parametric statistics were used throughout. The median percentage scores calculated for the dimensions of versions I and II of the Dizziness Impact Profile are shown in Figure 19.1. The greater the score, the greater the impact on quality of life.

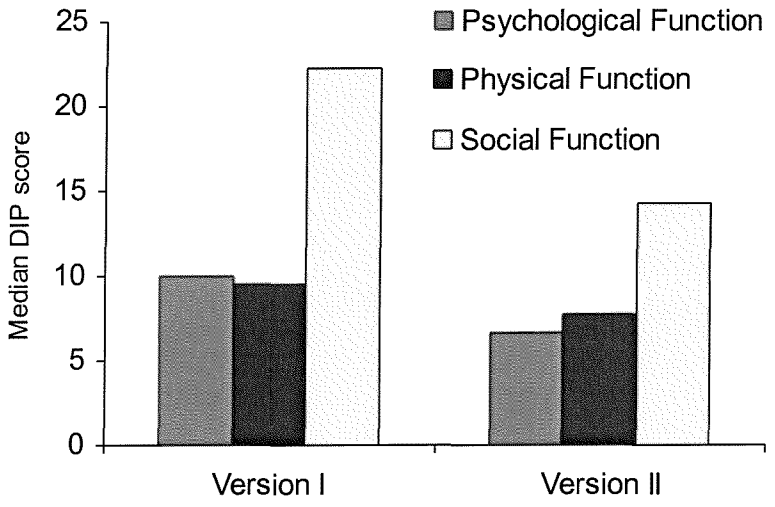


Figure 19.1: Factor scores for versions I and II of the Dizziness Impact Profile for dizzy individuals in the clinic dizzy sample (N=405)

The median, interquartile range (IQR) and minimum and maximum scores for the dimensions are shown in Table 19.3. For both versions of the DIP questionnaire, the social well-being score was significantly higher than both the physical and psychological well-being scores (Wilcoxon matched-pairs signed ranks test; $p<0.001$). There was no significant difference between physical and psychological well-being scores for either version.

The pattern of limitations reported by the dizzy individuals in the clinic dizzy sample as measured across the three dimensions was not significantly different for the two versions of the DIP (Chi-square, $p>0.05$).

Dimension	Median(%)	IQR(%)	Min(%)	Max(%)
Version I				
Psychological well-being	10.00	30.00	0	95.00
Physical well-being	9.52	33.33	0	100.00
Social well-being	22.22	55.56	0	100.00
Version II				
Psychological well-being	6.67	26.67	0	100.00
Physical well-being	7.69	30.77	0	100.00
Social well-being	14.29	57.14	0	100.00

Table 19.3: Dimension scores for version I and version II of the DIP in the clinic dizzy sample (N=405)

Median scores for version II were significantly lower (Wilcoxon matched-pairs signed rank test; $p < 0.001$) for physical and psychological well-being compared with version I. The median social well-being score for version II was lower than for version I although this difference did not reach significance. Scores on the two versions of the questionnaire are not independent and the statistical comparisons made between the two should be interpreted with caution.

19.7 PSYCHOMETRIC PROPERTIES OF THE DIZZINESS IMPACT PROFILE

Psychometric properties of the two versions of the new questionnaire were assessed. As well as making comparisons between the two versions of the DIP, comparisons were also made with the psychometric properties of the original FLP questionnaire.

19.7.1 Test-retest repeatability

One-month test-retest repeatability was assessed using the test-retest repeatability data obtained in the main clinic survey as described in Section 8.2. This property was assessed using all responders taking part in the repeatability study. The standard deviations of change and the correlations between time 1 and time 2 are presented in Table 19.4 for both versions of the DIP and the FLP. Criteria for repeatability were as described in Appendix 6.

Version	Questionnaire Dimension Score	SD of score change (%)	Spearman correlation
FLP	Psychosocial Dimension	7.8	0.89
	Physical Dimension	5.7	0.89
	Overall FLP score	4.8	0.93
DIP version I	Psychological well-being	12.5	0.82
	Physical well-being	14.3	0.86
	Social well-being	18.3	0.80
DIP version II	Psychological well-being	12.5	0.81
	Physical well-being	14.3	0.87
	Social well-being	20.1	0.80

Table 19.4: Test-retest repeatability data for versions of the DIP and FLP (N=87)

There are of course differences in what a percentage change equates to on the DIP in terms of the number of items endorsed. This difference is more marked between the FLP and DIP questionnaires rather than between the two versions of the DIP questionnaire. The large number of items in the FLP naturally increases its repeatability. It is also not surprising that that there is a larger spread in score changes between time 1 and time 2 for the dizziness-specific questionnaires. The smaller number of items in the DIP means that changes in items between time 1 and time 2 now have a greater influence on the dimension scores.

19.7.2 Internal consistency

The internal consistency of the two versions of the DIP questionnaire was assessed using Cronbach's alpha and the values for this statistic are presented in Table 19.5.

DIP dimensions	Cronbach's alpha		FLP dimensions	Cronbach's alpha
	Version I	Version II		
Psychological well-being	0.91	0.89	Psychosocial Dimension	0.94
Physical well-being	0.90	0.87	Physical Dimension	0.93
Social well-being	0.85	0.85	Overall	0.96

Table 19.5: Internal consistency for the two versions of the DIP and FLP questionnaire (N=405).

Both version I and version II were found to be internally consistent. The level of consistency was reduced compared with the original FLP questionnaire.

19.7.3 Floor and ceiling effects

The floor and ceiling effects for the dimensions of the two versions of the DIP are shown in Table 19.6 alongside those for the FLP.

The findings for the floor and ceiling effects compared with the FLP are as would be expected. The items not specific to dizziness but which may have been relevant to other health problems have been removed. This means that there are more responders scoring zero on the dimensions of the DIP.

There was a greater range of scores for the DIP with a small number of responders endorsing all items in the physical and social well-being dimensions for version I and in all dimensions for version II. There were no ceiling effects for the generic FLP questionnaire.

Version	Questionnaire Dimension Score	% floor	% ceiling	Range
FLP	Psychosocial Dimension	17.8	0	0-82
	Physical Dimension	29.1	0	0-69
	Overall FLP score	13.1	0	0-59
DIP version I	Psychological well-being	31.6	0	0- 95
	Physical well-being	32.3	0.2	0- 100
	Social well-being	34.8	1.7	0-100
DIP version II	Psychological well-being	42.7	0.5	0-100
	Physical well-being	42.0	0.2	0-100
	Social well-being	41.7	4.9	0-100

Table 19.6: Floor and ceiling effects and ranges of scores (N=405)

This higher ceiling effect for the DIP questionnaires compared with the FLP and for version II compared with version I can be explained by the removal of the redundant items for the typical dizzy individual in a clinic dizzy sample.

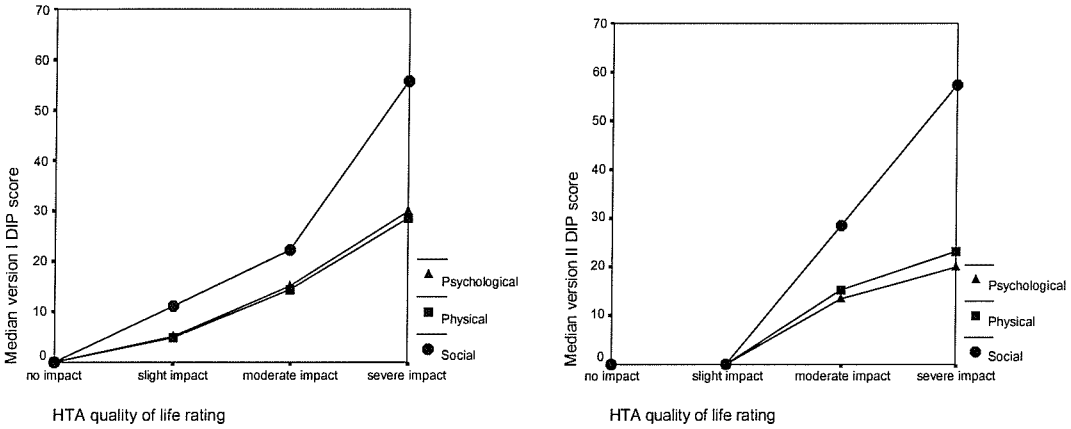
The difference in floor effect was greater than the difference in ceiling effect between the two versions of the DIP. It was considered important for more patients to register a quality of life score on the DIP questionnaire and therefore these findings support the use of version I of the DIP.

19.7.4 Construct validity

19.7.4.1 HTA quality of life rating scale and the DIP

The median dimension scores for the two versions of the DIP for each of the groups of clinic dizzy individuals defined by responses on the HTA quality of life rating scale are shown in Figure 19.2.

There is a trend towards higher DIP scores indicating worse quality of life with increased report of impact on quality of life on the HTA rating scale for both versions of the DIP. For version II of the DIP questionnaire, those responders reporting no or slight impact on quality of life have median dimension scores of zero. This is compared with version I where only those who report no impact on quality of life have a median score of zero.



(a) Version I (b) Version II

Figure 19.2: Median dimension scores on version I (a) and II (b) of the DIP for groups defined by the HTA rating scale.

This suggests that version I is able to assess the impact of the milder limitations reported by dizzy individuals. This relates to the lower report of floor effects on this version of the DIP questionnaire in Section 19.7.3.

19.7.4.2 Dizziness Handicap Inventory and the DIP

As for the FLP, the construct validity of the DIP was assessed against the DHI using both its original and revised subscale structure. The construct validity was assessed by examining the directions of proposed relationships between dimensions of the DIP and subscales of the DHI. From the similarities in item content in the dimensions of the two versions of the DIP, the same correlations were proposed with the DHI subscales for both version I and version II.

Validity of the DIP psychological well-being dimension

The content of the psychological well-being dimension was proposed to be strongly related to the items on the emotional subscale, and least related to the physical subscale. Generally low correlations were expected with the revised DHI subscales. It was however proposed that those recording handicap in the revised DHI subscales of restriction of familiar activities and agoraphobia might report greater psychological limitations on this DIP dimension.

Validity of the DIP physical well-being dimension

Although both the DIP and the DHI have scales referred to as 'physical', the content of these is very different, with the DHI physical subscale concentrating on postural difficulties rather than general physical activities. In the revised DHI, the subscale is interpreted as postural difficulties although the same arguments apply. Since the physical well-being dimension of the DIP is activities based, the strongest correlation was proposed with the functional subscale of the DHI and the weakest correlation with the emotional subscale in the original DHI. For the revised DHI, the similarly strong correlations were expected with the restriction of familiar activities and agoraphobia subscales and the least with the postural difficulties subscale.

Validity of the DIP social well-being dimension

From the emotional content of the social well-being dimension of the DIP, its strongest relationship was proposed to be with the emotional subscale and its weakest with the physical subscale. For the revised DHI, again the pattern of similar correlations with the restriction of familiar activities and agoraphobia was expected.

Observed correlations

Correlations between the DIP dimensions and the DHI subscales are shown in Table 19.7.

All correlations were as proposed apart from the relative magnitudes of the correlation between the physical well-being function and the DHI subscales.

Version	Dimension	Original DHI subscales			Revised DHI subscales		
		Physical	Functional	Emotional	Restriction of activities	Agora-phobia	Postural difficulties
FLP	Physical	0.52	0.62	0.57	0.59	0.59	0.35
	Psychosocial	0.45	0.56	0.63	0.61	0.54	0.28
Version I	Physical	0.49	0.62	0.55	0.59	0.58	0.33
	Psychological	0.42	0.50	0.62	0.58	0.51	0.26
	Social	0.42	0.59	0.58	0.30	0.54	0.26
Version II	Physical	0.48	0.58	0.51	0.53	0.56	0.32
	Psychological	0.39	0.46	0.59	0.55	0.48	0.24
	Social	0.42	0.60	0.57	0.60	0.55	0.26

Table 19.7: Correlations between the versions of the DIP and the FLP and DHI (N=342)

The weakest correlation for the physical well-being dimension was in fact with the physical subscale of the DHI rather than the emotional subscale as proposed. This is initially surprising since it was considered that postural difficulties reported on the DHI physical subscale would affect the ability to perform the physical activities in the DIP physical well-being dimension. This was also found for the physical dimension of the FLP and the DHI.

19.7.4.3 Conclusion

Both versions of the DIP have been shown to be valid measures of the quality of life of dizzy individuals in a clinic dizzy sample against both the original DHI and revised subscale structure.

19.8 COMPARISON OF DIP SCORES BETWEEN THE SURVEY GROUPS

The median DIP scores for version I and version II for the four survey groups are illustrated in Figure 19.3 and Figure 19.4 respectively.

For version I, DIP scores for the clinic dizzy sample were significantly greater than for the facial pain sample (Mann-Whitney U-test, $p<0.05$) and for both the population dizzy and 'normal' samples (Mann-Whitney U-test, $p<0.01$). The scores for the population dizzy sample were significantly greater than for the population 'normal' sample (Mann-Whitney U-test, $p<0.001$).

There is a change in the profile for the population dizzy sample compared with the clinic dizzy sample. The social well-being score was zero for those in the population dizzy sample whereas this was the greatest score in the clinic dizzy sample. This suggests that it is the limitations on social well-being that influence a dizzy individual to seek help. This was previously indicated from comparisons of the FLP category scores between the survey groups.

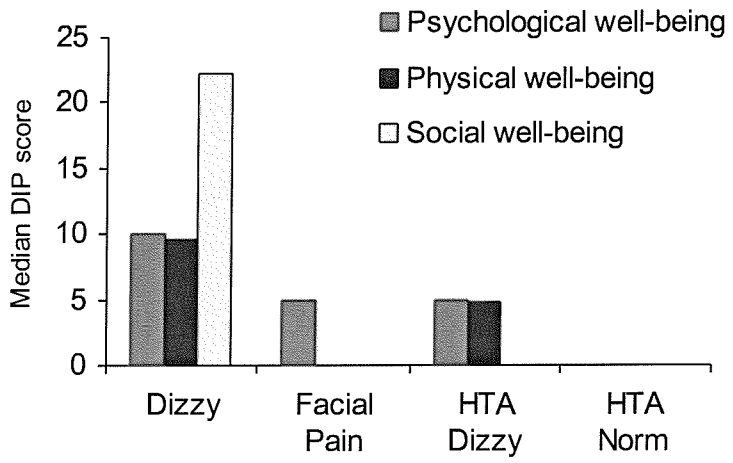


Figure 19.3: Version I DIP scores for the four survey groups.

For version II of the DIP, the psychological well-being factor score for clinic dizzy sample was not significantly greater than the score for facial pain sample or for population dizzy sample. The differences between the clinic dizzy sample and the three other survey groups were statistically significant for the physical and social well-being factors. Median scores for the dimensions were zero for the population dizzy sample despite non-zero scores on version I of the DIP and on the original FLP. This is likely due to the reduced ability of this version to assess milder limitations on quality of life for the clinic dizzy sample.

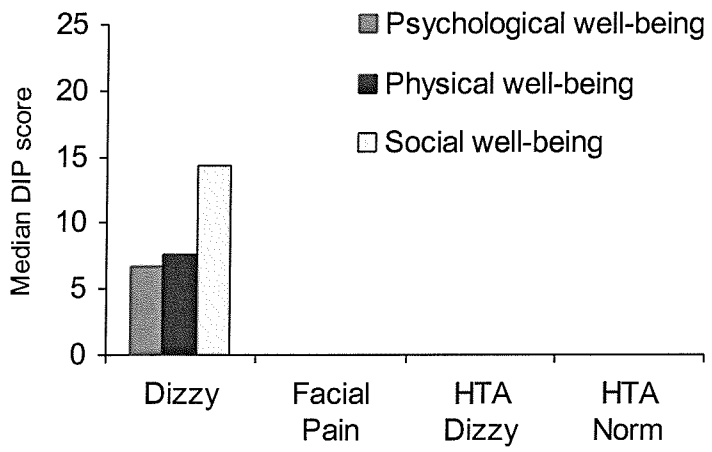


Figure 19.4: Version II DIP scores for the four survey groups.

19.9 CONCLUSIONS

Two versions of a quality of life questionnaire for the assessment of the limitations reported by and the quality of life of dizzy individuals, named the Dizziness Impact Profile (DIP), have been developed in the current study. Using the data obtained in the present survey as proxy for full independent evaluation, both versions of the DIP have been shown to be a valid, repeatable (one-month) measure of the quality of life of dizzy individuals. In common with the FLP, the spread of score changes over one month is too great for monitoring individuals but is sufficient to quantify and characterise group changes.

Although there were only minimal differences in the psychometric properties and item content of the two proposed versions of the DIP, version I was able to assess mild reductions in quality of life. This is particularly important for the use of the questionnaire in a clinic population where there will be some individuals who report less limitations in daily life.

20.0 MODEL OF THE QUALITY OF LIFE OF DIZZY INDIVIDUALS

A theoretical model of the quality of life of dizzy individuals and the aspects of lifestyle and functioning contributing to each of the dimensions has previously been proposed in Section 4.0 and later recalled in Section 17.0. This model involves *a priori* assumptions about the aspects of lifestyle to be included in the model.

As discussed, the structure of the theoretical model is based on limitations reported by dizzy individuals in the literature. Often the identification of these limitations has been based either on patient reports or on studies of the handicap and disability associated with dizziness. They are not based on the concept of quality of life.

A data-driven three-dimensional structure of the quality of life of dizzy individuals has been presented in Section 18.0 based on the self-report of limitations made on the FLP questionnaire. It was important to further develop this model by identifying those aspects of quality of life that contributed to well-being in each of these dimensions.

This could be achieved in two ways. The first was to describe the structure of each dimension using the original FLP categories for the items contained within each DIP dimension. The second was to identify the underlying structure within each of the dimensions separately using principal component analysis. Development of the final model based on the item content of the DIP would also result in a model that could be used in conjunction with the DIP.

Both approaches were applied to the item content of the final version of the DIP presented in Section 19.0.

20.1 MODEL STRUCTURE BASED ON ITEM CONTENT WITHIN EACH FACTOR

Using the item content of the three dimensions of the DIP, the structure of each would be as shown below in Table 20.1.

The psychological well-being dimension contained items from three of the five original categories of the FLP psychosocial dimension. It was also found to contain one item from the body care and movement category concerned with clumsiness and one item from the communication category concerned with speaking under stress. These were not included in the structure of the factor since only one item from each of the categories remained and the meaning of these items for the dizzy individual was thought to differ to that on the original generic questionnaire.

Psychological well-being	Physical well-being	Social well-being
Alertness	Body care and movement	Recreation and pastimes
Emotion	Ambulation	Social interaction
Social interaction	Mobility	
	Household management	

Table 20.1: Category structure of the dimensions of quality of life based on the original FLP categories.

Items from the four original categories of the FLP physical dimension were all included in the physical well-being dimension. No items from other factors were included.

The social well-being dimension only contained items from the FLP psychosocial categories of recreation and pastimes and social interaction. Items from the social interaction category also contributed to the psychological well-being dimension.

By adopting the original FLP categories, this assumes that an item that falls into a particular FLP category for generic health problems also falls into that category for a specific group such as dizzy individuals. This assumption may not always be valid. For example, the item concerned with clumsiness (BCM21) from the body care and movement category of the FLP is contained within the psychological well-being factor on the DIP. Its presence alongside the other items in this DIP factor suggests that the clumsiness reported is due to concentration and attention rather than dexterity and mobility difficulties in arthritis patients for example.

Secondly, items within a category of the FLP can be concerned with a range of activities. It is possible that certain items within categories or across categories may group together to form new areas of functioning that are important for dizziness.

This approach provides what initially appears to be a sensible interpretation of the content of the three dimensions. However, there is no evidence to support the assumption that the category structure of the original FLP questionnaire is appropriate for dizzy individuals. This means that using the original FLP categories of the items that are contained within each dimension of the DIP may not be the optimal way to describe the structure of the three dimensions of quality of life for these individuals.

20.2 MODEL BASED ON THE UNDERLYING STRUCTURE OF THE DIMENSIONS OF THE DIP

Principal component analysis with varimax rotation was carried out on the item content of each of the dimensions of the DIP to identify the underlying structure of the model of quality of life for the dizzy individual in a clinic sample. The Scree plot was used to assist in the selection of the number of factors to extract. However it was found that this did not always produce a solution that could be interpreted sensibly to model the quality of life of the dizzy individual.

The number of factors indicated by the Scree plot was used as a starting point. Additional solutions were subsequently interpreted based on the extraction of numbers of factors either side of the initial starting point.

Themes of functioning that contributed to the three DIP dimensions were evident in a number of different solutions. Grouping factors together by extracting a smaller number of factors tended to complicate their interpretation. Separation into a larger number of factors tended to split items into groupings and often pairs that did not appear to be related to each other or concerned with any specific area of functioning.

Although certain solutions consisted of factors made up of only one item, these were still treated as factors. This would not be acceptable in a situation where the aim was to quantify functioning based on that one item. The aim of this analysis was to identify the underlying structure of the quality of life in each of the dimensions. It is possible that an important area of functioning for a dizzy individual was addressed by only one item. Certain items also dealt with a range of activities or areas of functioning. It was therefore

decided that it was acceptable under the aims of the analysis for factors containing only one item to be extracted.

Various solutions for each quality of life dimension were investigated and interpreted although only the preferred solutions are presented here. The choice of solution was based on the sensible interpretation of the factors within the domain of dizziness and quality of life. This process contained an element of subjective judgement since it involved opinions as to which solutions were relevant for the dizzy individual and which ones were not.

The items are referred to using the original item codes adopted throughout from the FLP. Each factor will be discussed in turn and the results for the analysis presented.

20.2.1 Psychological well-being

After examination of solutions extracting between 2 and 7 factors, the 5-factor solution was extracted to represent the aspects of psychological well-being important for the dizzy individual.

Item	Factor 1 Mental Alertness	Factor 2 Emotiveness	Factor 3 Relationships	Factor 4 Concentration	Factor 5 Co-ordination
A102	0.658				
A97	0.648				
A100	0.631				
A99	0.562				
A95	0.555			0.415	
C127		0.707			
EM92		0.648			
EM88		0.535			
EM90		0.517		0.500	
EM85		0.493			
SI74			0.616		
SI73			0.609		
SI67			0.577		
SI83			0.564		
SI70			0.539		
A96				0.757	
A93				0.611	
A101				0.450	
A94					0.774
BCM21					0.630

Table 20.2: Five-factor solution extracted using principal component analysis with varimax rotation for the psychological well-being dimension of the DIP.

The loading of each of the items from the psychological well-being dimension of the DIP onto each of the extracted factors is shown in Table 20.2.

The solution explains 57.6% of the variance in the psychological well-being dimension responses. Items with loading values greater than 0.4 were considered to have a material contribution to the interpretation of each factor and only these loading values are shown. The interpretation of each factor is also shown in the headings for the table. Descriptions of items contributing to each factor are summarised in Table 20.3.

All items clearly load onto one factor except for A95 (React slowly) and EM90 (Irritable and impatient with self) that also load onto a second factor with a value greater than 0.4. In both cases the item was retained in the factor to which it was most strongly correlated. The loading of these two items onto Factor 4 (Concentration) does not affect the interpretation of the factors themselves.

Factor	Item	Item Description
1 - Mental alertness	A102	Difficulty with things involving thought and concentration
	A97	Difficulty with reasoning and solving problems
	A100	Do not keep attention on any activity for long
	A99	Forget a lot
	A95	React slowly
2 - Emotiveness	C127	Do not speak clearly when under stress
	EM92	Get sudden frights
	EM88	Behave nervously or restlessly
	EM90	Irritable and impatient with self
	EM85	Laugh or cry suddenly
3 - Relationships	SI74	Talk less with other people
	SI73	Express concern over what might be happening to health
	SI67	Often irritable with those around
	SI83	Do not joke with members of family as much as usually do
	SI70	Cutting down on length of visits to friends
4 - Concentration	A96	Do not finish things that are started
	A93	Confused and start more than one thing at a time
	A101	Make more mistakes than usual
5 - Co-ordination	A94	More minor accidents
	BCM21	Clumsy

Table 20.3: Descriptions of items contained within the extracted factors of the psychological well-being dimension

20.2.2 Physical well-being dimension

The identification of the underlying structure for the physical well-being dimension was more complicated than for either the psychological or social well-being dimension. After detailed examination and attempted interpretation of solutions ranging from 3 to 7 factors, a 3-factor solution was finally extracted and interpreted.

The loading of each of the items within the physical well-being dimension onto each of the extracted factors is shown in Table 20.4. The solution explains 47.9% of the variance in the psychological well-being dimension responses. As before, only loading values greater than 0.4 are shown except for item AMB2 which loaded most strongly onto Factor 2 with a value of 0.346 but also loaded onto Factor 1 with a value of 0.342. The interpretations of each of the factors are also shown in the table headings. Table 20.5 summarises the items contributing to each of the factors.

Item	Factor 1 Body care & movement	Factor 2 Household management and mobility - severe limitations	Factor 3 Household management & mobility - mild limitations
AMB7	0.660		
AMB3	0.603		
BCM19	0.597		
BCM29	0.594		
AMB9	0.579		
BCM34	0.553		
M40	0.540	0.487	
BCM15	0.533		
BCM24	0.477		
HM50		0.691	
M41		0.686	
HM51		0.684	
M44		0.606	
HM49		0.601	0.411
M45		0.581	
AMB2	0.342	0.346	
AMB1			0.696
HM46			0.689
AMB12			0.632
HM54			0.616
HM47		0.436	0.610

Table 20.4: Three-factor solution from principal component analysis with varimax rotation for the physical well-being factor of the DIP.

Initially this solution was not considered ideal despite being indicated by the Scree plot. The difficulty with the solution was seen as the combination of household management and mobility items into the same factor. Regardless of the number of factors used to describe the data, these items continually loaded onto the same factor. Increasing the number of factors did not separate these out and introduced pairs of items into the solution that did not make sense, such as walking up hills and putting shoes and socks on.

Factor	Item	Item description
1 - Body care and movement	AMB7	Walk by self but with some difficulty
	AMB3	Only use stairs with physical aid
	BCM19	Kneel, stoop or bend down by holding on to something
	BCM29	Have trouble putting on shoes, socks or stockings
	AMB9	Go up and down stairs more slowly
	BCM34	Dress self, but do so very slowly
	M40	Do not use public transport now
	BCM15	Only stand for short periods of time
	BCM24	Change position frequently
2 - Household management and mobility - severe limitations	HM50	Do not do any of shopping that I would usually do
	M41	Stay at home most of the time
	HM51	Do not do any of the cleaning that would usually do
	M44	Only stay away from home in short periods
	HM49	Do not do any maintenance work that I would usually do
	M45	Do not get about in the dark unless someone to help
	AMB2	Do not walk up or down hills
3 - Household management and mobility - mild limitations	AMB1	Walk shorter distances or often stop for a rest
	HM46	Only do work around the house for short periods or rest
	AMB12	Walk more slowly
	HM54	Do not do heavy work around the house
	HM47	Do less of the daily household chores than usually do

Table 20.5: Descriptions of items contributing to the factors of the physical well-being dimension.

Closer examination of the item content of each factor of the three-factor solution reveals an interpretation of the second and third factors, not in terms of aspects of functioning but in terms of the level of functioning needed to carry out the activities.

Items contained within the third factor are concerned with mild limitations whereas items contributing to the second factor are concerned with severe limitations. It is easily imaginable that an individual who reports that they are walking more slowly (AMB12) might also report that they are doing less daily chores (HM47) or no heavy house work (HM54).

Equally for the second factor that considers severe limitations, it is likely that a patient who is not able to do any of the household cleaning (HM51) will not be able to do any of the usual shopping (HM50) and stays at home most of the time (M41).

20.2.3 Social well-being

The structure of the social well-being dimension was examined based on the extraction of between 2 and 6 factors. The final solution was based on the 6-factor solution. The solutions consisting of a smaller number of factors tended to contain items that loaded strongly onto more than one factor.

The loading of each of the items within the dimension onto each of the extracted factors is shown in Table 20.6. The solution explains 87.0% of the variance in the social well-being dimension responses. The interpretations of the factors are again shown in the headings of the table. Table 20.7 shows the descriptions of the items for each of the factors.

Item	Factor 1 Social interaction	Factor 2 Recreation & pastime	Factor 3 Community activities	Factor 4 Hobbies	Factor 5 Physical recreation	Factor 6 Sexual relationships
SI64	0.819					
RP57	0.767					
RP69	0.753					
RP60		0.874				
RP63		0.567	0.522			
RP61			0.877			
RP56				0.846		
RP62					0.919	
SI72						0.951

Table 20.6: Six-factor solution from principal component analysis with varimax rotation for the social well-being factor of the DIP

It should be noted that these 6 factors explain the variance and underlying dimensionality of only 9 items that form the social well-being dimension. A possible disadvantage of the final solution is the apparent overlap between the aspects of functioning as interpreted from the solution. However solutions containing smaller numbers of factors did not distinguish between the differences in the types of social and recreational activities included within the items.

Factor	Item	Item description
1 - Social interaction	SI64	Go out less often to visit people
	RP57	Go out less often to enjoy self
	SI69	Take part in fewer social activities than I used to
2 - Recreation and pastimes	RP60	Doing more inactive pastimes instead of her usual activities
	RP63	Not doing usual physical recreation and active pastimes
3 - Community activities	RP61	Take part in fewer community activities
4 - Hobbies	RP56	Spend shorter periods of time on hobbies and recreation
5 - Physical recreation	RP62	Cutting down on physical recreation and active pastimes
6 - Sexual relationships	SI72	Sexual activity has decreased

Table 20.7: Descriptions of items contributing to the social well-being dimension

Social well-being is assessed by only a small number of items and many of these items consider more than one aspect. This results in a factor structure as presented in the tables above where aspects of functioning contributing to the social well-being dimension have been interpreted based on the content of one item. There are subtle differences between the items themselves that results in their separation into a large number of factors. Examples of this are physical recreation compared with recreation implying non-physical activities. However the solution presented is that proposed by the data rather than making *a priori* decisions about similarities or differences between the extracted factors.

20.3 COMPARISON OF THE THEORETICAL AND DATA-DRIVEN MODELS OF THE QUALITY OF LIFE OF THE DIZZY INDIVIDUAL

Table 20.8 compares the underlying structure of the theoretical four-dimensional model proposed in Section 4.0 (and recalled in Section 17.0) and that of the three-dimensional data-driven model presented in Section 20.2. The activities included in the theoretical model were based on known limitations experienced based on patient reports and handicap questionnaires and from the literature on the concept of quality of life. The data-driven model is based on quality of life of clinic dizzy individuals as reported on the FLP.

What is striking about the theoretical model in comparison with the data-driven model is the crudeness of the aspects of functioning and activities included. Much of the structure is made up of vague terms that can be interpreted as including many different activities. In contrast, the data-driven model includes more specific activities.

Dimension	Structure	
	Theoretical model	Data-driven model
Psychological well-being	Anxiety Depression Fear	Emotiveness Mental alertness Concentration Co-ordination Relationships
Physical well-being	Activities Energy Occupation	Body care & movement Household management & mobility - mild limitation Household management & mobility - severe limitation
Social well-being	Social activities Role in the community Relationships	Social activities Community activities Sexual relationships Recreation & pastimes Physical recreation Hobbies
Somatic Sensation	Dizziness Pain Nausea Hyperventilation	

Table 20.8: Comparison of the structure of the theoretical and data-driven models of the quality of life of the dizzy individual.

The structure of the somatic sensation dimension of the theoretical model was concerned with the report of symptoms and sensations both of dizziness itself and the autonomic reactions to this. The FLP is based on the behaviour of dizzy individuals and how somatic sensations impose limitations on lifestyle and functioning.

The theoretical model named 'Activities' as contributing to the Physical well-being dimension. Although not specified, the types of activities were intended to include both daily routine activities and recreational activities. What is shown in the data-driven model is the distinction between the daily activities and the recreation activities; the factors of body care and movement, household management and mobility contribute to physical well-being while recreation and pastimes and hobbies are contained within the social well-being dimension.

The absence of items concerning occupation within the model is in part due to the clinic dizzy sample and in part due to the construction of the work category of the FLP. This was discussed in detail in the context of the item content of the DIP (see Section 19.5). The

social well-being dimension was found not just to include social activities. It also extended to include the ability to carry on with the individual's hobbies, recreational activities and pastimes.

The role of relationships in the dimensions of quality of life differed between the two models. Relationships had been expected to be included in the social well-being dimension but were found in the psychological well-being dimension in the data-driven model.

Particularly important for the dizzy individual is the inclusion of a dimension concerned solely with social well-being. This has been shown to be important for dizzy individuals and has been suggested here as being responsible for individuals seeking help for their dizziness.

20.4 MODEL OF THE QUALITY OF LIFE OF DIZZY INDIVIDUALS IN A CLINIC POPULATION

The dimensions of quality of life of clinic dizzy individuals have been interpreted to be psychological well-being, physical well-being and social well-being. This model has been used to develop a condition-specific quality of life questionnaire for dizziness named the Dizziness Impact Profile (DIP).

The underlying structure of the dimensions based on the item content of the DIP questionnaire has lead to the interpretation of factors that contribute to the individual's well-being within each dimension. These factors have been used to refine the three-dimensional model previously presented in Section 18.0. Figure 20.1 illustrates the final model of the quality of life dizzy individuals as represented by the FLP in a clinic population.

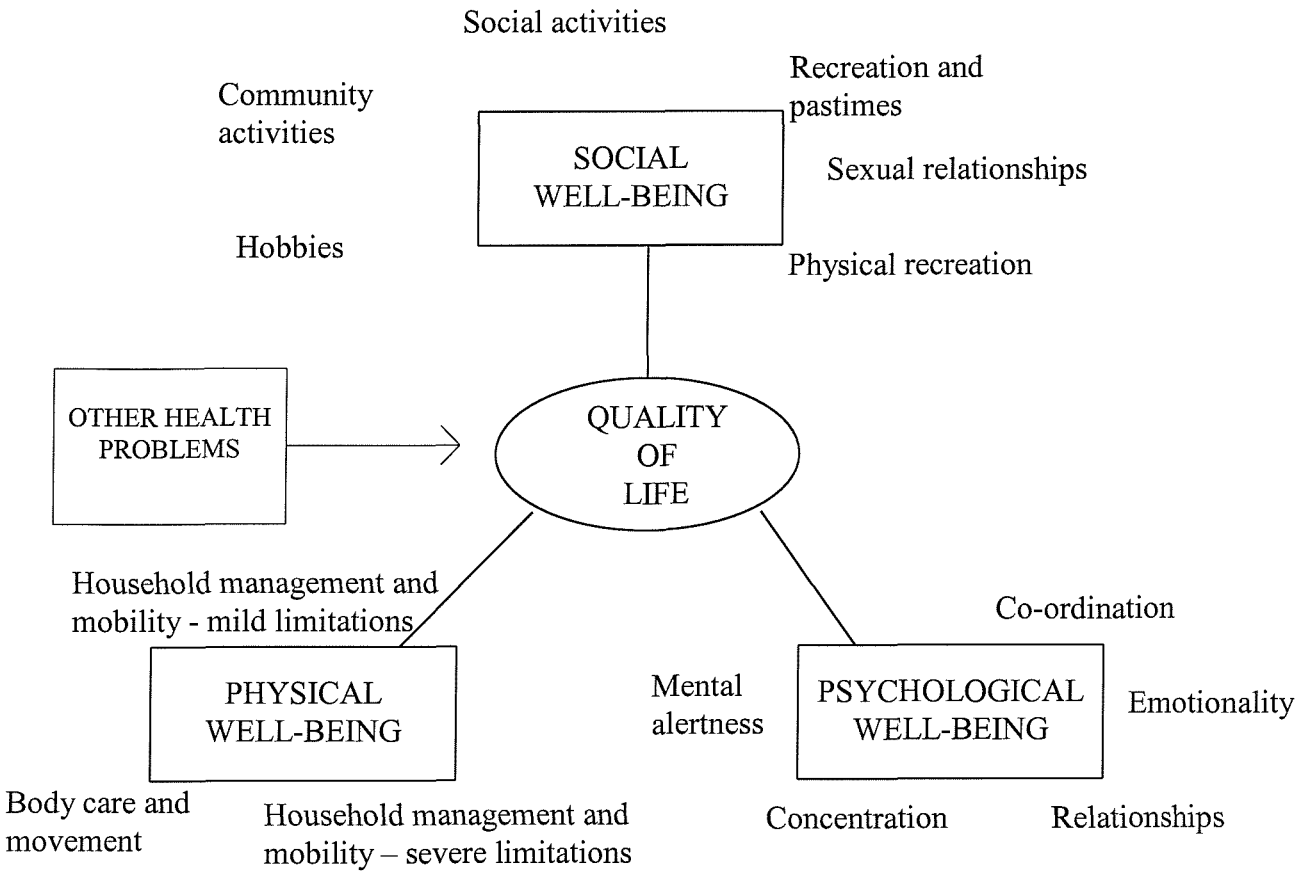


Figure 20.1: Data-driven model of the quality of life of dizzy individuals in a clinic dizzy sample

21.0 CONCLUSIONS

In Part III, the four dimension theoretical model of the quality of life of dizzy individuals has been refined based on responses on the FLP administered to dizzy individuals in a clinic population. Analysis of the responses along with some *a priori* decisions has led to the development of a data-driven model of the quality of life.

The three-factor structure of the final model reflects the multi-dimensional limitations reported by dizzy individuals. It is clear from the work presented in Part II that the quality of life of dizzy individuals cannot be fully understood without recognising other health problems. Hence, other health problems are added to the model. It is possible that the when there is a combination of dizziness and other health problems, the reduction in quality of life is greater than the sum of the reductions from the two alone. However, lack of a control sample with identical other health problems but no dizziness has prevented analysis of the interaction in this current study.

Formal examination of the combined effect of dizziness and other health problems is recommended based on the findings in the current study. The other health problems reported are shown to be characteristic of dizzy individuals. Future research will require a large control sample in order to match the other health problems with those in the clinic dizzy sample.

The quality of life of dizzy individuals can be adequately assessed using the shorter dizziness-specific quality of life questionnaire, named the Dizziness Impact Profile. In common with the FLP, the DIP cannot be used to measure individual changes in quality of life because of the wide within-subject variation in scores.

The dimensional aspects of quality of life of dizzy individuals have been identified as being psychological, physical and social well-being. The dimensions are treated as equal factors in the model in the absence of any evidence to the contrary. Each dimension is made up of factors that contribute to the individual's well-being in that dimension. The factors represent aspects of functioning in daily life that affect (usually restrict) the individual's well-being. The individual's well-being in each of the dimensions feeds into the overall quality of life of the dizzy individual.

22.0 GENERAL SUMMARY

Dizziness is known to be a common disabling condition. To date, information about the dizziness, the symptoms experienced and the quality of life of dizzy individuals in clinic (audiology departments) and general population samples has been limited. Shortcomings include the size and representativeness of samples surveyed, little attention to the characteristics of the dizziness reported in the general population and lack of validation for relevant populations of the questionnaires used to assess the limitations and restrictions in lifestyle experienced by dizzy individuals. Traditionally these have been assessed in the domain of handicap. The instrument for measuring handicap currently available and the subjective nature of the domain however, means that the limitations in lifestyle reported by dizzy individuals may not be reliably represented.

The present study has set out to address these shortcomings and to increase knowledge about dizziness and the limitations reported by dizzy individuals. The study has characterised the dizziness reported and described the limitations experienced by quantifying and establishing dimensions of quality of life for dizzy individuals. This has been achieved by carrying out a survey of dizziness, handicap and quality of life of dizzy individuals in clinic and general population samples.

The psychometric properties of the principal instruments used to assess the limitations reported by dizzy individuals have been established using standard statistical techniques. Both the handicap questionnaire, the Dizziness Handicap Inventory (DHI) and the established quality of life questionnaire, the Functional Limitations Profile (FLP) have been shown to be reliable and valid measures of the limitations reported by dizzy individuals. However, they are not sufficiently reliable to show differences between individuals.

The quality of life of dizzy individuals in clinic and general population samples of dizzy individuals has been assessed using the established Functional Limitations Profile and evaluated against comparison groups without dizziness. Quality of life has shown to be significantly reduced in dizzy individuals, the greatest reduction being for the psychosocial aspects. The reduction in quality of life is greater in the clinic dizzy than in the population dizzy samples. The limitations reported on the FLP are specific and different from those

reported by the comparison group of facial pain patients. Furthermore, the limitations depend specifically on the severity of dizziness as evidenced by clinic and general population dizzy samples.

A theoretical model of the quality of life of dizzy individuals has been developed based on current knowledge. Initially, this model guided the validation of the questionnaires and the survey work. The model has been refined based on responses given by the clinic sample of dizzy individuals on the Functional Limitations Profile. The final data-driven model illustrates the quality of life of dizzy individuals. Following from this, a dizziness-specific quality of life questionnaire, named the Dizziness Impact Profile has been developed using selected items from the FLP. Its psychometric properties have been assessed using the FLP item scores as a proxy for full independent validation. This new questionnaire provides a reliable, valid and convenient tool to assess the quality of life of dizzy individuals. In common with the FLP, it lacks sufficient reliability to show differences between individuals.

From the findings presented here, dizziness has been shown to be a widespread problem and a material impact on quality of life was reported in both clinic and general population samples of dizzy individuals. The dizziness reported in both clinic and general population samples of dizzy individuals has been characterised. The nature and extent of the limitations reported by dizzy individuals have also been quantified. The consequently increased understanding of dizziness and the limitations experienced, and the questionnaire instrument developed to assess these, can both be applied to the management of dizzy individuals in clinic practice and to service and resource planning for dizzy individuals.

23.0 FUTURE WORK

The psychometric properties have been established for the DIP using the FLP items selectively as a proxy for the actual questionnaires. These properties need to be demonstrated again by applying the DIP in its own right, although it is not anticipated that there will be material differences in the properties measured.

This questionnaire based on quality of life will be a valuable measure to assess the effectiveness of vestibular rehabilitation. For the DIP to be adopted as an outcome measure, the additional property of responsiveness must be established. A programme of future work has been planned to achieve this.

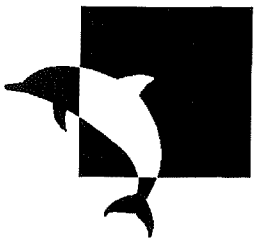
Following completion of the current study, a further study has been proposed to assess the effectiveness of the Epley manoeuvre for the treatment of BPPV. By adopting a treatment that has previously been shown to be effective, the responsiveness of the DIP to changes in quality of life as a result of the treatment can be assessed. It may be that adjustments will need to be made to the scoring scheme by introducing graded responses on the questionnaire to maximise its responsiveness.

Once the responsiveness of the DIP has been established, the questionnaire can then be used to assess the benefit patients receive from vestibular rehabilitation on quality of life, for which the evidence of its effectiveness is less clear than for symptoms.

The high prevalence of material reduction in quality of life and dizziness in the general population suggests that dizziness is an important public health problem which can result in lost work days. Results from the current study can be used to increase awareness of the problems encountered by dizzy individuals. Future work is needed to investigate the dizziness experienced in the general population and effective ways of treating this. Current research is addressing this although there appear to be problems with the participation of allied professions in such studies. If individuals with dizziness could be treated earlier, the vicious cycle of escalating functional limitations and ensuing reduction in quality of life can be halted earlier. It is likely that earlier intervention will be more successful. Health-economic evaluation of dizziness and its treatment is needed to demonstrate the wider importance of vestibular rehabilitation for service planning and funding.

APPENDIX 1

Functional Limitations Profile
and
Dizziness Handicap Inventory



University of Southampton

Institute of Sound and Vibration Research
University of Southampton

Functional Limitations Profile

We are interested in the activities you do in carrying out your daily life.

This booklet lists statements that describe things people often do when they are not well. Even if you think you are well, some of these statements may stand out, because they describe you and are related to your health. As you read each statement that describes you *today* and is *related to your health*, place a tick in the box to the right of the statement.

For example:
I am not driving my car ☐

If you have not been driving for some time because of your health and are still not driving today, you should tick this statement. On the other hand, if you never drive or are not driving today because your car is being fixed, you should not tick the box. Tick a statement *only* if you are sure that it describes you today and is related to your health.

Please tick the box at the end of each section when you have read all statements in that section.

Ambulation

The following statements describe walking and use of stairs. Remember, think of yourself today. Is this due to your health ?

1. I walk shorter distances or often stop for a rest. ☐
2. I do not walk up or down hills. ☐
3. I only use the stairs with a physical aid, for example handrail, stick or crutches. ☐
4. I only go up and down stairs with assistance from someone else. ☐
5. I get about in a wheelchair. ☐
6. I do not walk at all. ☐
7. I walk by myself but with some difficulty; for example, I limp, wobble, stumble, or I have a stiff leg. ☐
8. I only walk with help from someone else. ☐

9. I go up and down stairs more slowly; for example, one step at a time or I often have to stop. ☐
10. I do not use stairs at all. ☐
11. I get about only by using a walking frame, crutches, stick, walls, or hold on to furniture. ☐
12. I walk more slowly. ☐

Please tick here when you have read all statements in this section. ☐

Body Care and Movement
The following statements describe how you move about, bathe, go to the toilet and dress yourself today. Is this due to your health ?

13. I make difficult movements with help; for example, getting in or out of the bath or a car. ☐
14. I do not get in and out of bed or chairs without the help of a person or mechanical aid. ☐
15. I only stand for short periods of time. ☐
16. I do not keep my balance. ☐
17. I move my hands or fingers with some difficulty or limitation. ☐
18. I only stand up with someone's help. ☐
19. I kneel, stoop or bend down only by holding on to something. ☐
20. I am in a restricted position all the time. ☐
21. I am very clumsy. ☐
22. I get in and out of bed or chairs by grasping something for support or by using a stick or walking frame. ☐
23. I stay lying down most of the time. ☐
24. I change position frequently. ☐
25. I hold on to something to move myself around in bed. ☐
26. I do not bathe myself completely; for example, I need help with bathing. ☐
27. I do not bathe myself at all, but am bathed by someone else. ☐
28. I use a bedpan with help. ☐
29. I have trouble putting on my shoes, socks, or stockings. ☐
30. I do not have control of my bladder. ☐
31. I do not fasten my clothing; for example, I require assistance with

buttons, zips or shoelaces. ☐

32. I spend most of the time partly dressed or in pyjamas. ☐
33. I do not have control of my bowels. ☐
34. I dress myself, but do so very slowly. ☐
35. I only get dressed with someone's help. ☐

Please tick here when you have read all statements in this section. ☐

Mobility

These next statements describe how you get about the house and outside. Is this due to your health ?

36. I only get about in one building. ☐
37. I stay in one room. ☐
38. I stay in bed more. ☐
39. I stay in bed most of the time. ☐
40. I do not use public transport now. ☐
41. I stay at home most of the time. ☐
42. I only go out if there is a lavatory nearby. ☐
43. I do not go into town. ☐
44. I only stay away from home in short periods. ☐
45. I do not get about in the dark or in places that are not lit unless I have someone to help. ☐

Please tick here when you have read all statements in this section. ☐

Household Management

The following statements describe your daily work around the home. Remember think of yourself today, is this due to your health ?

46. I only do housework or work around the house for short periods of time or I rest often. ☐
47. I do less of the daily household chores than I would usually do. ☐
48. I do not do any of the daily household chores that I would usually do. ☐
49. I do not do any of the maintenance or repair work that I would usually do in my home or garden. ☐
50. I do not do any of the shopping that I would usually do. ☐
51. I do not do any of the cleaning that I would usually do. ☐
52. I have difficulty using my hands; for example, turning taps, using kitchen gadgets, sewing, or doing repairs. ☐

53. I do not do any of the clothes washing that I would usually do. ☐
54. I do not do heavy work around the house. ☐
55. I have given up taking care of personal or household business affairs; for example, paying bills, banking, or doing household accounts. ☐

Please tick here when you have read all statements in this section. ☐

Recreation and Pastime

The following statements describe the activities you usually do in your spare time, for relaxation, entertainment or just to pass the time. Again, think of yourself today, is this due to your health?

56. I spend shorter periods of time on my hobbies and recreation. ☐
57. I go out less often to enjoy myself. ☐
58. I am cutting down on some of my usual inactive pastimes; for example I watch TV less, play cards less, or read less. ☐
59. I am not doing any of my usual inactive pastimes; for example I do not watch TV, play cards, or read. ☐
60. I am doing more inactive pastimes instead of my other usual activities. ☐
61. I take part in fewer community activities. ☐
62. I am cutting down on some of my usual physical recreation or more active pastimes. ☐
63. I am not doing any of my usual physical recreation or more active pastimes. ☐

Please tick here when you have read all statements in this section. ☐

Social Interaction

These statements describe your contact with family and friends today. Remember, is this due to your health?

64. I go out less often to visit people. ☐
65. I do not go out at all to visit people. ☐
66. I show less interest in other people's problems; for example, I don't listen when they tell me about their problems, I don't offer to help. ☐
67. I am often irritable with those around me; for example, I snap at people or criticize easily. ☐
68. I show less affection. ☐
69. I take part in fewer social activities than I used to; for example, I go to fewer parties or social events. ☐

70. I am cutting down the length of visits to friends. ☐
71. I avoid having visitors. ☐
72. My sexual activity is decreased. ☐
73. I often express concern over what might be happening to my health. ☐
74. I talk less with other people. ☐
75. I make demands on other people; for example, I insist that they do things for me or tell them how to do things. ☐
76. I stay alone much of the time. ☐
77. I am disagreeable with my family, for example; I act spitefully or stubbornly. ☐
78. I frequently get angry with my family; for example, I hit them, scream, or throw things at them. ☐
79. I isolate myself as much as I can from the rest of my family. ☐
80. I pay less attention to the children. ☐
81. I refuse contact with my family; for example, I turn away from them. ☐
82. I do not look after my children or family as well as I usually do. ☐
83. I do not joke with members of my family as much as I usually do. ☐

Please tick here when you have read all item in this section. ☐

Emotion

The next statements describe your feelings and behaviour. Again think of yourself today and whether this is due to your health?

84. I say how bad or useless I am; for example, that I am a burden on others. ☐
85. I laugh or cry suddenly. ☐
86. I often moan and groan because of pain or discomfort. ☐
87. I have attempted suicide. ☐
88. I behave nervously or restlessly. ☐
89. I keep rubbing or holding areas of my body that hurt or are uncomfortable. ☐
90. I am irritable and impatient with myself; for example, I run myself down, I swear at myself, I blame myself for things that happen. ☐
91. I talk hopelessly about the future. ☐
92. I get sudden frights. ☐

Please tick here when you have read all statements in this section. ☐

Alertness

The following statements describe how alert you are. Think of yourself today and whether this is due to your health.

93. I am confused and start to do more than one thing at a time. ☐
94. I have more minor accidents; for example, I drop things, I trip and fall, I bump into things. ☐
95. I react slowly to things that are said or done. ☐
96. I do not finish things that I start. ☐
97. I have difficulty reasoning and solving problems; for example, making plans, making decisions, learning new things. ☐
98. I sometimes get confused; for example, I do not know where I am, who is around, or what day it is. ☐
99. I forget a lot; for example, things that happened recently, where I put things, or to keep appointments. ☐
100. I do not keep my attention on any activity for long. ☐
101. I make more mistakes than usual. ☐
102. I have difficulty doing things which involve thought and concentration. ☐

Please tick here when you have read all statements in this section. ☐

Sleep and Rest

These statements describe your sleep and rest activities today. Is this due to your health?

103. I spend much of the day lying down to rest. ☐
104. I sit for much of the day. ☐
105. I sleep or doze most of the time, day and night. ☐
106. I lie down to rest more often during the day. ☐
107. I sit around half asleep. ☐
108. I sleep less at night; for example, I wake up easily, I don't fall asleep for a long time, or I keep waking up. ☐
109. I sleep or doze more during the day. ☐

Please tick here when you have read all statements in this section. ☐

Eating
The following items describe your eating and drinking habits. Is this due to your health ?

110. I eat much less than usual. ☐
111. I feed myself but only with specially prepared food or special utensils. ☐
112. I eat special or different food; for example, I follow a soft food, bland, low salt, low fat, or low sugar diet. ☐
113. I eat no food at all, but I take liquids. ☐
114. I just pick or nibble at my food. ☐
115. I drink less fluids. ☐
116. I feed myself with help from someone else. ☐
117. I do not feed myself at all, but have to be fed. ☐

Please tick here when you have read all statements in this section. ☐

Communication
This section deals with how much you talk to other people and write. Think of yourself today and whether this is due to your health.

119. I have trouble writing or typing. ☐
120. I communicate mostly by nodding my head, pointing, or using sign language, or other gestures. ☐
121. My speech is understood only by a few people who know me well. ☐
122. I often lose control of my voice when I talk; for example, my voice gets louder or softer, or changes unexpectedly. ☐
123. I don't write except to sign my name. ☐
124. I carry on a conversation only when very close to other people or looking directly at them. ☐
125. I speak with difficulty; for example, I get stuck for words, I stutter, I stammer, I slur my words. ☐
126. I am understood with difficulty. ☐
127. I do not speak clearly when I am under stress. ☐

Please tick here when you have read all statements in the section. ☐

Work Items

The next group of statements has to do with any work you usually do other than managing your home. By this we mean anything that you regard as work that you do on a regular basis.

Do you usually do work other than managing your home? ☐Yes ☐No

If yes then complete this section.

If no;

Are you retired? ☐Yes ☐No

If you are retired, was your retirement due to your health? ☐Yes ☐No

If you are not retired but are not working, is this due to your health? ☐Yes ☐No

If yes, please tick item 128 and skip the rest of the items in this section.

If no, please skip this section.

128. I do not work at all (includes retired because of health). ☐

129. I do part of my job at home. ☐

130. I am not getting as much work done as usual. ☐

131. I often get irritable with my workmates; for example, I snap at them or criticize them easily. ☐

132. I work shorter hours. ☐

133. I only do light work. ☐

134. I only work for short periods of time or often stop to rest. ☐

135. I work at my usual job but with some changes; for example, I use different tools or special aids, or I swap jobs with someone else. ☐

136. I do not do my job as carefully and as accurately as usual. ☐

Please tick here when you have read all statements in this section. ☐

Thank you for your time and help with our research.

Please return with the other yellow questionnaires in the envelope provided (No stamp is needed)

Dizziness Handicap Inventory

The purpose of this scale is to identify difficulties that you might be experiencing because of your dizziness or unsteadiness. Please answer **YES, NO** or **SOMETIMES** to each question by ticking the appropriate box.

Answer each question as it pertains to your dizziness or unsteadiness problem only.

P1. Does looking up increase your problem?	**Yes** ☐	**Sometimes** ☐	**No** ☐
E2. Because of your problem do you feel frustrated?	**Yes** ☐	**Sometimes** ☐	**No** ☐
F3. Because of your problem do you restrict your travel for business or recreation?	**Yes** ☐	**Sometimes** ☐	**No** ☐
P4. Does walking down the aisle of a supermarket increase your problem?	**Yes** ☐	**Sometimes** ☐	**No** ☐
F5. Because of your problem do you have difficulty getting into or out of bed?	**Yes** ☐	**Sometimes** ☐	**No** ☐
F6. Does your problem significantly restrict your participation in social activities such as going out to dinner, movies, dancing or parties?	**Yes** ☐	**Sometimes** ☐	**No** ☐
F7. Because of your problem do you have difficulty reading?	**Yes** ☐	**Sometimes** ☐	**No** ☐
P8. Does performing more ambitious activities like sports, dancing, and household chores such as sweeping or putting dishes away increase your problem?	**Yes** ☐	**Sometimes** ☐	**No** ☐
E9. Because of your problem are you afraid to leave your home without having someone accompany you?	**Yes** ☐	**Sometimes** ☐	**No** ☐
E10. Because of your problem have you been embarrassed in front of others?	**Yes** ☐	**Sometimes** ☐	**No** ☐
P11. Do quick movements of your head increase your problem?	**Yes** ☐	**Sometimes** ☐	**No** ☐
F12. Because of your problem do you avoid heights?	**Yes** ☐	**Sometimes** ☐	**No** ☐

P13. Does turning over in bed increase your problem?	**Yes** ☐	**Sometimes** ☐	**No** ☐
F14. Because of your problem is it difficult for you to do strenuous housework or gardening?	**Yes** ☐	**Sometimes** ☐	**No** ☐
E15. Because of your problem are you afraid people may think you are intoxicated?	**Yes** ☐	**Sometimes** ☐	**No** ☐
F16. Because of your problem is it difficult for you to go for a walk by yourself?	**Yes** ☐	**Sometimes** ☐	**No** ☐
P17. Does walking down a road increase your problem?	**Yes** ☐	**Sometimes** ☐	**No** ☐
E18. Because of your problem is it difficult to concentrate?	**Yes** ☐	**Sometimes** ☐	**No** ☐
F19. Because of your problem is it difficult for you to walk around your home in the dark?	**Yes** ☐	**Sometimes** ☐	**No** ☐
E20. Because of your problem are you afraid to stay home alone?	**Yes** ☐	**Sometimes** ☐	**No** ☐
E21. Because of your problem do you feel handicapped?	**Yes** ☐	**Sometimes** ☐	**No** ☐
E22. Has your problem placed stress on your relationship with members of your family or friends?	**Yes** ☐	**Sometimes** ☐	**No** ☐
E23. Because of your problem are you depressed?	**Yes** ☐	**Sometimes** ☐	**No** ☐
F24. Does your problem interfere with your job or household responsibilities?	**Yes** ☐	**Sometimes** ☐	**No** ☐
P25. Does bending over increase your problem?	**Yes** ☐	**Sometimes** ☐	**No** ☐

Please complete and bring with you to the appointment with the other questionnaires. Thank you.

APPENDIX 2

Dizzy symptom questionnaire

University of Southampton

RESEARCH INTO BALANCE PROBLEMS

Questionnaire Number _____

To give me some background information about your balance problem, please answer the following questions. Tick the box that best applies to you and your balance problem.

Date completed_____ **Full name** _____

How old are you ?_____ **years** ☐ Male ☐ Female

What has been your main occupation? (If retired or not currently working write in your usual occupation) **Self** _____

Spouse _____

How long have you experienced your balance problems?

☐ less than 6 months ☐ 1-2 years
☐ 6-12 months ☐ more than 2 years

How long do the attacks last?

☐ less than 1 minute ☐ 1-5 minutes ☐ 5-20 minutes
☐ 20min -1hr ☐ more than 1 hour ☐ continuous

How often do the attacks occur on average?

☐ more than 1 a day ☐ a few times a week ☐ once a week
☐ once a month ☐ couple of times a year ☐ once a year
☐ all the time

What brings on an attack?

☐ nothing ☐ head/body movements ☐ other

If other, please specify_____

Please tick the words that best describe the symptoms you have during an attack. (You may tick more than one box)

☐ spinning ☐ unsteadiness ☐ lightheadedness
☐ nausea ☐ vomiting ☐ giddiness
☐ other , please specify_____

_____

Do the attacks incapacitate you? ☐Yes ☐No

Are you currently taking any medication for your balance problem? ☐Yes ☐No

If yes, please specify _____

Have you received any non-medical treatment for your balance problem? ☐Yes ☐No

If yes, please specify_____

_____

Please turn over

Do you experience any difficulty with your hearing ? ☐Yes ☐No

Do you ever get noises in your head or ears (tinnitus) that usually last longer than 5 minutes?

☐ No, never ☐ Some of the time ☐ Most or all of the time

Please rate your symptoms <u>nowadays</u> on the scale below. Circle the score that is the most appropriate for your balance and/or dizziness symptoms.

1	2	3	4	5	6	7	8	9	10
no symptoms									worst possible symptoms

Has dizziness or unsteadiness ever stopped you from working or carrying out your normal activities for more than 1 day?

☐ No
☐ Yes, more than 1 day and less than 1 week
☐ Yes, more than 1 week and less than 1 month
☐ Yes, more than 1 month

Nowadays, how much does your dizziness or unsteadiness worry, annoy or upset you?

☐ Not at all annoying
☐ Slightly annoying
☐ Moderately annoying
☐ Severely annoying

Nowadays, what impact does your dizziness or unsteadiness have on your quality of life? Consider participation in social events, work, relationships, personal well-being.

☐ Not affected
☐ Slightly affected
☐ Moderately affected
☐ Severely affected

Please tick any of the following that apply to you and have experienced recently. If you have a health problem that is not listed then please specify (You can tick more than one box).

☐ Lower limb problem eg. artificial leg, paralysis
☐ Head injury with loss of consciousness for more than an hour
☐ Raised blood pressure
☐ Neck problems eg. arthritis
☐ Arthritis of lower joints eg. hips,knees,ankles
☐ Depression/anxiety
☐ Other (please specify)_____

_____

Please rate your symptoms <u>today</u> on the scale below. Circle the score that is the most appropriate for your balance and/or dizziness symptoms.

1	2	3	4	5	6	7	8	9	10
no symptoms									worst possible symptoms

Thank you for your help.
Please return with the yellow questionnaires
in the envelope provided (No stamp is needed).

APPENDIX 3

HTA dizzy symptom questionnaire

University of Southampton

Appendix 3

Questionnaire Number_____

RESEARCH INTO BALANCE PROBLEMS

To provide us with additional information about your health, please answer the following questions. Tick the box that applies to you and your health **nowadays**.

Date completed _____ **Full Name** _____

***Nowadays*, do you have any difficulty with your hearing?** ☐ Yes ☐ No

***Nowadays*, do you get noises in your head or ears (tinnitus) which usually last longer than 5 minutes?** ☐ Yes ☐ No

***Nowadays*, do you have any problems with your nose?** For example, blocked nose, runny nose, mucus running down the back of your nose, or sneezing bouts (with at least 6 sneezes together) that has lasted for more than 14 days in a row; hayfever.
☐ Yes ☐ No

***Nowadays*, do you have any trouble with your speaking or singing voice?** For example, hoarseness, loss or weakness of the voice, other changes such as croakiness or an unstable pitch that have lasted for more than 14 days.
☐ Yes ☐ No

***Nowadays*, do you have a throat problem?** For example, tonsillitis or a severe sore throat. ☐ Yes ☐ No

***Nowadays*, do you have a problem with dizziness, unsteadiness or lightheadedness?** For example dizziness in which things seem to spin around you, dizziness in which you seem to move; unsteadiness, lightheadedness or feeling faint.
☐ Yes ☐ No

***In the last year*, have you been to your own doctor (GP) or referred to a hospital about problems with balance, dizziness or unsteadiness? Tick all that apply.**
☐ No ☐ Yes, visited doctor (GP) ☐ Yes, referred to hospital

Thank you for your help.
Please return with the yellow questionnaires in the envelope provided (no stamp is needed).

As part of our continuing research, we may contact you again to ask if you would be willing to take part in further studies. Please indicate below by ticking the box if you do **not** want to be contacted about further research.

Do NOT want to be contacted ☐

Note that completing these questionnaires does not commit you to take part in further research.

APPENDIX 4

Facial pain symptom questionnaire

University of Southampton

RESEARCH INTO FACIAL PAIN

Questionnaire Number _____

To give me some background information about your facial pain, please answer the following questions. Tick the box that best applies to you and your facial pain.

Date completed_____**Full Name**_____

How old are you? _____ **years** ☐ **Male** ☐ **Female**

What has been your main occupation? (If retired or not currently working write in your usual occupation) **Self** _____

What has been your spouse's main occupation?

Spouse _____

How long have you been experienced problems with facial pain?

☐ less than 6 months ☐ 6-12 months
☐ 1-2 years ☐ more than 2 years

How long on average does an episode of pain last ?

☐ less than 1 minute ☐ 1min-1hr
☐ 1-24hrs ☐ 1-7days
☐ 1week-1month ☐ more than 1 month ☐ continuous

How often on average do you experience episodes of facial pain ?

☐ all the time ☐ more than once a day
☐ a few times a week ☐ once a week
☐ once a month ☐ couple of times a year

How would you describe the site of your pain?

☐ Well localised ☐ Poorly localised

How would you describe your pain ?(Please tick only <u>one</u> box.)

☐ Sharp ☐ Dull ☐ Throbbing

Are you currently taking any medication for your facial pain? ☐ Yes ☐ No

If yes, please specify the medication _____

_____

If yes, was this prescribed at your recent appointment? ☐ Yes ☐ No

Please tick any of the following that apply to you or you have experienced recently. If you have a health problem that is not listed then please specify. (You may tick more than one box)

☐ Loss of consciousness for more than an hour
☐ Lower limb problem e.g. artificial leg, paralysis
☐ Arthritis of lower joints e.g. hips,knees,ankles
☐ Hypertension
☐ Depression/anxiety
☐ Other (please specify)_____

_____

Please turn over .....

Do you experience any difficulty with your hearing? ☐ Yes ☐ No

Do you ever get noises in your head or ears (tinnitus) which usually last longer than 5 minutes?

☐ No, never ☐ Some of the time ☐ Most or all of the time

Do you suffer from dizziness, unsteadiness or problems with balance?

☐ Yes ☐ No

Please rate your symptoms <u>nowadays</u> on the scale below. Circle the number that is the most appropriate for your facial pain. Circle only one number.

1 2 3 4 5 6 7 8 9 10

no symptoms — worst possible symptoms

Has your facial pain problem ever stopped you from working or carrying out your normal activities for more than 1 day?

☐ No
☐ Yes, more than 1 day and less than 1 week
☐ Yes, more than 1 week and less than 1 month
☐ Yes, more than 1 month

Nowadays, how much does your facial pain worry, annoy or upset you?

☐ Not at all annoying
☐ Slightly annoying
☐ Moderately annoying
☐ Severely annoying

Nowadays, what impact does your facial pain have on your quality of life? Consider participation in social events, work, relationships, personal well-being.

☐ Not affected
☐ Slightly affected
☐ Moderately affected
☐ Severely affected

Please rate your symptoms <u>today</u> on the scale below. Circle the score that is the most appropriate for your facial pain. Circle only one number.

1 2 3 4 5 6 7 8 9 10

no symptoms — worst possible symptoms

Thank you for your help

Please return with the other yellow questionnaires in the envelope provided (No stamp is needed).

APPENDIX 5

HTA 'normal' symptom questionnaire

University of Southampton

Appendix 5

Questionnaire Number_____

RESEARCH INTO QUALITY OF LIFE

To provide us with additional information about your health, please answer the following questions. Tick the box that applies to you and your health **nowadays**.

Date completed _____ **Full Name** _____

***Nowadays*, do you have any difficulty with your hearing?** ☐ Yes ☐ No

***Nowadays*, do you get noises in your head or ears (tinnitus) which usually last longer than 5 minutes?** ☐ Yes ☐ No

***Nowadays*, do you have any problems with your nose?** For example, blocked nose, runny nose, mucus running down the back of your nose, or sneezing bouts (with at least 6 sneezes together) that has lasted for more than 14 days in a row; hayfever. ☐ Yes ☐ No

***Nowadays*, do you have any trouble with your speaking or singing voice?** For example, hoarseness, loss or weakness of the voice, other changes such as croakiness or an unstable pitch that have lasted for more than 14 days. ☐ Yes ☐ No

***Nowadays*, do you have a throat problem?** For example, tonsillitis or a severe sore throat. ☐ Yes ☐ No

***Nowadays*, do you have a problem with dizziness, unsteadiness or lightheadedness?** For example dizziness in which things seem to spin around you, dizziness in which you seem to move, unsteadiness, lightheadedness or feeling faint. ☐ Yes ☐ No

If you have *ever* suffered from any of the following, please tick any that apply to you. You can tick more than one box.

- ☐ Attacks of dizziness in which things seem to spin around you
- ☐ Unsteadiness, lightheadedness or feeling faint
- ☐ Attacks of dizziness in which you seem to move

Please tick any of the following that apply to you. If you have any health problem that is not listed then please tick other and specify. (You can tick more than one box.)

- ☐ Lower limb problem e.g. artificial leg, paralysis
- ☐ Head injury with loss of consciousness for more than one hour
- ☐ Raised blood pressure
- ☐ Neck problems e.g. arthritis, restricted movement
- ☐ Arthritis of lower joints e.g. hips, knees, ankles
- ☐ Depression/anxiety
- ☐ Other, please specify _____

_____

Thank you for your help.
Please return with the yellow questionnaires in the envelope provided (No stamp is needed).

As part of our continuing research, we may contact you again to ask if you would be willing to take part in further studies. Please indicate below by ticking the box if you do **not** want to be contacted about further research.

Do NOT want to be contacted ☐

Note that completing these questionnaires does not commit you to take part in further research.

APPENDIX 6.0: STATISTICAL AND ANALYTICAL METHODS

A range of statistical methods were adopted throughout the study to analyse the questionnaire responses and to assess the psychometric properties of the questionnaires. The techniques are reviewed here.

A6.1 DISTRIBUTION OF DATA

The distribution of all data analysed was examined using the Komogorov-Smirnov test. Apart from age, all data were not normally distributed. Non-parametric statistics were therefore used through out to analyse the questionnaire responses. Age was examined using parametric statistics.

A6.2 ADJUSTMENT OF *P* VALUE FOR MULTIPLE COMPARISONS

Performing multiple comparisons to investigate the effect of a characteristic on questionnaire scores for example increases the probability that significant differences will occur between pairs, even if those pairs are equal. Statistical procedures are available that adjust the observed level of significance to protect against the possibility that more differences are reported as statistically significant than really are. However such methods have been developed for parametric statistics and not the non-parametric statistics used here. The rationale adopted for a parametric correction for multiple comparisons, Bonferroni adjustment was applied here.

Bonferroni[1] involves an adjustment to the *p* value for significance by dividing the original significance level by the number of comparisons to be made. Concerns are that this approach is conservative when there are large number of comparisons. For multiple comparisons the *p* value for a 5% significance level was adjusted to 0.01. This takes into account the increased probability of a difference being significant while avoiding the problems encountered when using the over conservative Bonferroni adjustment. Reference to the use of such adjustments will be made where appropriate.

[1] Based on the well-known Bonferroni inequality, which states that the probability of occurrence of one or more events can never exceed the sum of their individual probabilities.

A6.3 TEST-RETEST REPEATABILITY

A questionnaire has associated with it test-retest uncertainty. If a questionnaire is applied on two separate occasions, there are likely to be changes in the score due to the uncertainty of the questionnaire. There may also be bias on the scores between the two applications due to the questionnaire itself or the property being assessed. The better the repeatability, the smaller the changes are on the questionnaire between time 1 and time 2.

A number of different statistical methods have been adopted in the literature to assess test-retest repeatability. Unfortunately these have not all been appropriate and valid tests of this property. The methods to be used in this current survey are discussed.

A6.3.1 Standard deviation of change

The standard deviation of the change between time 1 and time 2 provides information about the reliability of the questionnaire. This measures changes within subjects. The smaller the standard deviation, the more repeatable the questionnaire.

A6.3.2 Bland-Altman plot

A Bland-Altman plot has been proposed as a graphical technique to illustrate the repeatability of a measure (Bland and Altman, 1986). The plot, shown in Figure 6.1 illustrates the agreement between two measurements.

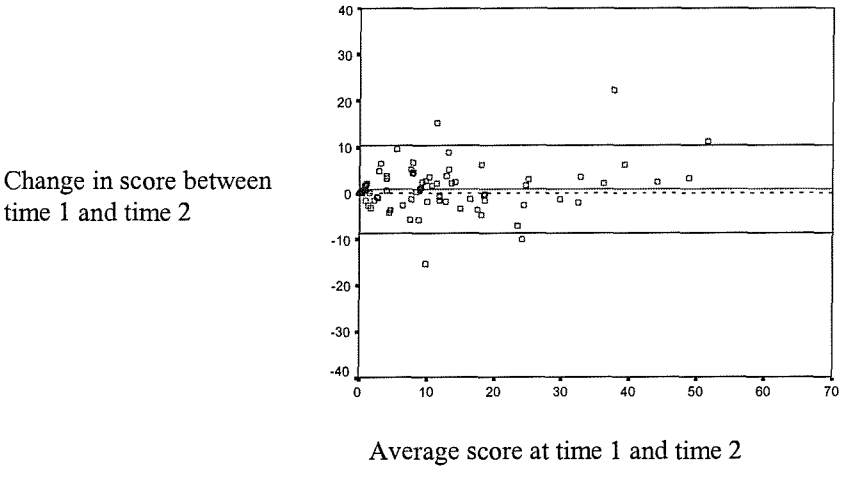


Figure 6.1: Example of a Bland-Altman plot

The mean difference between time 1 and time 2 should be zero (or at least near zero). Such a method also shows how, if at all, the reliability of the questionnaire changes with the magnitude of the questionnaire scores themselves. For a questionnaire that has poor repeatability there will be considerable variation in repeated measurements on the questionnaire for the same subject.

A6.3.3 Correlation coefficient

Measurement of the correlation between time 1 and time 2 indicates the discriminatory power of the questionnaire amongst individuals. By inference this may provide information about the ability to measure changes within individuals over time.

A questionnaire can have a small standard deviation but a low correlation coefficient between time 1 and time 2. Therefore although the questionnaire is reliable there is little variation in scores between individuals. A questionnaire with a small standard deviation and high correlation coefficient between replications indicates a reliable questionnaire that differentiates between individuals.

The correlation coefficient is therefore an important addition to the statistical methods already reviewed. There has however been a tendency for it to be applied on its own. In this case there is a danger that a high correlation is measured while there is a systematic change in the magnitude of scores from time 1 to time 2.

A6.4 VALIDITY

The validity of a questionnaire is the demonstration that it measures what it claims to measure. Two main forms of validity are assessed in this survey- content and construct validity. The statistics to assess these properties are generally not well established and often claims are made of the validity of a questionnaire without formal statistical analysis having been carried out. The methods adopted here are those that are most widely accepted.

A6.4.1 Content validity

This form of validity examines the structure within a questionnaire and the correlations between items belonging to a proposed internal scale and the score for that scale.

A6.4.2 Construct validity

Construct validity examines the relationships between the questionnaire of interest and criterion measures. It is based on the theoretical proposition of relationships or the absence of relationships between the questionnaire and the criterion measures. There are two forms of construct validity: convergent validity is the presence of a relationship with a related measure; discriminant validity is the absence of a correlation between variables that should not be related. The relationships are examined using non-parametric correlations.

A6.5 INTERNAL CONSISTENCY

Internal consistency is a measure of the reliability of a questionnaire. It is dependent on the structure and design of the questionnaire. In the cases where the design includes many items assessing the same underlying construct, the internal consistency for those items should be high. For the design where the items assess differing underlying constructs, the internal consistency should be low.

Internal consistency here is assessed using Cronbach's alpha, which is based on the average correlation between items in a scale. Scales with high internal consistency and therefore that are reliable have alpha values close to one.

A6.6 FACTOR ANALYSIS USING THE PRINCIPAL COMPONENTS METHOD

Factor analysis is a parametric statistical technique. Justification for its use is found in those sections of the thesis where it is applied. The theory of the technique itself is outlined here.

The analysis is a mathematical technique used to identify underlying variables or factors to explain the pattern of correlations between a set of variables. The technique can also be

performed on the covariance matrix formed by the variables. The description of the technique given here is based on the use of the correlation matrix.

A6.6.1 Factor identification

The most common form of factor analysis is the principal components method (Howitt and Cramer, 1997). Principal components analysis (PCA) identifies factors that are linear combinations of the observed variables. The factors are extracted in order of the amount of variance in the original variables that is explained by the factor. The first factor is the linear combination of original variables to explain maximum variance. The second factor is orthogonal (perpendicular) to the first and is the linear combination that has maximum variance of the remaining variance from the original variables, and so on.

The amount each original variable is associated with an extracted factor is represented by a factor loading which can be understood in a similar way to a correlation coefficient. A variable with a high factor loading is correlated highly with that factor. The factor loadings are used to determine the variables that contribute to a factor. Although there appear to be no established guidelines, it has been suggested that values of 0.3 or 0.4 are commonly applied as the criterion for a material loading value (Sue High, 1999; Peter Smith, 1999).

Each extracted factor explains a certain amount of variance determined by how the original variables load onto the factor. This explained variance is represented by an eigenvalue, calculated as the sum of the squared loadings of a particular factor. In extracting the factors, principal components analysis aims to maximise the variance explained by each consecutive factor.

A6.6.2 Factor rotation

The aim of factor analysis is to understand the conceptual underlying structure of the correlation matrix (or when used, the covariance matrix) from the variables. It is often found that it is difficult to interpret the common meaning of the original variables that combine to form the extracted factor.

A technique developed to represent the underlying structure of the variables in a more interpretable way is factor rotation. Rotation of the factors involves maximising the number of high loadings on a factor and minimising the number of low loadings.

Rotation of the original factors is recommended as part of the factor analysis (Howitt and Cramer, 1997). Orthogonal rotation is the most routinely used method of factor rotation where the orthogonality of the factors is maintained.

A6.6.3 Factor reduction

A full PCA model would consist of as many factors as original variables. However all factors may not be needed to explain the variance in the data. Factor reduction is the technique to simplify the structure and to reduce the number of factors, and as a result the number of original variables used to explain the variance in the original data.

Reduction of the number of factors to describe the variance in the data and the subsequent interpretation of the extracted factors introduce a subjective aspect to the technique. These aspects of the analysis require the specification of criteria that often depend on the purpose of the analysis.

Extraction of the right number of factors has been reported to be particularly important when the factors are to be rotated (Howitt and Cramer, 1997). However since there is no universally accepted test to determine the number of factors, this again must be based on the subjective opinion of the experimenter.

Despite the absence of a universally accepted method to determine the number of factors to be extracted, a number of methods have been proposed. The two most commonly adopted methods will be outlined here. The first method is to extract only those factors with eigenvalues greater than 1.00 (after Kaiser(1959)). This is based on the assumption that a factor with an eigenvalue less than 1.00 does not receive its 'fair share' of variance by chance. Although this means that it cannot be statistically significant (Howitt and Cramer, 1997), the converse that a factor with eigenvalue greater than 1.00 is statistically significant is not necessarily true.

The second method is to use the 'Scree' test. This is based on a plot of the amount of variance explained by each successive factor identified in the factor analysis. An example of a plot is shown in Figure 6.2. The point at which the curve flattens is where each successive factor explains a similar amount of variance. This point is used to indicate the start of the non-significant factors (after Catell (1966)).

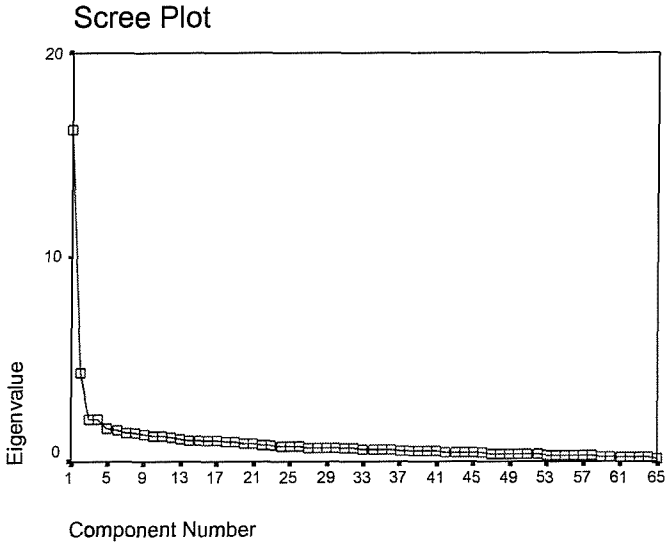


Figure 6.2: Scree plot

A6.6.4 Factor interpretation

Interpretation of the extracted factors is based on their content in terms of the original variables entered into the analysis.

APPENDIX 7

Patient information sheets for the dizzy individuals
in the clinic and general population samples

University of Southampton

RESEARCH INTO QUALITY OF LIFE

Thank you for considering to take part in our research.

We are interested in how balance problems affect a person's lifestyle and their ability to carry on with their usual daily activities. In our research we are also contacting patients who experience facial pain to compare the impact of these two health problems. A little of your time will allow us to learn more about the impact of your balance problems.

I would be grateful if you would complete the enclosed questionnaire booklet. This is concerned with many aspects of your daily life that may be affected by your balance problems. Although you may find that some of the items are not relevant to you, please complete the whole questionnaire. There are also additional questionnaires which are more concerned with your symptoms and how you perceive your health to be. These should be completed on the same day as the questionnaire booklet. In addition, as part of the research, you may receive additional questionnaires in around a month's time.

Please complete all of the questionnaires on the same day and within a week of your visit to the Audiology clinic. However, it is important that you do <u>not</u> complete them on the day of testing.

Your responses will be kept private and confidential. You may decline to take part or withdraw at any time without giving reason. This will not affect the treatment you receive for your balance problem.

Please return all of the questionnaires in the envelope provided. There is no need for a stamp. If you have any questions, please do not hesitate to contact me.

Thank you for taking the time to help our research.

Yours sincerely

Rachel Booth BSc, MSc
Audiological Scientist

MRC
Medical Research Council

MRC Institute of Hearing Research
University Park
Nottingham NG7 2RD
United Kingdom

Dear

RESEARCH INTO QUALITY OF LIFE

Thank you for completing and returning the questionnaire you received recently as part of the study being carried out by the Medical Research Council into Ear, Nose and Throat problems.

As part of our continuing research, we are interested in how a person's health affects their lifestyle and their ability to carry out their usual daily activities. In our research we are contacting people who do not complain of any ear, nose or throat problems. We are also contacting people who complain of dizziness to see how much effect dizziness can have on a person's day to day life so that we can compare the two groups. A little of your time will allow us to learn more about the effect on quality of life of different types of health problems.

I would be grateful if you would complete the enclosed questionnaire booklet. This is concerned with many aspects of your daily life that can be affected by health problems. Although you may find that some of the items are not relevant to you, please complete the whole questionnaire as this is still important for our research. There are also additional questionnaires that are concerned with ear, nose and throat problems and how you perceive your health. Please would you complete all of the questionnaires on the same day. In addition, as part of the research, you may receive the questionnaires again in around a month's time.

Please complete and return all of the enclosed questionnaires in the envelope provided as soon as possible. No stamp is needed.

Your responses will be kept private and confidential. You may decline to take part or withdraw at any time without giving reason.

This research is being carried out jointly with Rachel Booth at the ISVR Hearing and Balance Centre, University of Southampton. If you have any questions about the research, you can contact Rachel on 01703 592288.

Thank you very much for taking the time to help our research.

Yours sincerely

A C Davis

Professor Adrian Davis
Head of Epidemiology and Public Health Medicine

APPENDIX 8

Diagnostic sheet for dizzy individuals in the clinic sample

STUDY OF THE QUALITY OF LIFE OF BALANCE-DISORDER PATIENTS

Questionnaire Number _____

Patient Name:
Address:

Postcode:

Please give the patient the attached questionnaire pack and keep this sheet.
Guidelines for information to give to the patient:

- the research is part of a study being carried out at the University of Southampton to improve the treatment of patients
- the importance of completing the questionnaires so that we can improve knowledge and subsequent care and treatment
- patients can decline to take part or withdraw at any time without giving reason and without affecting the management they receive in the department
- pack contains information about the study and a pre-paid envelope for them to return the completed questionnaires
- it should take around 30 minutes to complete the questionnaires

Assessed by _____ Date _____

Please indicate below the diagnostic category that *best* describes the patient's condition. If the patient has 2 types of problems, please indicate the diagnosis that is related to the symptoms that bothers the patient the most.

Peripheral asymmetry	☐	Peripheral, no asymmetry	☐
Meniere's like	☐	Central	☐
BPPV	☐	Positional -other	☐
N.A.D on testing	☐	Other, please specify	☐

_____

Please indicate below any additional factors that appear to play an important role in the patient's balance problems.

☐ Neck problems ☐ Anxiety

☐ Lack of confidence ☐ Poor coping strategies eg visually dependent etc.

What type of appointment was this?

☐ Diagnostic assessment ☐ VR assessment

Would you recommend referral to vestibular rehabilitation? ☐ Yes ☐ No

Comments:_____

_____

Please could you place this sheet in the folder provided marked **Quality of Life Study** in the office.

Thanks
Rachel Booth

APPENDIX 9

Follow-up information sheet for non-responders
in clinic and general population samples of dizzy individuals

University of Southampton

Appendix 9
Follow-up information sheet for non-responders in the clinic sample of dizzy individuals

RESEARCH INTO QUALITY OF LIFE

We are carrying out research at the University of Southampton looking at the impact of balance problems on a person's lifestyle and their ability to carry on with their usual activities. In our research we are also contacting patients who experience facial pain to compare the impact of balance problems and facial pain upon quality of life.

You may remember receiving one of our questionnaire packs when you visited your local Audiology department. If you have already returned the completed questionnaire pack then I apologise for taking up your time again.

A little of your time will allow us to learn more about the impact of your balance problems. It will also help us develop ways of measuring how a person benefits from treatment.

If you have not already returned the questionnaires, I would be very grateful if you could complete the enclosed questionnaires. The questionnaire booklet is concerned with many aspects of your daily life that may be affected by your balance problems. Even though you may find that some of the items are not relevant to you, please complete the whole questionnaire as this still provides us with important information. There are additional questionnaires that are concerned with your symptoms and how your perceive your health to be. These should be completed on the same day as the questionnaire booklet. In addition, as part of the research, you may receive additional questionnaries in around a month's time.

Your responses will be kept private and confidential. You may decline to take part or withdraw at any time without giving reason. This will not affect the treatment you receive for your balance problems.

Please complete and return all the enclosed questionnaires in the envelope provided. No stamp is needed.

If you have any questions, please do not hesitate to contact me.

Thank you very much for taking the time to help our research.

Yours sincerely

Rachel Booth BSc MSc
Audiological Scientist

Appendix 9
Follow-up information sheet for non-responders
in the general population sample of dizzy individuals

MRC Institute of Hearing Research
University Park
Nottingham NG7 2RD
United Kingdom

Medical Research Council

Dear

RESEARCH INTO QUALITY OF LIFE

We are carrying out research jointly with the University of Southampton to look at how a person's health affects their lifestyle and ability to carry out their usual activities.

You may remember receiving a set of questionnaires through the post. If you have already returned the questionnaire pack then I apologise for taking up your time again.

In our research we are contacting people who complain of dizziness, unsteadiness or lightheadedness to see how much effect dizziness can have on a person's day to day life. From your responses to the original MRC questionnaire about a range of ear, nose and throat problems, we have selected you as one of the people reporting dizziness. Your responses to the enclosed questionnaires are important even if you are no longer experiencing any dizziness or have never experienced any dizziness. If you have never experienced any dizziness, please complete and return the questionnaire 'Research into Quality of Life' and indicate that you have never experienced any problems of dizziness, unsteadiness or lightheadedness.

If you experience dizziness now or have done in the past, I would be very grateful if you could complete all of the enclosed questionnaires. The booklet is concerned with many aspects of your daily life that can be affected by health problems. Although you may find that some of the items are not relevant to you, please complete the whole questionnaire as this is still important for our research. There are also additional questionnaires that are concerned with ear, nose and throat problems and how you perceive your health. In addition, as part of the research, you may receive questionnaires again in around a month's time.

Please help me with this important research by completing the enclosed questionnaires and returning them in the envelope provided as soon as possible. No stamp is needed.

Your responses will be kept private and confidential. You may decline to take part or withdraw at any time without giving reason.

This research is being carried out jointly with Rachel Booth at the ISVR Hearing and Balance Centre, University of Southampton. If you have any questions about the research, you can contact Rachel on 01703 592288.

Thank you very much for taking the time to help our research.

Yours sincerely

A C Davis

Professor Adrian Davis
Head of Epidemiology and Public Health Medicine

APPENDIX 10

Information sheet about the repeatability study carried out in the clinic sample of dizzy individuals

University of Southampton

RESEARCH INTO QUALITY OF LIFE

Thank you very much for completing and returning the questionnaire pack you received when visiting your local hospital for the assessment of your balance problems. The information from your questionnaires will contribute towards our knowledge about how balance problems affect a person's lifestyle.

As part of our continuing research we want a selection of people to complete the questionnaires for a second time. I would therefore be very grateful if you could complete the enclosed questionnaires. This will provide us with important information to look at how the questionnaires can be used to measure the impact of your balance problems and the benefit received from treatment.

Please complete all of the enclosed questionnaires within a week and return in the envelope provided. No stamp is needed.

Your responses will be kept private and confidential. You may decline to take part or withdraw at any time without giving reason. This will not affect any treatment you receive for your balance problems.

Thank you again for taking the time to help our research.

Yours sincerely

Rachel Booth BSc MSc
Audiological Scientist

APPENDIX 11.0: SURVEY OF FACIAL PAIN PATIENTS

The purpose of the survey of the comparison group of facial pain patients has been discussed elsewhere. The methodological aspects of this survey and the results obtained are presented here.

A11.1 SUBJECTS

Subjects were consecutive adult patients attending a maxillofacial outpatient department for the initial assessment of facial pain.

For ethical reasons a lower age limit of 18 years of age was placed on subjects. There was no upper age limit. Patients were fluent in written English for reliable completion of the questionnaires.

Patients attending the Maxillofacial outpatient department at Southampton General Hospital, Southampton University Hospitals NHS Trust took part in the survey. Although not representative of all facial pain patients, the survey would provide the intended comparison group for the clinic sample of dizzy individuals as previously outlined.

A11.2 SUBJECT NUMBERS

Sample size calculations were based on being able to detect a difference of 4% in overall FLP score between clinic dizzy patients (assumed population mean 10.0%, SD 12%) and facial pain patients (assumed population mean 6%, SD 8%) as being significant ($p<0.05$) with a power of 80%. Calculations indicated that 80 subjects were needed to return questionnaires. Assumed mean score for the clinic sample of dizzy individuals was based on the score obtained in a pilot study; that for the facial pain sample was proposed assuming quality of life to be reduced but to a lesser extent than for the dizzy clinic sample.

Prior to commencement of the survey, approximately 10 new facial pain patients were assessed each week within the department. It was considered sufficient to recruit only the one centre to take part in the study to obtain the sample size required.

It became apparent during the survey that the number of administered questionnaires was lower than expected. This was for two reasons. Contract obligations in the department reduced the number of new patients seen and in the busy clinics, questionnaire packs were not administered to every patient.

As a result of these problems, in the 15 months of the survey only 82 questionnaire packs were administered at a rate of around five per month; considerably less than the projected numbers.

A11.3 ETHICAL APPROVAL

Local Research Ethics Committee (LREC) approval was obtained from the Southampton and South West Hants LREC in conjunction with the survey of dizzy patients in Southampton.

Changes were required to the original documentation to provide clear information that the facial pain patients were to act as a comparison group in the research.

A11.4 QUESTIONNAIRE PACKS

As for the clinic sample of dizzy individuals, a questionnaire pack was administered to each patient meeting the selection criteria for the study. The pack contained information about the research, the questionnaires and a Freepost addressed envelope for the return of the completed questionnaires.

The questionnaires were presented in an A5 envelope that was labelled 'Research into Quality of Life. Thank you for taking part.' The presentation of the questionnaires was the same as for the survey of dizzy individuals (see Section 11.5).

A11.4.1 Patient information

The information sheet was similar to that for the dizzy individuals to avoid any bias. The information sheet was again written to encourage patients to take part in the research by providing information about the survey and what was involved. This was particularly important for this group since patients were informed of their role as a comparison group

and because of the anticipated less reduction in quality of life in individuals with facial pain compared with dizzy individuals.

Details included in the information sheet were phrased in such a way that the ethical requirements were met while also emphasising the importance of learning about facial pain from the patient.

The information sheet also provided details about the questionnaires and instructions for their completion and return. Patients were made aware that they may receive a second questionnaire pack by post in a month's time. This was part of the follow-up of non-responders. A contact name and number was provided for any queries concerning the research.

Assurances of confidentiality and the option to withdraw from the survey at any stage without reason and without affecting future treatment were made.

A11.4.2 Questionnaires

The questionnaire pack for the survey of facial pain patients contained the facial pain symptom questionnaire and the Functional Limitations Profile. A discussion of these questionnaires is found in Section 6.0.

A11.4.3 Completion of the questionnaires

Instructions for the completion of the questionnaires were provided on the information sheet. Patients were required to complete the questionnaires at home and return them in the enclosed envelope.

In contrast to the survey of dizzy patients, the facial pain patients were requested to complete the questionnaires on the day of the appointment in the maxillofacial department. This was to prevent any effect of medication prescribed at the appointment on the responses to the FLP questionnaire. It was felt that this restriction may prevent a large number of patients from responding and so the caveat was introduced that alternatively patients should complete the questionnaires as soon as possible after the appointment.

It was made clear that the questionnaires should be completed on the same day although the order in which the questionnaires were to be completed was not specified. This issue is discussed in Section 11.5.3.

A11.4.4 Administration of the questionnaire packs

The consultant, registrar or house officer assessing the patient administered the questionnaire pack at the time of the appointment.

Each clinician involved in the survey was given a copy of the protocol that was developed in collaboration with the consultants involved. An attempt was made to meet each clinician to explain the research and to encourage the clinicians to remember to administer the questionnaire packs. Nurses were also recruited to remind the clinicians to administer the questionnaires at the appointments.

Guidelines for instructions to the patient were attached to each questionnaire pack as part of the diagnostic sheet (Section A11.6). The verbal instructions given to patients included the following.

- an explanation of the research
- that the research was being carried out at the University of Southampton
- that the pack contained information about the study and a Freepost envelope for the return of the completed questionnaires
- that the questionnaires should take around 20 minutes to complete
- taking part in the study would not affect the treatment received

Posters were placed in the consulting rooms to remind clinicians to hand out the questionnaires. Frequent visits were also made to the department to remind those involved.

Initially the clinician identified patients eligible for the survey during the course of the assessment. Later, eligible patients were identified while preparing the hospital notes and the packs were placed inside the corresponding hospital notes. This achieved an improvement in the administration rate for the questionnaire pack.

A11.4.5 Diagnostic questionnaire

The clinician completed a diagnostic questionnaire for each patient receiving a questionnaire pack at the time of the appointment as for the clinic sample of dizzy

individuals. This provided information about the patient population and also details about those requiring follow-up questionnaires.

The diagnostic categories were specified to describe the patient population surveyed and were defined based on discussions with the collaborating consultants. The categories were chosen to reflect the most common causes of facial pain encountered within a maxillofacial department. A category of 'other' was specified to include those diagnoses not covered.

The diagnostic categories for the facial pain patients were as follows.

- Temporal-mandibular joint (TMJ) disorders
- Atypical facial pain
- Neuralgia
- Dental pain
- Vascular/migranous
- Sinus disease
- Other, please specify.

A concern was that because of the nature of the presentation of facial pain, it would be difficult to diagnose the cause at the initial assessment or that this diagnosis may differ from one made at a later date. The categories specified however could be considered to be general groupings of causes and not as specific as the explanation of the cause that would be required by a patient. For those where the cause was unclear, it was possible to indicate this in the other category. It would be possible at a later date to check the medical records of patients to ascertain the diagnostic category for those where the diagnosis was not certain.

There was the possibility of a discrepancy between diagnostic categories assigned by consultants compared with junior medical staff. The appointment system within the department was such that the consultants themselves saw the most difficult cases, which were often facial pain patients. It was therefore assumed that the diagnostic category was accurately assigned to patients at the initial assessment.

A11.5 FOLLOW-UP OF NON-RESPONDERS

Patients who had not returned the completed questionnaires one month after receiving the questionnaire pack were contacted with a follow-up letter and second set of questionnaires by post. The approach to follow-up non-responders for the dizzy survey was adopted for the follow-up of facial pain patients and a fuller discussion of this stage of the survey is found in Section 11.6.

Timely follow-up of patients required return of the diagnostic sheets. It was not possible to follow-up a small number of patients because of the late return of the diagnostic sheets. The date that the follow-up questionnaires were administered was recorded in the patient's details. No further contact was made with the patients if the follow-up questionnaires were not returned.

A11.6 RESULTS

A11.6.1 Return rate

Of the 82 questionnaires administered during the 15 months of the survey, 54 completed questionnaires were returned at an overall return rate of 65.9%. This was achieved after contacting non-responders once for follow-up. Before follow-up the return rate was 56.3%.

Return of completed questionnaires was independent of sex (Chi-squared, $p>0.05$) and there was no significant difference in age between responders and non-responders (Student t-test, $p>0.05$). Recoding the diagnostic categories into Temporal-mandibular joint (TMJ) disorders, other causes and not given, there was no difference in the distribution of diagnostic categories for responders and non-responders (Chi-squared, $p>0.05$).

A11.6.2 Responder details

Mean age of responders was 42.2 years (SD 17.7, 95% CI: 37.3; 46.0; Range 17-76 years). Of those responding 82% were female and although males (mean age 50.0 yrs; 95% CI: 33.4; 66.6 years) were older than females (mean age 41.2; 95% CI: 36.1; 46.4) this was not significant.

Although the original variables for symptom characteristics were recoded by combining adjacent response categories, the small number of male subjects meant that sex differences could only be investigated using limited statistical investigations.

No sex differences were found for any of the characteristics of the population investigated apart from the length of attacks where males were nearly 8 times more likely to report attacks lasting less than one hour than females (Odds ratio: 7.71; 95% CI: 1.52; 39.1).

An age effect was only found for the report of other health problems with those with other health problems significantly older than those without (Mann-Whitney U test, $p<0.001$).

A11.6.3 Diagnostic categories

The percentages of responders assigned to each of the diagnostic categories are shown in Table 11.1.

Diagnostic category	Percentage of responders
TMJ disorder	70%
Atypical facial pain	7%
Neuralgia	6%
Dental pain	2%
Vascular/migranous	0%
Sinus	2%
Other	4%
Not given	9%

Table 11.1: Diagnoses of patients returning completed questionnaires (N=54).

The majority of patients (70%) who completed the questionnaires presented with a TMJ disorder. Other diagnoses were facial pain secondary to radiotherapy and facial arthromyalgia. Only small numbers of patients presented with the other listed causes of facial pain.

A11.6.4 Prevalence of otological symptoms

The percentage of facial pain patients reporting hearing difficulties, tinnitus and dizziness are shown in Table 11.2.

Otological symptom	N	Yes (%)	No (%)
Hearing difficulties	50	18%	82%
Tinnitus for more than 5 minutes	52	44%	56%
Dizziness, unsteadiness or balance problems	53	40%	60%

Table 11.2: Prevalence of hearing difficulties, tinnitus and dizziness for facial pain patients responding to the questionnaire.

Of those reporting tinnitus (N=23), 96% reported that it was only some of the time. The one responder indicating they experienced tinnitus most or all of the time also reported dizziness but no hearing difficulties.

The prevalence of hearing difficulties and tinnitus is lower than those obtained in the dizzy patient population.

The 40% prevalence of dizziness, unsteadiness or problems with balance is identical to that found in the National Study of Hearing for a problem with balance, dizziness or giddiness in the general population (Davis, 1997). A difficulty with this question however is the use of the phrase 'problems with balance' that could incorporate ambulation difficulties due to lower limb problems. Difficulty in responding to this type of question has been reported (Davis, 1997) although in this current survey 96% responded to this item. Only one of those reporting dizziness specified vertigo as a health problem on the symptom questionnaire. Although certain medications have a side-effect of dizziness, this did not apply to any of the patients reporting dizziness.

A11.6.5 Medication

Medication was currently being taken for facial pain by 52% of responders. Of those taking medication, only 35% had this prescribed at the outpatient appointment. The majority of medications not prescribed at the recent appointment were pain killers available without prescription such as ibuprofen, aspirin and co-codamol.

A11.6.6 Other health problems

Health problems other than facial pain were reported by 52% of responders. The numbers of patients experiencing each of the health problems specified on the symptom questionnaire are given in Table 11.3. The other health problems listed include those reported by more than 1% of the clinic sample of dizzy individuals.
The report of other health problems was less than the report for dizzy patients where nearly 80% of patients reported other health problems.

Considerably fewer responders with facial pain presented with arthritis of lower joints (15%) when compared with the dizzy patients (27%). Although this could be due in part to the younger facial pain patients, this difference may reflect the possible interaction

between dizziness and pre-existing difficulties with the lower joints increasing the limitations reported and triggering consultation for the dizziness problem.

Health problem	Percentage of responders
Lower limb problem	0%
Head injury with loss of consciousness	0%
Raised blood pressure	5.6%
Neck problems	5.6%
Arthritis of lower joints	14.8%
Depression/anxiety	22.2%
Other	
Headache/migraine*	5.6%*
Insomnia	3.7%
Angina*	3.7%*
Hypothyroidism*	1.9%*
Asthma	3.7%
Irritable Bowel Syndrome*	1.9%*

Table 11.3: Health problems reported by facial pain patients on the symptom questionnaire (N=54)

Only a small percentage of facial pain patients reported neck problems (6%) compared with the dizzy patients (41%) which supports the importance of neck problems either as a cause or as a result of restricted movements to prevent provoking the dizziness.

A higher percentage of facial pain patients reported migraine or headaches. This report is not surprising because of the link with facial pain although none of those returning the questionnaires were diagnosed with a migranous cause for the facial pain.

A11.6.7 Symptom characteristics

The duration of facial pain problems and the length and frequency of facial pain episodes as reported on the symptom questionnaire are shown in Figure 11.1.

The median duration of problems with facial pain was 1-2 years. Although the median length of episodes was 1-7 days, the most common response was for the pain to be experienced continuously. Despite the length of attacks, 83% of patients reported attacks more than a few times per week with a median frequency of more than one per day. Of those indicating continuous attacks, all reported attacks all the time on the frequency item except two patients who reported that the attacks occurred once a day.

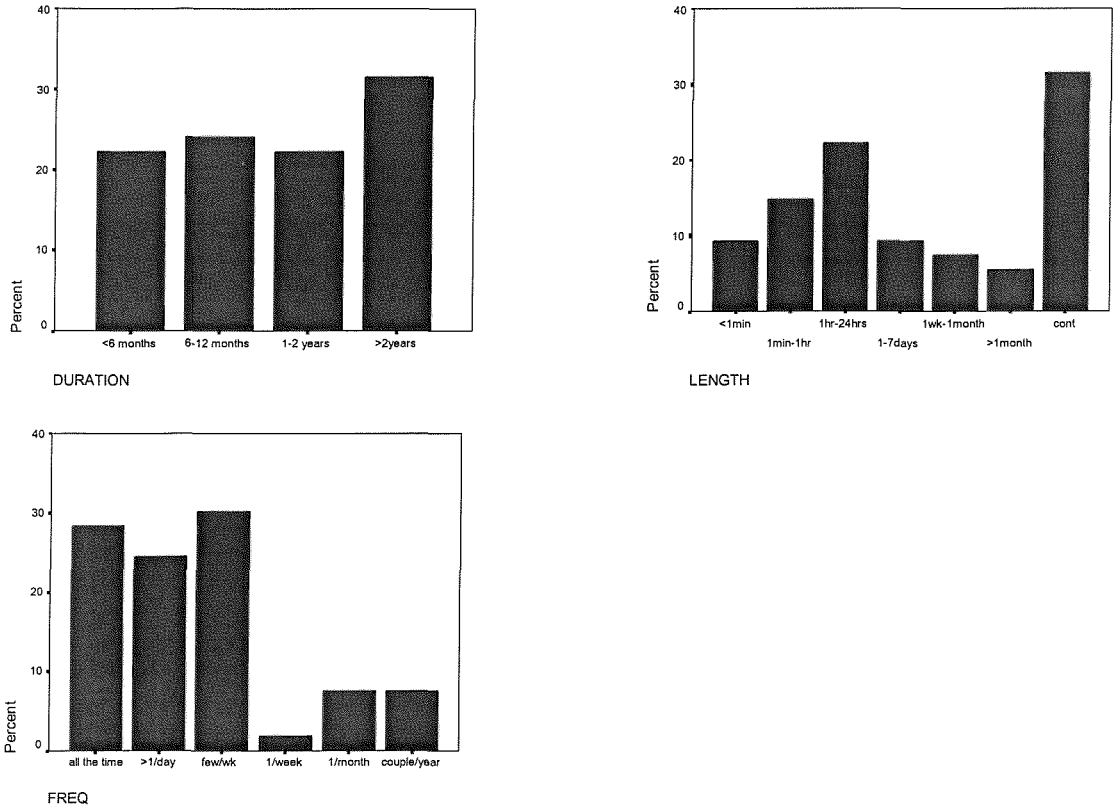


Figure 11.1: Symptom characteristics reported by the facial pain patients (N=54).

A11.6.7.1 Comparison of symptom characteristics for facial pain and dizzy patients

From the responses on the symptom questionnaires in the two clinic samples, both facial pain and dizziness are shown to be long standing problems. The temporal characteristics of the attacks for the two problems do differ. Episodes of facial pain for the responding patients were longer than the attacks of dizziness. This had been expected and was incorporated in the response categories for this item on the facial pain symptom questionnaire. The pattern of frequent attacks occurring at least a few times per week is very similar for both patient groups and it is hypothesised that this frequent occurrence of facial pain is a significant factor in patients seeking help for the pain.

The relationship between frequency and length of attacks is not as strong as that for dizziness where more frequent attacks were associated with attacks of shorter duration. Examination of median frequency of attacks for each facial pain patient group defined by length of attacks showed the frequency of attacks to be similar irrespective of the length (apart from continuous attacks).

A11.6.8 Pain characteristics

The majority of responders (83%) reported that the pain was well localised. Descriptions of the pain itself varied across all response categories. Just under half of responders (49%) said the pain was dull, just under a third (31%) said it was sharp and the remainder (20%) indicated that it was a throbbing pain.

A11.6.9 Symptom severity

The severity of symptoms reported for both *nowadays* and *today* are illustrated in Figure 11.2 with 1 representing no symptoms and 10 the worst possible symptoms.

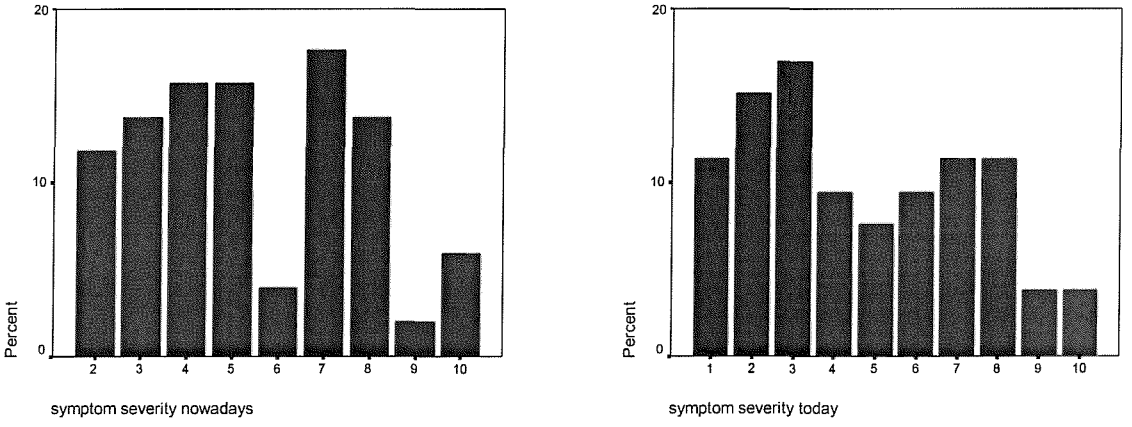


Figure 11.2: Symptom severity ratings for *nowadays* (N=51) and *today* (N=53)

The median severity of symptoms was 5 for *nowadays* (IQR: 4; Range 2-10) and 4 for *today* (IQR: 5; Range 1-10). Symptom severity rating was significantly lower for *today* indicating less severe symptoms compared with *nowadays*. No patients indicated that they had no symptoms *nowadays* although 11% had no symptoms *today*.

Nearly half of patients reported no change in symptom severity rating between *nowadays* and *today* while 43% reported less severe symptoms *today* compared with *nowadays*. The proportions of changes occurring between *nowadays* and *today* are similar to those for dizzy patients. This is possibly due to the similar frequency characteristics of facial pain and dizziness.

A11.6.10 HTA ratings for facial pain

The responses to the HTA rating scales are shown in Figure 11.3. Facial pain prevented 40% from working or carrying out their normal activities for more than one day. Of these, nearly two-thirds (64%) had been prevented from working less than one week. Only 4% had not been able to work for more than one month because of facial pain.

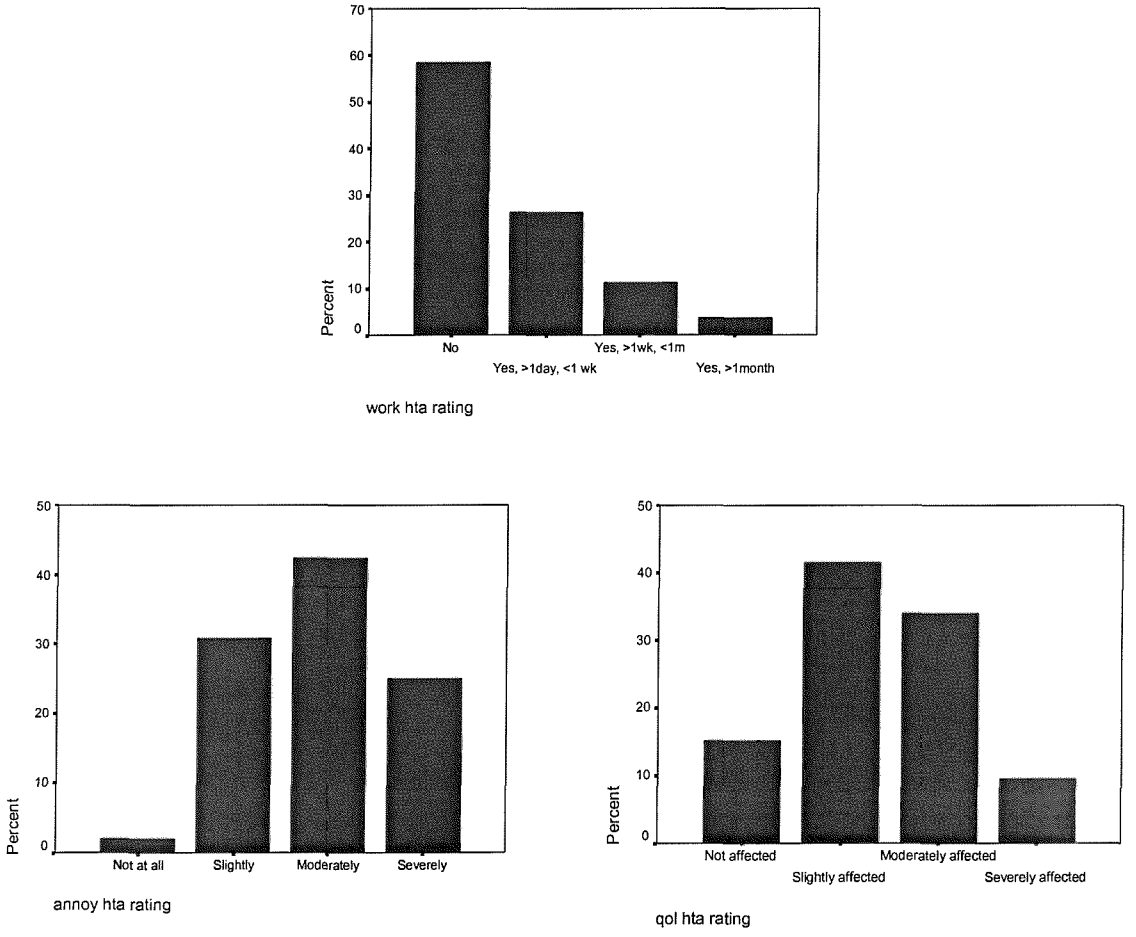


Figure 11.3: HTA Rating responses for facial pain.

Some level of worry, annoyance or upset as a result of the facial pain was reported by 98% although as discussed previously it is not clear which of these states are responsible for this response. A quarter of responders indicated that the level of worry, annoyance or upset was severe. This frequent report of worry, annoyance or upset associated with the facial pain is consistent with the high prevalence of depression or anxiety.

An effect of facial pain on quality of life was reported by 85% of responders. The majority reported that this was only a slight effect (42%) although 9% did report that the facial pain had a severe impact on quality of life.

A11.6.10.1 Comparison of HTA rating scale responses for facial pain and dizzy patients

Facial pain resulted in less time away from work or normal activities compared with dizziness although a small percentage had been prevented from working for more than one month. The work HTA rating was significantly dependent on the patient group (Chi-square, $p<0.05$) with dizzy patients reporting significantly greater time from work (Mann-Whitney U-test, $p<0.05$).

In contrast, the level of worry, annoyance or upset associated with the facial pain tended to be greater than for dizziness, although this did not reach significance. It is proposed that it is the annoyance associated with pain that accounts for this greater effect. Although the same percentage of facial pain and dizzy patients report an impact on quality of life, this tended to be more severe for the dizzy patients compared with the facial pain patients.

There was no significant dependence of the quality of life rating on the group although there appeared to be a trend towards worse quality of life ratings for the dizzy group.

A11.6.11 Functional Limitations Profile

The FLP was completed by the 54 responders taking part in the survey.

Facial pain patients were anticipated to indicate worse health-related quality of life for the psychosocial rather than physical aspects of functioning as measured by the FLP. No effect of facial pain was expected in the physical categories of ambulation, body care and movement, mobility and household management. High scores were expected for the emotion category, which contains items concerned with pain (EM86, EM89). An emotional response to the pain was expected to be reflected in high scores for the social interaction category that contains items not only concerned with social activities but feelings such as irritability. Limitations in the category of eating were also expected.

A11.6.11.1 FLP scores

The Komogorov-Smirnov test showed that responses on the FLP questionnaire could not be assumed to be normally distributed . Dimension and category scores are presented using non-parametric statistics in Table 11.4.

Scores are presented as percentages to allow for comparison of functioning in each of the categories and dimensions considered by the questionnaire. Higher percentage scores represent greater limitations in quality of life.

FLP Score	Median (%)	IQR (%)	Min (%)	Max (%)
Ambulation	0	6.34	0	36.98
Body care & movement	0	2.75	0	36.74
Mobility	0	0	0	33.98
Household management	0	7.19	0	71.80
Physical dimension	0	6.23	0	36.28
Recreation & pastimes	0	19.06	0	93.47
Social interaction	1.71	13.79	0	78.67
Emotion	8.37	18.18	0	79.65
Alertness	0	8.65	0	100.00
Sleep & rest	0	6.67	0	41.04
Psychosocial dimension	3.91	14.37	0	82.82
Eating	0	4.99	0	20.25
Communication	0	0	0	49.20
Work	0	4.98	0	48.60
FLP overall score	2.62	9.14	0	49.30

Table 11.4: Median dimension and category percentage scores on the FLP questionnaire for facial pain patients (N=54).

A11.6.11.2 Dimension profile

The median dimension and overall scores for facial pain patients are illustrated in Figure 11.4. As expected, scores for the psychosocial dimension were significantly greater than those for the physical dimension (Wilcoxon matched-pairs signed ranks test, $p<0.001$).

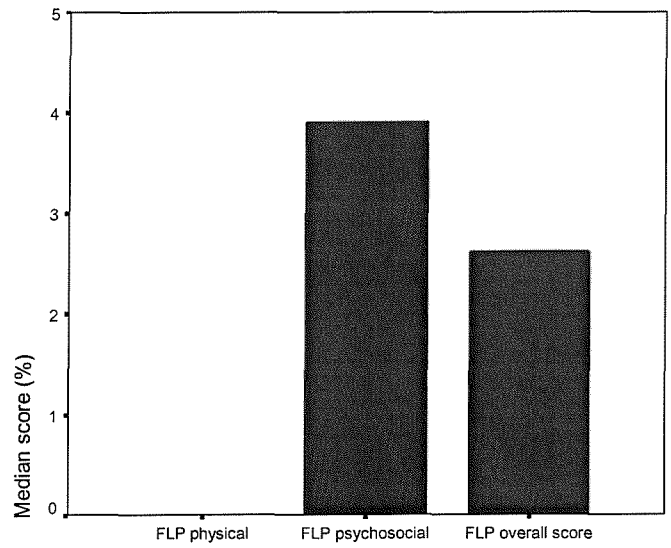


Figure 11.4: Dimension and overall FLP percentage scores for facial pain patients.

A11.6.11.3 Category profile

Figure 11.5 illustrates the profile of quality of life for the facial pain patients across the twelve categories of the questionnaire.

The highest median score was for the *emotion* category. The majority of facial pain patients reported no limitations in all aspects of lifestyle considered by the categories of the FLP except for *social interaction* and *emotion* as anticipated. This material emotional impact on quality of life also links with the frequent report of worry, annoyance or upset reported on the HTA rating scale.

Although the median score for the eating category was zero, a number of responders indicated that they did not eat as much as usual (E110) and ate special or different food such as soft food (E112).

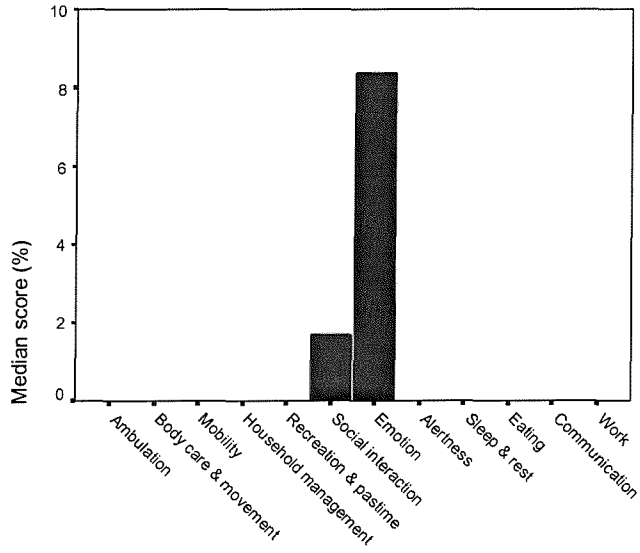


Figure 11.5: Median category percentage scores for the FLP for facial pain patients (N=54).

A11.6.12 Conclusions

Quality of life of facial pain patients attending a Maxillofacial department for the initial assessment of facial pain has been shown to be reduced for the typical patient in the psychosocial dimension of quality of life. The profile of scores shows limitations predominantly for the emotion category of quality of life and to a lesser extent social interaction.

This profile of quality of life for facial pain patients is different to that presented in Section 14.0 for dizzy individuals. Formal comparison of the consequences of facial pain and dizziness is made in Section 15.0.

APPENDIX 12.0: SURVEY OF 'NORMAL' INDIVIDUALS IN THE GENERAL POPULATION

The methods for the surveys carried out in the general population have been discussed in the context of the survey of the population sample of dizzy individuals in Section 11.0. The methodology discussed here is that relevant only to the survey of 'normal' individuals in the general population.

A12.1 SUBJECTS

Subjects were selected from adult responders to the Health Technology Assessment (HTA) study of ear, nose and throat problems in the Southampton postal district.

Subjects were identified based on responses to the items of the HTA questionnaire shown in Table 12.1. Only responders over 18 years of age were selected.

Item	Response
Q8 Nowadays how much does any difficulty in hearing worry, annoy or upset you?	No problem
Q13b Nowadays how much do these noises [tinnitus] worry, annoy or upset you when they are at their worst?	No problem
Q15 In the last 12 months, how much have ANY problems with your nose worried, annoyed or upset you?	No problem
Q18 In the last 12 months, how much has ANY voice problem worried, annoyed or upset you?	No problem
Q21 In the last 12 months how much has ANY throat problem worried, annoyed or upset you?	No problem
Q23 Have you ever suffered from dizziness etc [sic]	No
Q24 Nowadays how much does the dizziness or unsteadiness worry, annoy or upset you?	No problem

Table 12.1: Items and responses from the HTA questionnaire to select individuals

The normal population sample consisted of individuals in the general population reporting no hearing difficulties, tinnitus or dizziness or unsteadiness nowadays, no nose and throat problems (NT problems) in the last 12 months and no dizziness ever.

A12.2 SAMPLE SIZE

The sample size calculation was based on detecting a significant difference in quality of life between the 'normal' population sample and the clinic dizzy sample.

To detect a difference between a mean of 12% (SD 12%) for the overall FLP score for the clinic dizzy sample (N=385) and a mean of 4% (SD 4%) for the normal population sample at a power of 80% would require a normal population sample size of 33. The assumed mean score for the clinic dizzy sample was based on results from a pilot study and that for the normal population sample was based on published data for 'non-disabled' individuals in the general population (Patrick, 1989).

From the original responses to the HTA survey, 1032 responders were identified as meeting the selection criteria. Concerns about low return rates resulted in the decision to send questionnaire packs to all responders meeting the selection criteria.

A12.3 QUESTIONNAIRE PACK

The questionnaires included within the pack are discussed in detail in Section 6.0. The questionnaires administered in the pack were a symptom questionnaire to re-establish the selection criteria for the sample and the FLP. The pack also contained a patient information sheet as for the dizzy population sample but reflecting the purposes of this current survey. Instructions for completion and return of the questionnaires were as for the dizzy population sample. Non-responders were contacted by post one month after the original administration of the questionnaire pack.

A12.4 RESULTS

A12.4.1 Return rate

Questionnaires were returned by 315 subjects at a return rate of 31% after follow-up. The return rate before follow-up was 14%.

Return of the completed questionnaires was significantly dependent on the sex of the responder (Chi-squared, $p<0.05$) with males 1.6 times more likely not to respond than females (Odds ratio 1.6; 95% CI: 1.2; 2.1). Non-responders (mean age 44.77 years, SD 16.13 years) were significantly younger than responders (mean age 48.71, SD 16.60 years). This is in contrast to the survey in the general population of dizzy individuals where no effect of age or sex on response was found. A summary of the ages of responders and non-responders is shown in Table 12.2. The sex was not known for three of the non-responders.

	Responders		Non-responders	
	Number	Mean age (years)	Number	Mean age (years)
Males	145	47.48	409	42.48
Females	170	49.76	300	47.92
Total sample	315	48.71	712	44.77

Table 12.2: Mean ages of responders and non-responders.

A12.4.2 Symptoms reported

Subjects were selected to take part in the survey who reported no ENT problems and no dizziness problems now or ever on the original HTA questionnaire. Despite this, 29% of responders who completed all items on the HTA symptom questionnaire administered in the current survey reported that they had at least one of these problems nowadays.

The percentages of responders completing the HTA symptom questionnaire and reporting ENT problems (N=305) are presented in Table 12.3.

There was no significant difference in age (Mann-Whitney U test, $p>0.05$) or sex (Chi-square, $p>0.05$) between those who did and did not meet the selection criteria from responses in the current survey. The group who now reported ENT symptoms or dizziness also reported significantly more other health problems (Chi-square, $p<0.05$) in the current survey.

The eight month delay between administration of the original HTA questionnaire used to select subjects and administration of the questionnaire packs in the current survey may explain some of the discrepancy in the report of ear, nose and throat problems and dizziness.

Symptom	Percentage of responders
Hearing difficulties	7.5%
Tinnitus	2.3%
Nose problems	12.8%
Voice problems	2.0%
Throat problems	1.3%
Dizziness problems	3.3%
Dizziness ever	15.8%

Table 12.3: Percentages of responders reporting ENT problems and dizziness (N=305).

This is unlikely to explain all of the frequent report of nose problems nowadays or the report of dizziness ever in the current compared with original survey. The high prevalence of nose problems is possibly explained by the administration of the questionnaires in the summer time and positive reports made due to hayfever.

It has been reported that responders find questions concerned with balance and dizziness difficult to complete (Davis, 1997). Since such a question encompasses many possible experiences of problems with balance and dizziness, its inclusion in a study focused on dizziness may result in more careful consideration of experiences and result in positive response to this item.

For ease of reference, responders in this survey will be referred to as 'normal' individuals in the general population. Results are only presented for those responders who met the original selection criteria for inclusion following the current survey.

A12.4.3 Subject details

Mean age of responders (N=217) was 48.9 years (SD 16.4 years, 95% CI: 46.7; 51.1 years, Range 19-86 years). Of these, 45% were male. No significant difference in age was found between male and female responders, the ages for whom are shown in Table 12.4.

	N	Mean (yrs)	95% CI	SD	Range
Male	98	47.3	44.4 - 50.3	14.8	20-80
Female	119	50.2	47.0 - 53.4	17.6	19-86

Table 12.4: Mean age for male and female responders.

A12.4.4 Other health problems

Other health problems were reported by only 26.3% of responders. Those who reported other health problems were significantly older than those who reported no other health problems (Mann-Whitney U-test, $p<0.001$). Table 12.5 details the percentages of subjects reporting each of the specified health problems and any other health problems reported in the dizzy clinic sample (indicated by an asterisk in the table).

The percentages of subjects reporting each of the specified health problems was smaller than those for the clinic and population samples of dizzy individuals and the clinic sample of facial pain patients.

Health Problem	Percentage of responders (%)
Lower limb problem	2.3%
Head injury	0%
Raised blood pressure	10.1%
Neck problems	3.2%
Arthritis of lower joints	6.5%
Depression/anxiety	2.3%
Other	
Diabetes*	2.3%
Angina*	1.4%
Back problems*	0.9%
Asthma	0.9%
Hypothyroidism*	0.9%
Irritable Bowel Syndrome*	0.5%

Table 12.5: Health problems reported by the HTA normal subjects (N=217) (* indicates additional problems reported in the clinic sample)

12.4.5 Functional Limitations Profile

The Komogorov-Smirnov test showed the FLP questionnaire responses could not be assumed to be normally distributed. The median FLP scores for the normal population sample are shown in Table 12.6.

All median category and dimension scores were zero indicating no reduction in quality of life for the typical 'normal' individual in the general population. From the interquartile ranges it can also be seen that 75% of patients scored zero on all category and dimension

scores. Only for the overall FLP score was the score for the 75th percentile not zero, although this was only 0.87%.

FLP Score	Median (%)	IQR (%)	Min (%)	Max (%)
Ambulation	0	0	0	55.17
Body care & movement	0	0	0	37.26
Mobility	0	0	0	17.33
Household management	0	0	0	77.55
Physical dimension	0	0	0	39.29
Recreation & pastimes	0	0	0	63.19
Social interaction	0	0	0	25.91
Emotion	0	0	0	53.10
Alertness	0	0	0	47.54
Sleep & rest	0	0	0	36.21
Psychosocial dimension	0	0	0	29.40
Eating	0	0	0	15.44
Communication	0	0	0	19.56
Work	0	0	0	48.60
FLP overall score	0	0.87	0	22.36

Table 12.6: FLP scores for the HTA normal group (N=217)

The maximum scores however show that certain responders did report limitations in functioning on the questionnaire. The scores presented include those for responders with other health problems. In each case, the maximum scores shown in the table are for those with other health problems except for the eating category where the maximum score is for a responder with no other reported health problems. Those with other health problems scored significantly[1] higher on the categories of ambulation, household management, social interaction, emotion and the physical and psychosocial dimensions and the overall FLP score (Mann-Whitney U test, $p<0.01$).

A12.4.6 CONCLUSIONS

There was no reduction in quality of life for the typical 'normal' individual in the general population.

[1] p value adjusted to 0.01 for significance at the 5% level (see Appendix 6)

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