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PSYCHOLOGICAL AND PHYSIOLOGICAL EFFECTS OF SUBLIMINAL STIMULATION

by

Ian Lee, B.Sc.

Submitted for the degree of Doctor of Philosophy,
University of Southampton, 1981.

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ACKNOWLEDGEMENTS

I would like to express my gratitude to the following individuals who have assisted me with various aspects of the research reported in this thesis: my supervisors, Dr. P. Tyrer and Professor J.L. Gibbons, who provided invaluable advice and encouragement at all times; Mrs S. Horn and Dr. J. Hughes, who conducted the clinical assessments reported in Experiments 1 and 3; Professor T. Shelley and the members of the Medical Physics Department, Southampton General Hospital, for assistance with psychophysiological recording equipment; Mr. J. Alexander for advice on statistics; Mr. J. Shah for assistance with physiological data analysis; and my wife for acting as both secretary and research assistant.

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UNIVERSITY OF SOUTHAMPTON

ABSTRACT

FACULTY OF MEDICINE

PSYCHIATRY

Doctor of Philosophy

PSYCHOLOGICAL AND PHYSIOLOGICAL EFFECTS OF SUBLIMINAL STIMULATION

by Ian Lee

The work reported in this thesis investigates psychological and physiological effects of subliminal stimulation in clinical and non-clinical settings. The concept of subliminal stimulation, its use in clinical areas, and the syndrome of agoraphobia are discussed in the review chapters. Four experiments are then reported. The first three are concerned with the use of subliminal stimulation in the treatment of agoraphobia. The fourth experiment examines the responses of non-clinical subjects to a variety of subliminal films, in an attempt to replicate and extend the findings of Tyrer, Lewis and Lee (1978).

The results of the experiments showed that: (1) subliminal, supraliminal and progressively faded films can all be used successfully in the treatment of agoraphobia; (2) the faded procedure gives the best clinical improvements; (3) the subliminal procedure is the least stressful for the patients; (4) physiological measures can be used to distinguish emotive or phobic supraliminal films from neutral supraliminal films; (5) physiological measures are neither a good indication of a patient's response to treatment, nor a reliable objective measure of the efficacy of the treatment; (6) when designing experiments to investigate subliminal effects, particular care should be taken to avoid fatigue effects, masking of subliminal stimuli by preceding supraliminal stimuli, and confounding of delayed responses in repeated measures designs.

In the final chapter a number of possible directions for further research are described and discussed.

CHAPTER 1: THE CONCEPT OF SUBLIMINAL STIMULATION

INTRODUCTION

Throughout its history the concept of subliminal stimulation has been a controversial one. Many people still hold the view that in order to be able to respond to a stimulus, one must first be aware of that stimulus. Responses are not thought to be a product of incoming stimuli. Instead a conscious subjective correlate or internal image of the stimulus is thought to be necessary before a response can be made. Awareness is the sine qua non of perception. An alternative and equally plausible view is that although sensory stimulation may, and usually does give rise to awareness of the stimuli, the state of being aware of the stimuli is neither a necessary consequence of effective stimulation, nor a necessary precursor to a response. This second, apparently innocuous hypothesis, has given rise to a long and sometimes acrimonious controversy.

Although the idea of an individual's emotions and behaviour being influenced by stimuli outside his awareness was first mentioned in classical times, experimental work on subliminal phenomena did not begin until the late 19th century. There was then a steady increase in interest in the area, reflected in the number of experimental studies published, until the late 1950's, when for a number of reasons discussed later, research almost stopped. Since this low point there has been a steady increase in interest in subliminal phenomena, and currently it is an area of vigorous research activity. The course of the changing climate of opinion concerning the

subliminal perception hypothesis has been graphically portrayed by Dixon (1971; see Figure 1.1, page 4). Although this graph is purely descriptive, it does give some idea of the variations of attitudes about subliminal perception, even if the current credibility is somewhat overestimated

EXAMPLES OF EARLY RESEARCH

In the first period of experimental activity between 1850 and 1960, there were five main areas of interest:

1. the influence of subliminal stimuli on verbal behaviour, particularly in forced choice discrimination studies where the subject is encouraged to guess;
2. the influence of subliminal stimuli on perceptual experience;
3. the Poetzl phenomenon, in which subliminal material initially unavailable for recall may subsequently appear in dream recall or free association tests;
4. the influence of subliminal stimuli on sensory thresholds, and
5. the classical conditioning of subliminal stimuli.

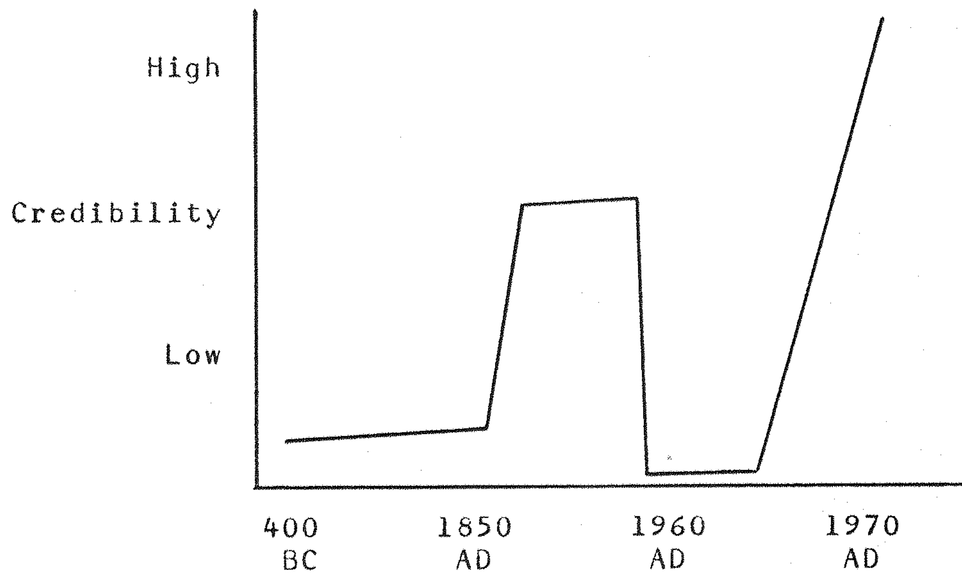


Figure 1.1: Changes in the credibility of the subliminal perception hypothesis between 400 BC and 1970 AD. Taken from Dixon, 1971.

The Influence of Subliminal Stimuli on Verbal Behaviour

Early research on the limits of sensory discrimination suggested that verbal behaviour could be determined by stimuli that were outside the range of awareness. Pierce and Jastrow (1884) found that subjects could discriminate between weights that differed by less than one JND (defined as the smallest just noticeable difference between two weights) if they were forced to make the choice, rather than being allowed to respond 'same' or 'don't know'. Judgements of 'heavier' were correct significantly more frequently than predicted by chance, even when the subjects had zero confidence in their judgements. The supposed guesses of the subjects appeared to be correct responses to information about the weights of which they were unaware.

Williams (1938) asked subjects to guess whether a circle, a square or a triangle was being projected onto a screen at subliminal intensities. In addition to guessing the type of stimulus presented, the subjects also had to rate their degree of confidence for each response as either 'object seen clearly', 'doubtful, but with something seen' or 'pure guess'. Only the trials which resulted in pure guesses were used in the data analysis. Over a long series of trials Williams found that the frequency of correct guesses was significantly above the chance level. Baker (1937) found similar effects in the auditory modality when he asked subjects to distinguish between subliminal Morse dots and dashes. Overall the above studies and other similar work indicated

that verbal behaviour could be directly affected by subliminal stimuli.

The Influence of Subliminal Stimuli on Perceptual Experience

The early work in this area was concerned with well known visual illusions. Dunlap (1900) tested the hypothesis that the Muller-Lyer illusion (Figure 1.2, page 7) would still be seen even when the arrow lines were too faint to be visible. He conducted two experiments in which subjects were shown a long horizontal line with three short vertical lines across it. The experimenter moved the outer two vertical lines until the subject judged that they were equidistant from the middle line. The subject was not told that the arrow sections were also being presented, but at subliminal intensities. The results showed that the subjects did experience the illusion, although the effects were small, and there were no reports of awareness of the arrow components.

This finding is typical of many in the field of subliminal perception in that some replication studies confirm the initial results whereas others fail to find any effects. Titchener and Pyle (1907) replicated Dunlap's work and failed to find any evidence for subliminal effects. In addition they also showed that at supraliminal levels the size of the illusion was not influenced by the brightness of the arrows. This was accepted until 1931 when Bressler published a study showing not only that subliminal arrows did produce the illusion, but also that the size

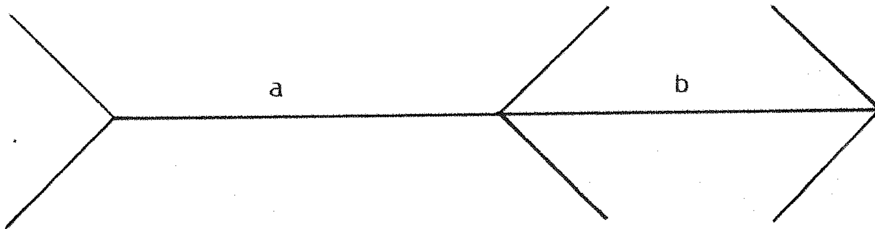


Figure 1.2: The Muller-Lyer Illusion. Section a appears to be longer than Section b although they are identical.

of the illusion was an inverse function of the degree of subliminality of the arrows, i.e. the illusion was weakest with arrows just below the awareness threshold, and increased with both brighter and fainter arrows. Recent experiments (Trimble and Eriksen, 1966) have again failed to find the effect.

Smith and Henriksonn (1955) found other visual illusion effects using a different stimulus. They first presented a set of fan shaped lines, immediately followed by a square. Tachistoscopic presentation allowed them to present the fan lines so briefly that subjects did not report seeing them. However, they did report seeing the square as a trapezoid (the Zollner Illusion).

The Poetzl Phenomenon

In a series of studies Poetzl (1917) reported that items from a subliminal picture which were not reported immediately after the stimulus presentation could subsequently appear in dreams. His interest in the area came from observations of individuals with lesions in the visual areas who could not report the presence of visual stimuli until some time after their presentation. He presented twenty-four (24) subjects with a complex visual stimulus (a colour picture of the ruins at Thebes) for 10 msec. The subjects then had to describe what they had seen. He later asked them to report the contents of any dreams they had on the following night. The results, although largely descriptive in nature, supported the view that only items that were not reported following the stimulus presentation appeared in

the dream reports.

The effect was also found by Malumad and Linder (1931) and Fisher (1954), and Allers and Teler (1924) found that the initially unavailable items could also emerge during word association tests. Fisher's extensive study (1954) has stimulated interest in the phenomenon, and there are many recent reports of such effects (reviewed by Dixon, 1971).

The Effect of Subliminal Stimuli on Sensory Thresholds

In the post war period the topic in the subliminal area that has attracted most attention is that of the effect of subliminal stimuli on recognition thresholds. A number of studies appeared in the late 1940's (Bruner and Postman, 1947a, 1947b; McCleary and Lazarus, 1949; McGinnies, 1949) which reported that significantly longer tachistoscopic exposure periods were required for the recognition and verbalisation of emotionally charged or taboo words than for neutral words. Bruner and Postman (1947b) used the term 'perceptual defence' to explain their results. The perceptual defence hypothesis is that there is an active central process which operates on the sensory input to inhibit awareness of anxiety provoking stimuli. In order for this process to operate there must be subliminal processing of sensory stimuli to determine whether they are likely to be anxiety provoking, and therefore requiring inhibition, or not.

In addition to measuring the exposure durations necessary for recognition of emotionally toned and neutral words, McGinnies (1949) also measured skin resistance throughout the threshold determinations. His subjects not only needed longer recognition times for emotional words, but also had higher skin resistance during the pre-recognition period for such words. McGinnies also explained his results in terms of the operation of a perceptual defence mechanism.

These findings initiated a period of vigorous research into threshold effects, and there were many critics of the perceptual defence hypothesis, (e.g. Freeman, 1954; Goldiamond, 1958; Howes and Solomon, 1951; Howie, 1952). The research work done on the perceptual defence hypothesis up to 1960 was comprehensively reviewed by Brown (1961), who summarised the results of the research as indicating that:

1. there are significant differences in duration thresholds for the correct report between neutral and emotional, threatening or anxiety inducing words or pictures;
2. there is an inverted U curvilinear relationship between the recognition threshold of a visual stimulus and the extent to which that stimulus arouses emotions, with medium levels of anxiety producing raised thresholds and other levels producing lower thresholds;
3. galvanic skin responses (G.S.R.'s) recorded prior to correct recognition are higher for emotive than neutral stimuli;

4. pre-recognition guesses as to the nature of tachistoscopically presented stimuli differ between neutral and emotive stimuli, with neutral words being guessed more accurately.

Subliminal Conditioning

Early studies on subliminal conditioning used low level electric shocks, which the subjects did not detect, as the conditioned stimuli, and there were reports of successful conditioning of respiratory, eyeblink and other responses (Cason and Katcher, 1933; Silverman and Baker, 1935). Baker continued these conditioning studies, and in 1938 carried out an experiment to try to condition the pupillary light reflex to a tone presented below the auditory threshold. He used a change of illumination as the unconditioned stimulus and a simultaneous subliminal tone as the conditioned stimulus, and found a conditioned response after three trials. These conditioned responses to subliminal tones generalised less than responses conditioned to supraliminal tones, and they were more resistant to extinction. Although Baker replicated this result (Metzner and Baker, 1939), other investigators were unable to produce subliminal conditioning of the pupillary light reflex (Hilgard, Miller and Ohlson, 1941; Wedell, Taylor and Skolnick, 1940).

In a well known study Lazarus and McCleary (1951) conditioned shock produced G.S.R.'s to five out of ten nonsense syllables presented supraliminally, and then exposed the syllables

individually at 50% recognition levels. The average G.S.R. response to shock conditioned syllables was found to be greater than to non-shock syllables on trials where the subjects were unable to give correct verbal identification of the syllables. They interpreted their data as showing 'a process by which some kind of discrimination is made when the subject is unable to make a conscious discrimination'.

In considering the above research,,it is apparent that the history of subliminal perception up to the late 1950s was little different from that of many other areas of psychology. There was always a certain antagonism to the idea among the American behaviourists, but this was not confined to subliminal perception, and it did not inhibit research work. As in other areas controversial findings appeared and were challenged, replications were carried out, hypothetical explanations for results were advanced and rejected, experimental methodologies were found to be lacking and were improved. Criticisms were frequently at a more personal level than was usual in other fields, but this did not deter people, and over the years consistent findings began to emerge and be accepted. Then in 1958 there was an abrupt decline in interest in subliminal phenomena, and research work almost completely stopped. The long standing objections to the idea of subliminal perception, and the reasons for the decline of interest in 1958 are considered in the next two sections.

OBJECTIONS TO THE CONCEPT OF SUBLIMINAL PERCEPTION

There is no doubt that many people were antagonistic to the idea of subliminal perception because they did not like to think that their behaviour could be influenced by stimuli of which they were unaware. If the claims of the supporters of subliminal perception were to be believed, then it was easy to envisage a situation of unwanted, covert authoritarian control over people by various groups with vested interests in behavioural control, such as businessmen, educationalists and governmental bodies. The obvious difficulties of detecting the use of subliminal material added to the unease about the concept. The emotional reaction against the possibility of insidious control led many people to reject the early findings, not on a scientific basis, but rather because they did not want to believe the results. This rejection was made easier by the fact that by its very nature subliminal perception cannot be experienced, therefore rejection of the concept did not involve any contradiction of intuitive feelings.

A number of authors have put forward logical arguments against the possibility of subliminal perception. These are based on the view that stimuli that do not have sufficient intensity to be perceived consciously are non-existent as far as the perceiver is concerned, therefore it is logically impossible for such non-existent stimuli to influence the perceiver's behaviour. Obviously this is more a statement of faith than a logical argument, since it is only valid if one assumes a model of the perceptual

process such as that shown in Figure 1.3 (page 15), i.e.

1. perception is a linear process,
2. conscious representation is the necessary end product of that process, and
3. perception is an all or none process, so that anything that is incompletely analysed is lost and cannot influence responses.

Although such a restrictive and naive description of the perceptual process would not be entertained today, many people accepted logical criticisms as being the definitive rebuttal of the concept of subliminal perception.

The cause of subliminal perception was not helped by the variability of the quality of the experimental work done to support it. Critics pointed to the confusing terminology used, and the different meanings attributed to the word subliminal. Terms such as subliminal, marginal and incidental were used interchangeably by some people, whilst others regarded them as referring to quite different types of stimuli. Also the definition of what constituted a subliminal stimulus varied considerably, so that for some it meant a lack of awareness on the part of the subject, others arbitrarily decided that certain stimulus intensities were subliminal, whilst others used the 50% detection point from classical threshold determinations to define subliminality. Sometimes the basis for the decision was not reported. Such apparent lack of concern for methodology and terminology allowed critics to dismiss the experimental work as of low standard, and therefore liable to produce unreliable results.

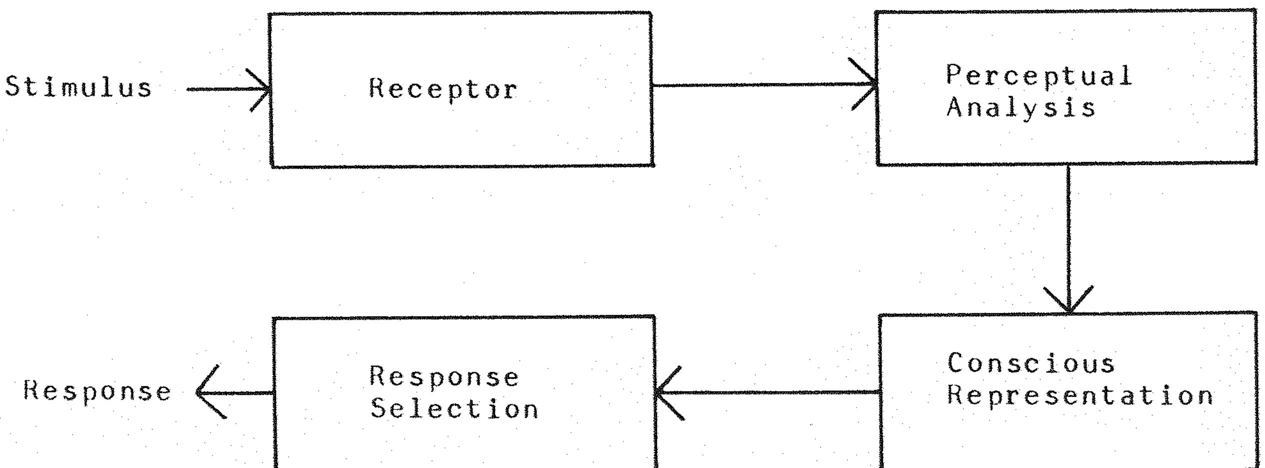


Figure 1.3: A Model of the Perceptual Process

The final major factor in the poor standing of subliminal perception was the fact that it was primarily concerned with subconscious processes, and as such was closely identified with Freudian psychology. In the U.S.A. and to a lesser extent in Europe, the standing of psychoanalysis was very low following the behaviourist revolution initiated by J.B.Watson and maintained by B.F.Skinner. The majority of psychologists engaged in research actively avoided anything to do with subconscious, covert or private events, preferring to study behaviour in terms of measurable responses produced as a result of obvious stimuli.

THE RAPID DECLINE IN INTEREST IN SUBLIMINAL PERCEPTION

Despite the fact that many psychologists were critical of the concept of subliminal perception, and did not believe the results published to support it, this did not prevent work continuing. However, this changed in 1958, when there was a rapid decline in interest in the area, with a sharp reduction in the number of research reports published. A crucial factor in this rapid change was the claim made by American businessmen that they could modify consumer buying behaviour by means of subliminal stimulation. Cinema audiences had been shown subliminal messages exhorting them to buy popcorn and soft drinks, and the makers of the subliminal projection equipment claimed that the messages had resulted in large increases in the sales of these items. The claims were

presented as being the results of properley conducted scientific tests, but unfortunately no details were given concerning such matters as when and where the tests were carried out, how many people participated, how the tests were conducted, the presence or absence of control groups, assessment of the subliminality of the messages, and the extent of normal day to day fluctuations in the sales of the popcorn and drinks. Therefore the veracity of the claims could not be evaluated, but despite this the popular press in America latched onto the claims, with many commentators (e.g. Vance Packard, The Hidden Persuaders, 1957) talking about subversive control of the population, etc., thereby causing considerable public concern.

In this atmosphere of widespread public interest, the opinions and attitudes of psychologists concerning subliminal perception hardened. A small number of supporters insisted that subliminal perception was a genuine phenomenon, but unlikely to be able to cause the major shifts in behaviour that the businessmen had talked about. Opponents denied all possibility of subliminal perception, dismissing the work done in the area as of low standard, inadequate and inconclusive, and therefore to be ignored. These views were not in general based on a critical examination of the experimental work, but rather on a desire to pre-empt any public criticism of psychological research in general by themselves discrediting this one particular area, and divorcing it from mainstream psychology. Some felt that subliminal perception was scientifically disreputable, and given the

public concern over subliminal advertising the best course of action was to terminate all interest in the area, particularly in view of the experience of the atomic scientists, who suffered a fall from grace in the eyes of the public in the 1950s, and subsequently had problems with cuts in the amount of research funds available.

At a more official level complaints about subliminal advertising had been received by the relevant regulatory body, the Federal Communications Commission. There were particular fears about the possibility of political organizations using subliminal television advertisements in their campaigns. Given the conflicting and contradictory statements concerning the efficacy of subliminal stimulation, the Commission ignored the psychologists, bowed to public pressure and erred on the safe side by proposing a complete ban on all forms of subliminal advertising. This proposal was readily accepted by Congress.

Within the academic world 1958 saw the appearance of four major publications, all of which had a marked impact on the subliminal perception controversy. There were three papers - 'Unconscious Processes' by Eriksen (1958); 'Indicators of Perception' by Goldiamond (1958) and 'Subliminal Perception: An Overview' by McConnell, Cutler and McNeil (1958). The fourth publication was a book - 'Perception and Communication' by Broadbent (1958).

The first two papers were long and detailed criticisms of the methods used in experiments purporting to demonstrate subliminal phenomena.

Both Eriksen and Goldiamond were of the opinion that reported subliminal effects were artefactual, being caused by inaccurate threshold determinations and response biases rather than sensory effects.

The main argument of both papers was that subjects in awareness and recognition experiments do not always report accurately on the presence of completely supraliminal stimuli, therefore verbal report is not a foolproof indication of perception. With less intense stimuli such failures to respond become more common. This is called negative response bias. Possible reasons for such biases are that subjects may prefer to be thought insensitive rather than prone to hallucinations, or may feel that it is better to give no response rather than an incorrect one in situations where they are uncertain. In perceptual defence experiments subjects may be unwilling to report taboo words.

After a detailed consideration of methods used in subliminal studies, Goldiamond concluded his article by noting that variations in a subject's response strategies could be caused by varying numerous factors such as:-

1. the instructions given by the experimenter,
2. the subect's expectations,
3. penalties for false alarms and misses,
4. amount of practice given on the task,
5. information on the time of stimulus arrival,
6. whether or not a forced choice was used,
7. the natural frequency of occurrence of

the stimulus,

8. the type of response used.

The overall conclusions drawn were that 'the subject, in responding to a perceptual situation, tends to respond in terms of the consequences of his response and in relation to other non-perceptual variables'. Verbal reports concerning the presence or absence of stimuli were often inaccurate, and threshold determinations were insufficiently controlled. These sources of error resulted in the threshold values obtained being too high, therefore stimuli that the experimenter presumed to be subliminal could actually be supraliminal. If normal supraliminal responses were made to such stimuli it would create a false impression of a subliminal effect.

Although these criticisms were probably applicable to many of the early studies, it is unlikely that they could account for all the subliminal findings, as the authors suggested. Also they assume that all errors would be in the direction of setting the threshold too high. However, it is conceivable that some subjects would report stimuli present when they had not seen any, in order to please the experimenter. This would have the effect of producing a threshold that was too low. Despite this obvious overstatement of the case, the two papers were widely influential, to the extent that Erdelyi (1974) commented that 'the force of their analyses appears to have undermined the voluminous research enterprise'.

The publication of Perception and Communication by Broadbent (1958) was important

in that it revived interest in memory and attention, and made new proposals concerning their relationship to the way in which the sensory systems operate. It also initiated a new interest in attempts to produce plausible models of human performance in defined perceptual situations. These were exciting developments, and set the stage for a move away from behaviourism as the dominant force in experimental psychology. Many psychologists interested in perception were attracted to these new areas, and interest turned away from subliminal work. Broadbent's book diverted many competent researchers and thereby was partly responsible for the decline of subliminal work.

The fourth, and by far the most influential publication, was that of McConnell et al., (1958), which appeared in American Psychologist, the official journal of the American Psychological Association. In the article they first examined the evidence concerning subliminal effects, and contrary to Eriksen and Goldiamond, concluded that under certain conditions subliminal perception could occur. The authors then addressed themselves to the public concern over subliminal reports, and the ethical questions involved. The following extracts from the article make clear the concern, and the authors' (and by implication the A.P.A.'s) position regarding subliminal studies:

> 'Recently, to our dismay, the announcement of a commercial application of long established psychological principles has assumed nightmarish qualities, and we find ourselves unwillingly cast in the role of invaders of personal privacy, and enemies

of society. A kind of guilt by association seems to be occurring ...'.

'The most strident public objections have been directed towards the possibility that suggestions or attempts to influence or persuade may be administered without the knowledge or consent of the audience'.

'The psychologists' ethical quandary, then, stems directly from the inescapable implications of deviousness in the use of such a technique. The appropriate guidelines for conduct are provided in this ethical statement:

Principle 2.62-2. It is unethical to employ psychological techniques for devious purposes, for entertainment, or for other reasons not consonant with the best interests of a client or with the development of psychology as a science'.
(From the A.P.A. Ethical Standards of Psychologists, 1953).

'If in his mature judgement the intended uses of the principles of subliminal perception do not meet acceptable ethical standards, the psychologist is obligated to disassociate himself from the endeavour'.

This was a definitive statement from highly influential psychologists concerning the non-acceptability of work on subliminal perception, and as Dixon's graph (Figure 1.1, page 4) shows,

it clearly had the desired effect.

OTHER MAJOR CRITICISMS OF SUBLIMINAL PERCEPTION RESEARCH

We have already considered the logical, emotional and ethical objections raised to the concept of subliminal perception, and briefly mentioned some of the criticisms directed at the experimental work. These methodological points will now be considered in more detail.

Report Validity

The question of report validity has frequently been raised with regard to subliminal findings, the inference being that subjects were either deliberately or inadvertently giving false reports about their perceptual experiences, and therefore the results obtained are open to doubt. It is strange that such criticisms have been voiced only with regard to subliminal work, since almost all psychological experiments involving humans assume a close relationship between subjects' experiences and their verbal reports of those experiences. There are no reasons why subjects in subliminal studies should be any less accurate or honest in their reports than subjects in any other studies. Indeed, since subliminal experiments usually only involve the subject in decisions concerning the presence or absence of stimuli, rather than descriptions about the nature of the stimuli, there should be fewer errors with these less complex reports, and the results should be more reliable.

Failure to Replicate Results

This is another common criticism about subliminal work, but once again it should not be confined to one topic since replication failures are common in all areas of science. It should be emphasised that failure to demonstrate a particular effect merely shows that under certain circumstances weak stimuli do not have any effect on behaviour, and it does not show that such effects can never be obtained. In this context Dixon (1971) has noted that many supposed replication studies have been conducted by researchers who are openly critical of subliminal work, and have included modifications and alterations in the experimental materials and procedures which make subliminal effects unlikely to occur. Not surprisingly, the results of such studies have confirmed the pre-conceptions of the investigators.

Word Frequency Effects

This criticism has been almost entirely associated with experiments on perceptual defence. Howes and Solomon (1950, 1951) proposed that perceptual defence effects could be explained in terms of frequency differences in the occurrence of neutral and taboo words, independent of emotionality. They produced a series of scatter-plots relating recognition thresholds to $\log_{10}$ of word frequencies. These frequencies were obtained from the Thorndike-Lorge (1944) semantic word counts. They found a negative correlation coefficient of 0.70 between $\log_{10}$ word frequency

and recognition threshold. There are two major problems with this frequency argument as an explanation of the perceptual defence effect. The first is that the Thorndike-Lorge word counts were produced as a teacher's reference guide on what words to teach children, and as such were based on children's books, comics, magazines etc. Not surprisingly, there were very few taboo words in the count, and it seems safe to suggest that the frequency of use of such words by adults is greatly under-estimated by Thorndike-Lorge. Eriksen (1963) tried to assess the accuracy of the Thorndike-Lorge frequencies by asking subjects to define lists of words, some neutral and some taboo. The correlation between Thorndike-Lorge frequencies and number of correct definitions was 0.57 for neutral words, and 0.03 for taboo words, indicating that Thorndike-Lorge was not an accurate reflection of the subjects' familiarity with taboo words.

The second problem with the frequency argument is that the frequency effect shown in the scatter-plots was not large, and Eriksen (1963) pointed out that there is no relationship between threshold and frequency in the range 10-3,000 per million, the effect being confined to differences between extremely frequent and extremely infrequent words. It is now felt that taboo words occur sufficiently frequently to discount this variable as a source of artefact.

The best rejection of the frequency criticism comes from studies in which affective responses are conditioned to a set of nonsense words, and the recognition thresholds for these words are compared to thresholds obtained for equally

frequent non-conditioned nonsense words. Perceptual defence effects have still been found in such studies (Chapman and Feather, 1972; Sales and Haber, 1968).

Partial Cues

The partial cue explanation of subliminal effects is in essence a variation of the report validity criticism dealt with earlier. The assumption is that the subject is aware of small parts or features of the stimulus, and although these are insufficient to induce the subject to report their presence, they do in fact control his response.

It is plausible that in some studies in which there are inadequate threshold determinations, insufficient questioning of the subjects about awareness of stimuli, and responses required that are structurally similar to the stimuli presented, then partial cues may account for any subliminal effects reported. However, this explanation cannot account for all reported subliminal effects. As noted above there is no basis for questioning the validity of subject reports about awareness of stimuli, particularly when such criticism is confined to subliminal studies. Also the presence of partial cues is unlikely in studies in which the awareness threshold, as opposed to the recognition threshold, is used to determine the stimulus level used. Finally the partial cue hypothesis predicts that responses to subliminal taboo stimuli should transfer to structurally similar neutral stimuli, but this has not been found (Worthington, 1964; Wallace and Worthington, 1970).

EVIDENCE FROM SIGNAL DETECTION STUDIES

A problem with all the response bias criticisms is that there is an assumption that perceptual and response processes can be readily separated. However, at present no one has delineated the necessary and sufficient operations to define and distinguish between perceptual and response processes. The closest we can come to resolving this problem is to use the terminology of Signal Detection Theory (Swets, 1964). This theory was developed by communications engineers to assess the overall performance of information transmission systems. It envisages a stimulus input as being made up of a stimulus signal and noise inherent in the system. The intensity of noise in the system at any given time is assumed to follow a normal distribution. The discriminability of a stimulus (d') is the difference between the mean value of the noise distribution alone and the mean value of the signal plus noise distribution, (see Figure 1.4, page 28) and corresponds to the size of the signal. The subject's responses concerning the presence or absence of a signal on any given trial are determined by his decision criterion (B, see Figure 1.4, page 28). This may be at any point along the intensity continuum. If the stimulus is greater than B then the subject responds that the signal was present; if the stimulus intensity is equal to or less than B then the subject responds that the signal was not present. The subject is not asked to say whether or not he was aware of the signal, but instead he is asked whether he prefers the decision that the signal was present

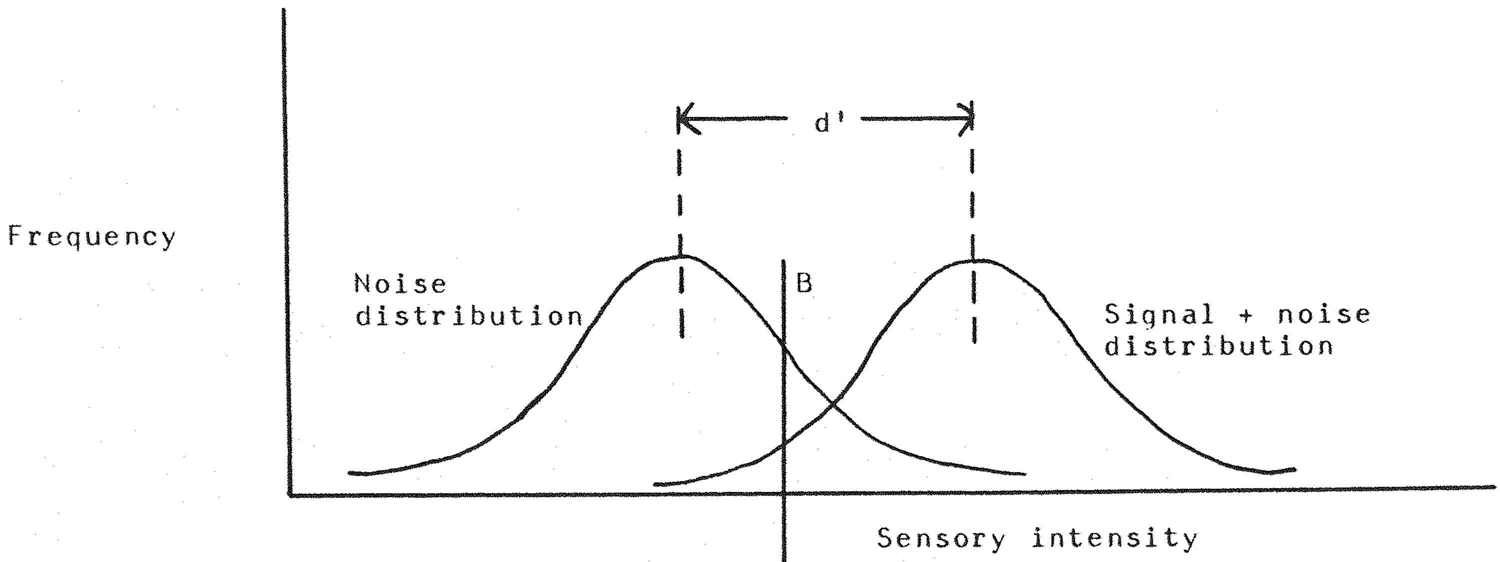


Figure 1.4: Assumptions of signal detection theory.

or the decision that the signal was absent. Values for d' and B can be determined in experimental settings using standard psychophysical procedures (see Swets, 1964). Variations in d' may be identified with sensory or perceptual effects, and variations in B are seen as response effects. Studies which have investigated subliminal phenomena in terms of Signal Detection Theory have in general found variations in stimulus emotionally to be related to variations in d' and not B (Broadbent and Gregory, 1967; Chapman and Feather, 1972; Dorfman, 1967; Hardy and Legge, 1968), indicating that subliminal effects cannot be attributed to bias in response processes.

PROBLEMS OF DEFINITION

Although there used to be a certain amount of confusion over what was meant by the word 'subliminal', most interested parties would now accept Dixon's (1971) position that subliminal stimuli are stimuli that the subject is never aware of, and the description 'subliminal perception' should be confined to situations in which stimuli of which the subject is completely unaware are shown to produce contingent responses. This excludes 'marginal stimuli', where partial cues may be operative, and 'incidental learning', where the subject is aware of the stimulus, but unaware of any stimulus-response contingency. The criteria for assuming subliminal perception to have occurred are:

1. the eliciting of contingent responses by stimulation below the absolute awareness threshold, where this threshold is itself

defined as the lowest level of stimulus energy at which the subject ever reports seeing or hearing anything of the stimulus,

2. the retrospective reporting by the subject that he neither saw nor heard anything of the stimulus,
3. the occurrence of contingent responses, without reported awareness of the stimulus, that differ qualitatively from those elicited by the same stimulus when presented above the awareness threshold.

ATTITUDES AND RESEARCH WORK SINCE 1958

Following the events of 1957 and 1958 the majority of papers published on subliminal matters were critical in nature, raising one or more of the points discussed above. The climate of opinion was hostile. However, as the various criticisms were answered, and the quality of research work improved, there was a slow but steady shift of opinion towards a more open minded approach about subliminal effects. This was aided by the changing views of cognitive processes initiated by Broadbent (1958). It became apparent that control and selection processes operated in such areas as perception, memory and attention, and the individual was unaware of this. Conscious awareness became a redundant element in theories of perception.

Important publications such as those by Dixon (1971) and Erdelyi (1974) highlighted the inadequacies of many of the criticisms of subliminal studies. Interest in subliminal work moved from arguing over its existence to investigating the nature of subliminal phenomena. After comprehensively

reviewing the field, Dixon concluded that the existence of subliminal effects had been reliably demonstrated in at least eight different areas; adaptation levels, conscious perception, dream content, verbal behaviour, emotional responses, drive related behaviour, perceptual thresholds and memory. In the next chapter applications of subliminal work in clinical areas will be discussed.

CHAPTER 2: CLINICAL APPLICATIONS OF SUBLIMINAL PERCEPTION

INTRODUCTION

There have been relatively few individuals interested in making use of subliminal perception in clinical settings. This is somewhat surprising, given the widespread use of other techniques from experimental psychology, such as biofeedback and operant conditioning. In addition much of the early concern over subliminal perception centered around the use of subliminal stimuli in the modification of attitudes and behaviour, therefore one might have expected clinical psychologists and psychiatrists to show rather more interest than they have. There are however some individuals, the main one being L.H.Silverman, who have carried out studies of the use of subliminal stimuli in clinical settings, and their research work will now be considered.

THE RESEARCH WORK OF L.H.SILVERMAN

Silverman's interest in subliminal perception stemmed from a desire to provide experimental support for the psychoanalytic theory that psychopathology is caused by unconscious conflicts. Such pathology is viewed as a response to the pressure of unacceptable libidinal and aggressive drives. These threaten the individual with increased anxiety, therefore these drive derivatives are blocked by employing defensive operations. When these defensive operations are successful there are no traumatic consequences, but when they fail the drives and the anxiety both appear and cause complex psychopathologies such as phobias and obsessions.

Silverman attributed the lack of experimental data on this theory to the difficulty of manipulating unconscious conflicts without making them conscious, because the theory predicts that when such drives become conscious their link with pathology is broken. He proposed that by using subliminal drive related stimuli the problem would be overcome.

His early studies concentrated on the relationship between aggressive stimuli and what he termed 'pathological thinking' and 'pathological non verbal behaviour', which refer to thinking and behaviour that can be judged to be out of keeping with the normal requirements of logic and reality considerations, i.e. psychotic behaviour characteristic of schizophrenic patients.

The basic experimental design used in all Silverman's early work is the same. Each patient or subject is seen individually for an 'aggressive session' on one day and a 'control session' on another day. At the beginning of each session a baseline measure for pathological behaviour and thinking is obtained using various tests such as the Rorschach test, word association tests and story recall tests. The subject is then asked to look at a tachistoscope and he is presented with a set of subliminal stimuli, experienced as a series of flashes. He is then asked to describe the flashes. Usually four subliminal exposures of a picture with aggressive content or one with neutral content were shown. Then the tests used for the baseline pathology determination are repeated to assess the effect of the stimuli. In the second session the procedure is repeated except that the stimuli are changed from

aggressive to neutral or vice versa. The person administering the psychological tests and operating the tachistoscope is always blind with respect to the stimulus content. The evaluation of the test protocols is also done blind.

Silverman's definition of a subliminal stimulus is one in which the exposure level is set so that stimuli with different content cannot be differentiated from each other. This discrimination task is given after the two experimental sessions. Two different stimuli are presented in random order at the same level as those used in the test sessions, and the subject's task is to tell them apart. In addition the aggressive and neutral stimuli are presented supraliminally to assess their effect when the subject is fully aware of them.

In his various experiments Silverman has used different aggressive and neutral pictures with essentially the same results. Examples of the stimuli are a snarling man with a dagger in his upraised hand v. a man reading a newspaper; a growling tiger chasing a monkey v. two playful dogs; a roaring lion v. a small bird in flight; and a man with bared teeth attacking a woman v. two bland looking men.

In all the early studies with schizophrenics carried out in Silverman's laboratory, subliminal aggressive stimulation was found to intensify either pathological thinking or pathological non verbal behaviour or both. This pathology typically emerged as a delayed effect. The length of time that the schizophrenic had been in hospital was also found to be an important variable. In studies using long stay patients

(Silverman, 1966; Silverman and Silverman, 1967; Silverman and Spiro, 1967, 1968) the aggressive stimulation produced much broader and more intense effects than in studies using recently admitted patients (Silverman and Candell, 1969, 1970; Silverman and Gordon, 1969; Silverman, Spiro, Weisberg and Candell, 1969). This difference was interpreted as supporting the psychoanalytic assumption that short term schizophrenics have more ego resources available to them than long term schizophrenics, therefore they can resist the encroachment of pathology more easily.

Two studies were carried out (Silverman, 1965; Silverman and Goldweber, 1966) to investigate the relationship between subliminal aggressive stimulation and psychopathological effects in non schizophrenic individuals. Silverman (1965) used two groups of hospital workers screened for absence of schizophrenia as his subjects. The first group received the standard experimental procedure, but the second group were primed for aggressive thinking at the start of each session by the experimenter, who read out a highly aggressive short story. This primed group were divided into those who responded to the passage with strongly aggressive imagery, and those who did not. Only those subjects who were primed for aggressive thinking and displayed aggressive imagery were found to show pathological responses following subliminal aggressive stimulation. This result was replicated by Silverman and Goldweber (1966). The conclusion reached was that only individuals in a schizophrenic-like state i.e. a state of aggressive arousal with impaired ability to

moderate aggressive impulses, would show pathological responses to subliminal aggressive stimuli. It should be noted that British psychiatrists would not describe such a state as schizophrenic-like.

Since libidinal as well as aggressive drives are held to be important in psychoanalytic theory, Silverman has conducted a number of studies using libidinal stimuli (Silverman, Klinger, Lustbader and Farrell, 1970; Silverman and Silverman, 1964; Silverman and Silverman, 1967). In these studies the subliminal stimuli were intended to arouse homosexual and voyeuristic drives. They did not produce the pathological behaviour that the aggressive stimuli did, but they did produce decrements in performance on intelligence tests.

In the studies in which the stimuli were also shown supraliminally, the results showed that both for schizophrenics (Silverman and Candell, 1970; Silverman and Spiro, 1968) and non schizophrenics (Silverman and Goldweber, 1966; Silverman _et al._, 1970) there was no increase in pathological symptoms following the supraliminal stimuli. The pathological effects were dependent on the subject being unaware of the stimuli. Silverman concluded from this that one of the functions of awareness is to protect the individual from the pathological effects of noxious external stimuli.

Psychoanalytic theory also predicts that under certain circumstances the stirring of unconscious drives can be therapeutically valuable by enhancing adaptation rather than intensifying pathology, e.g. in some cases unconscious fantasies may gratify intense ego

drives without mobilizing guilt or anxiety. In two studies (Silverman and Candell, 1970; Silverman, Spiro, Weisberg and Candell, 1969) subliminal stimuli were used to try to arouse in schizophrenics the fantasy that they had a symbiotic union with their mothers. It was predicted that stimulation of such a fantasy would reduce pathology in patients. Symbiotic stimuli were compared with neutral stimuli, and the results showed that the patients reacted to the subliminal symbiotic stimuli with reductions in pathological behaviour. The same stimuli presented supraliminally had no effect.

In the early 1970's, Silverman turned his attention away from studies on schizophrenics to investigate depression, homosexuality and stuttering. He supervised three studies in which the effects of stimulating aggressive drives were studied in widely different depressive populations. Rutstein and Goldberger (1973) used a group of hospitalised, suicidal women, Varga (1973) used depressed and hypomanic college students, and Miller (1973) studied young adults prone to depression due to the loss of a parent in childhood. The results from these studies all showed that subliminal aggressive stimuli led to increased depressive feelings, which were not apparent following supraliminal stimulation. These findings were interpreted as supporting the psychoanalytic view that depression involves turning unconscious aggressive wishes against oneself.

Silverman's investigation of homosexuals (Silverman, Kwawer, Wolitzky and Coron, 1973) used two groups of male homosexuals. In this

case the stimuli used were intended to arouse conflicts over incestuous wishes. The results showed that following the subliminal incestuous stimuli there was an increase in homosexual feelings and a decrease in heterosexual feelings. Following a subliminal symbiotic stimulus there was a decrease in anxiety and defensiveness. Male heterosexual controls did not show these responses. The results were interpreted as supporting the psychoanalytic view that homosexuality involves in part a flight from incest. Similarly according to psychoanalytic theory individuals who have problems with stuttering have conflicts over anal wishes, the stimuli used by Silverman, Klinger, Lustbader, Farrell and Martin (1972) were intended to arouse such conflicts. The results confirmed the theory, with increases in stuttering following subliminal anal stimuli, and no changes following neutral stimuli.

More recently Silverman has turned from demonstrating increases in pathology in various settings to using pathology reduction in therapeutic programs. Silverman, Frank and Dachinger (1974) carried out a study on twenty women with insect phobias, who had agreed to take part in a modified systematic desensitisation procedure. Their hypothesis was that the success of systematic desensitisation in reducing phobic symptoms was due to the activation of unconscious fantasies of symbiotic gratification. The activation of such fantasies is made more likely by the tranquillity inducing muscle relaxation procedure, the darkened room and the presence of the therapist as a healing mother figure. They tested their hypothesis by

substituting subliminal symbiotic stimulation for the muscle relaxation part of a normal systematic desensitisation program. Each time the subject reported anxiety during the visualisation of insects, she was asked to view subliminal exposures of either a symbiotic or a control stimulus. Blind measures of phobic behaviour and anxiety were made before and after four treatment sessions, and the experimental group were found to have improvements not apparent in the control group.

Subliminal symbiotic stimulation was also used in conjunction with a behaviour modification program for the treatment of obesity (Silverman, Martin, Ungaro and Mendelsohn, 1978). Obese women were treated for either eight or twelve weeks. In both programs the behavioural instructions were accompanied with subliminal stimuli, with half the subjects receiving stimuli designed to arouse symbiotic gratification fantasies, and the remaining half receiving control stimuli. Weight loss was measured at the end of the program, and after four and twelve week follow-up sessions. In both programs there was evidence of enhanced weight loss in the symbiotic subjects, but the differences in losses between them and the controls were only significant at follow-up.

COMMENTS ON SILVERMAN'S WORK

In 1975 Silverman published an article reviewing his own experimental work (Silverman, 1975). This article prompted a reply by J.P. Watson (1975) in which he critically examined both the experimental techniques used by Silverman, and the interpretation of the results obtained. The first criticism concerned the dependant variables used in many of the studies. Watson noted that variables such as 'sexual orientation index' derived from interviewer ratings, 'story recall pathological thinking score' and indices derived from Rorschach tests were far from objective, and particularly in Britain there were serious doubts about the validity of projective procedures in general and Rorschach tests in particular. He also criticised the use of measurements of 'self-object differentiation', 'oral aggressive derivatives' and 'primary process pathology', on the grounds that they are so far removed from actually measuring behaviour that there are great difficulties in establishing that what is measured is what is claimed to be measured.

Watson then went on to question the interpretation of the results, irrespective of the dependant variables used. He questioned the conclusion that increases in psychopathology following subliminal stimulation were due to the activation of unconscious fantasies and conflicts. He preferred, in the absence of other evidence, to interpret the results in terms of normal mechanisms unrelated to the psychoanalytic unconscious, i.e. the experimental and control stimuli had quite different affective connotations and should

therefore generate different behavioural responses.

Another point to be kept in mind when considering the work of Silverman is that there have been few independent replications of his results. In his review articles (Silverman, 1971, 1975) he quotes a number of independent replications (Antel, 1969; Buchholz, 1968; Kaye, 1975; Leiter, 1972; Lomangino, 1969; S.E.Silverman, 1969) but all these are unpublished doctoral dissertations, and none of the experiments have subsequently been published in books or journals, therefore one cannot fully evaluate these replications.

A more accessible replication study is that of Litwack, Wiedemann and Yager (1979), who presented schizophrenic patients with subliminal aggressive and neutral stimuli, as in Silverman's studies, and added a third stimulus designed to activate fantasies of object loss. Pre- and post-exposure measures of psychopathology were performed, as well as a measure of the patient's sense of differentiation from a mother figure. Finally the patients' reactions to the stimuli presented supraliminally were recorded. The results supported and extended Silverman's findings in that:

1. subliminal aggressive stimuli increased psychopathology, particularly in relatively undifferentiated and non-defended patients,
2. subliminal stimulation of fantasies of object loss also increased pathology, and increased patients' sense of merging with the mother figure,
3. these changes were not produced using supraliminal stimuli.

Another replication of Silverman's work was carried out by Greenberg (1977), who investigated the effects of neutral and aggressive stimuli on the thought processes of schizophrenics. The subjects consisted of twenty-four (24) male patients diagnosed as schizophrenics with no secondary diagnosis. Eighteen (18) of them fell into Silverman's long term category (hospitalised for at least 6 years), two (2) were short term (hospitalised for less than 3 years) and four (4) were in between categories. The stimuli used by Greenberg were supplied by Silverman, who also gave advice about the experimental conditions. Great care was taken to make the replication as close as possible. However, the results did not confirm Silverman's findings in that:

1. the subliminal neutral stimuli produced an increase in pathological thinking, while the subliminal aggressive stimuli produced a decrease,
2. there was no significant difference between the stimuli on any measure of pathological non verbal,
3. there were no delayed effects,
4. there were no differences apparent between long and short term patients.

Greenberg noted that there may have been unknown differences between the subjects used by Silverman and his own, but concluded that there must be considerable doubt over Silverman's results, and the theoretical statements that followed them.

OTHER SUBLIMINAL WORK IN THE CLINICAL AREA

Next to Silverman the most active research clinician in this area has been H. Shevrin. He started work on subliminal phenomena in the 1950's, his interest having been aroused by Fisher's work on the Poetzl phenomenon (Fisher, 1954, 1956), and by a consideration of the psychoanalytic theory of thinking. According to this theory it is postulated that concepts maintain their logical character unless the person using them is affected by strong conflicts relating to particular ideas, or is in an abnormal state such as produced by sleep, toxicity or severe psychopathology. Under these conditions the realm and content of concepts may be altered, and in addition words themselves may lose their referential character and become auditory patterns prone to various primary process transformations. Shevrin assumed that subliminal stimuli were more easily incorporated into trains of thought subject to primary process forces.

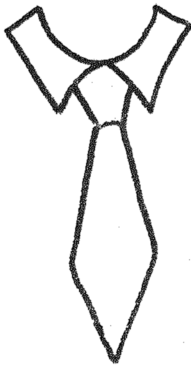
His early work on the Poetzl phenomenon was carried out in collaboration with Lester Luborsky (Luborsky and Shevrin, 1956; Shevrin and Luborsky, 1958), and they found that not only were the subliminal visual stimuli transformed when reproduced in dreams, but also the meanings underwent changes, e.g. a lorry might be recalled as a car or a wheelbarrow.

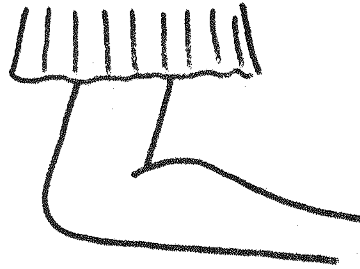
In 1961 they published a paper describing a technique for directly investigating such primary process transformations of subliminal stimuli (Shevrin and Luborsky, 1961). They devised pairs of stimuli in which there were

two levels of comprehension possible; firstly at a primary process phonetic level, and secondly, at a logical secondary process level. They hypothesised that the phonetic relationship would be present following subliminal presentation. They called this technique the Rebus technique. The two stimulus pairs used in their first experiment are shown in Figure 2.1 (page 46). Following presentation of a stimulus pair subjects were asked to draw a picture of what they thought the stimulus contained, and then given word lists consisting of rebus words 'tiny' and 'begun' and so called clang words 'title' (related to tie), 'penny' (knee), 'besides' (bee) and 'wagon' (gun). Subjects had to rank such lists in the order in which they attracted attention. After these tests the subjects were shown the stimulus supraliminінally. Shevrin and Luborsky predicted that:

1. subjects would rate as higher in attraction words associated to the stimulus presented than non-associated words,
2. the relevant rebus word should be rated more attractive than other words (the Rebus effect),
3. the subject would not perceive the clang or rebus connections between the words and pictures following supraliminal exposure, because they would be using secondary process thought.

Their results confirmed hypotheses (1) and (3), but not (2). They concluded that in the Rebus technique they had developed a powerful





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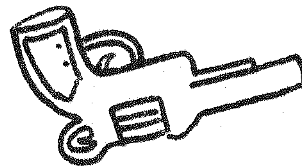


BEGUN

Figure 2.1: The Stimuli used by Shevrin and Luborsky (1961)

technique for studying primary process transformations of pictures.

In later work (Shevrin and Fritzler, 1968a), he reported that it was possible to use the cortical average evoked response to discriminate a meaningful rebus stimulus from a meaningless but structurally similar abstract stimulus, when presented either subliminally or supraliminally. This was interpreted as showing that primary and secondary process thoughts are associated with different cortical average evoked responses (AER) parameters. (In an independent replication Schwartz and Rem, 1975, were unable to distinguish between two stimuli on the basis of the AER at any exposure level). They also reported that the AER could be used to distinguish individuals rated high or low in repression (Shevrin and Fritzler, 1968b). Shevrin, Smith and Fritzler, (1971) then reported that the relationship between the AER and repression was only apparent when meaningful sublimininal stimuli were used. In a review paper, Shevrin (1973) wrote in a general way about the importance of these findings for studying pathological thought processes, the role of attention in repressive defences, the possibility of manipulating drive states (c.f. Silverman), the potential benefits of using subliminal stimulation and the AER in diagnosis and therapy, but ended by saying that such developments are still some way in the future. At present Shevrin has not reported any further work towards these goals.

The use of subliminal stimuli in a different setting was reported by Hart (1973). He attempted to modify attitudes towards alcoholism by presenting a subliminal visual stimulus consisting of a picture of a whisky bottle and a half filled glass, with the word POISON printed underneath. His experimental

group first completed the Marcus alcoholism questionnaire (Marcus, 1963), and then were given ten subliminal presentations of the stimulus once a day for five days. The control group followed the same procedure except that they did not receive any stimuli. At the end of the presentation sessions the questionnaire was again completed. The results showed that the experimental group had significantly changed their attitudes towards alcoholism, with no change in the control group.

Tyrer, Lewis and Lee (1978) investigated the effects of subliminal and supraliminal stress on symptoms of anxiety. Tyrer (1973) had postulated that the great variability in symptoms attendant on anxiety neurosis was due to variations in the level of awareness of the anxiety producing stimuli. In normal anxiety there is full awareness of the source of the worry, and psychic and somatic symptoms are experienced equally. 'Anxiety equivalents' in which somatic symptoms predominate are the result of the source of anxiety being unknown, therefore in the absence of any other known factors the somatic symptoms become the primary complaint of the patient.

This theory predicts that anxiety can be induced using subliminal stimuli, and that reactions to stimuli will show greater emphasis on somatic symptoms of anxiety. These predictions were tested in two experiments. In the first a sequence of twenty anxiety inducing words were presented subliminally to twelve (12) female volunteers, and supraliminally to a second group matched on the basis of their scores on the Trait Anxiety Index of the State Trait Anxiety Inventory (Speilberger, Gorsuch and Lushene, 1970). Pre- and post-exposure measures

of anxiety were obtained using the State Anxiety score from the same test, and also the subjects completed a set of visual analogue scales estimating both somatic and psychic anxiety symptoms. The results showed significant increases in psychic symptoms for both subliminal and supraliminal groups, but no significant changes in somatic symptoms for either group.

The second experiment used short films as the emotive and neutral stimuli, since such material is less artificial than the teachistoscopic presentation of single words, and in addition it allows a much longer exposure to the stimuli. It was hoped that this increased exposure would produce more pronounced effects. The emotive film consisted of a sequence shot from a car travelling through Southampton in busy traffic, which was shown at five times the normal speed. The comparison neutral film was of a swan floating on a lake. Each film lasted for 90 seconds.

Two groups of twenty-five (25) individuals matched on their scores on the Trait Anxiety Scale were shown the films subliminally and supraliminally. Pre- and post-exposure ratings of anxiety were recorded for each film. The results showed that under both subliminal and supraliminal conditions the traffic film increased symptoms of anxiety and the swan film decreased them. Therefore, the prediction that anxiety could be induced using subliminal stimuli was confirmed, but the prediction that such anxiety would show an emphasis on somatic symptoms was not confirmed.

The results from this study, combined with the results from studies using films in treating anxiety states and phobias led to the experiments reported in

this Thesis. The first three experiments are concerned with the development of a novel method of treatment for agoraphobia using subliminal films, and the fourth experiment is a replication and extension of the Tyrer, Lewis and Lee study. In the next chapter current methods of treatment of agoraphobia will be considered.

CHAPTER 3: THE SYNDROME OF AGORAPHOBIA AND ITS TREATMENT

INTRODUCTION

The term agoraphobia was first used by Westphal (1871) when referring to patients with fear of going into public places such as streets, open squares and markets. Today the term includes a wider range of phobic situations, and many people diagnosed as agoraphobic have multiple fears including being in cinemas, shops, lifts; travelling in cars, buses, trains and aeroplanes; and being in crowds of people. Fear of heights is also common in the syndrome. Some patients express their fears in different terms, being frightened of situations in which they feel constrained or unable to escape from. Snaith (1968) suggested that it would be better to describe agoraphobia as a fear of being away from a place, object or person representing safety.

Some individuals complain only of isolated fears, and apart from limited phobic situations they are able to enjoy a normal life. It is more common to find agoraphobics suffering from multiple fears, and in addition many also experience free floating anxiety, depression, depersonalisation and panic attacks. The severity of the problem can range from discomfort and lack of confidence while in phobic situations to extreme fear and complete alteration of life style to avoid any possible contact with phobic situations.

PREVALENCE OF AGORAPHOBIA

Agoraphobia is a common problem. Agras, Sylvester and Oliveau (1969) made a study of a Vermont community and found 6.3/1000 of the adult population could be described as agoraphobic. This is higher than would be expected from clinical practice, but a frequent complaint of members of agoraphobia associations and self help groups is that general practitioners are often unsympathetic to their problems, and unwilling to refer them on to the psychiatric services. In addition there must be a certain number of agoraphobics who never seek help for their problems, therefore it is probable that many clinicians underestimate the frequency of the complaint.

The incidence of phobic patients in psychiatric practice is about 2% in both Britain and America (Errera and Coleman, 1963; Hare, 1965), and the majority of these appear to be agoraphobic. The syndrome is much more common in women than men, with most patients being married women aged between 20 and 50. It is rare in children, where school and social phobias are more common.

THE RELATIONSHIP OF MARITAL AND SEXUAL PROBLEMS TO AGORAPHOBIA

Agoraphobic problems are frequently attributed by clinicians to marital and/or sexual difficulties, although these claims appear to be based on anecdotal and single case evidence. Frigidity is the most common sexual problem, but this usually antedates the onset of agoraphobia. Both Roberts (1964) and Marks and Gelder (1965) found over 50% of agoraphobics to be sexually maladjusted. However, this figure is not surprising in view of the high levels of anxiety experienced by many agoraphobics, and it compares with that found for women diagnosed with anxiety states (Winokur and Holeman, 1963), obsessive-compulsive disorders (Marks, 1965) and hysteria (Winokur and Leonard, 1963). In addition many agoraphobics enjoy a normal sex life, therefore sexual disorder does not seem to be implicated in the development of the syndrome.

The question of the importance of marital problems in agoraphobia was investigated by Torpy and Measey (1974). They investigated spouse perception between agoraphobic women and their husbands, using techniques developed by Drewery (1969). The sample population studied was obtained through the Open Door Association, and questionnaires were sent out to fifty couples. Twenty-eight (28) couples returned completed forms. Each individual was asked to rate 'myself as I am', 'my spouse as I see him/her' and 'myself as I think my spouse sees me' on eight dimensions. In addition the marriage had to be rated on a five point scale (0 - very happy, 4 - breaking up). Their data allowed them to investigate whether the couples'

predictions, expectations and understanding of each other were accurate or not, and whether those couples complaining of poor marriages had similar self images.

Sixteen (16) of the couples rated their marriages as good, and twelve (12) rated them as poor. The only failure in accurate interpersonal perception found was in the poor marriage group, where the wives saw their husbands as extremes of stability and toughness, although their husbands did not rate themselves in this way. In all other comparisons there were no significant differences.

Torpy and Measey concluded that although agoraphobic symptoms were coexistent with failures of interpersonal perception in some poor marriages, there was no evidence to relate the state of the wife to the marital situation. The only failing of this study is that there was no clinical examination of the wives, their agoraphobia being inferred from their membership of the Open Door Association, therefore it is possible that they would not all meet strict clinical criteria for agoraphobia.

A better controlled study of the relationship of agoraphobia to marital problems was carried out by Buglass, Clarke, Henderson, Kreitman and Presley (1977) in Edinburgh. They compared a group of thirty (30) agoraphobic women with a group of controls matched for age and social class. The criteria for inclusion in the agoraphobic group were designed to exclude social phobics, and women with primary depressive disorders, and only women cohabiting with their husbands were considered. Couples who experienced

prolonged separations, e.g. because of physical illness, were excluded. The control group women were screened for absence of psychiatric illness over the preceding two years, and like the agoraphobics had to be cohabiting with their spouse with no prolonged separations.

Each couple taking part in the study were first interviewed together by a sociologist, and then individually by a psychiatrist. All individuals completed the Cornell Medical Index (Brodman, Erdmann and Wolff,1956), measuring physical and psychological symptoms, the Eysenck Personality Inventory (Eysenck and Eysenck, 1964) and a Semantic Differential test. The interviews were semi structured, and investigated current symptomatology, childhood experiences and perception of the spouse. The interviews of the couples also covered allocation of household duties, social activities and problems with children.

All conjoint interviews were carried out by one person, therefore there was no problem with inter rater reliability. For the individual interviews reliability was assessed in sample couples seen by two raters. The criterion for acceptability of an assessment was 90% agreement between the raters.

Apart from the presence of their phobias and associated symptoms, the agoraphobic women differed significantly from the controls in terms of hypochondriasis (16 phobics, 0 controls) and gynaecological illness (20 phobics, 12 controls). Family background was similar in terms of parental age, family size, birth order, parental deprivation, parental death during childhood and parental quarrelling. However, there was a significantly

greater incidence of the presence of step parents, step siblings and adopted siblings in the families of the phobics. The parents of the phobics had no more psychological or drinking problems than those of the controls. In addition there was no evidence for differences in current or premorbid type and frequency of contact with the mother, and no differences in terms of 'dependent personalities', or sexual adjustment prior to the phobic problems. This changed after the onset of the phobia, with a marked loss of libido reported by many of the women.

There were no significant differences found between the two groups of husbands on a wide variety of personal characteristics. The illness of the wife did not appear to affect the husband's occupational status, time spent at work, money earned or satisfaction gained, although subjectively the husbands of the phobics felt that they had been adversely affected by the wives' problems.

The social contacts and activities of the two groups were very similar, although fewer phobic women participated in group meetings. In the field of domestic activities only one (1) out of twenty-one (21) tasks differentiated the two groups. Not surprisingly this was concerning the shopping. Allocation of decision making in various areas did not differ between the groups, and there were no significant differences in psychiatric symptoms in the children, although a higher proportion of the control children were psychiatrically disturbed. None of the agoraphobics' children refused to attend school or showed any other signs of agoraphobia.

The most striking feature of this very comprehensive survey is the lack of differences between the two groups. Many of the common statements about aetiology and the background, behaviour and attitudes of agoraphobics find no support in the results. It is a pity that so few clinicians are familiar with this important study.

METHODS OF TREATMENT

Psychotherapy

Before the popularisation of behavioural techniques for modifying phobic behaviour the standard method of treatment was psychotherapy, either alone or in combination with drug therapy. Although individual psychotherapists could be highly successful, the prognosis was generally poor, particularly in the case of agoraphobia, in which there is generally little improvement due to non-specific factors (Mathews, 1978). Psychotherapy is still in common use, despite the fact that the behavioural methods to be discussed below have been shown to be therapeutically more effective, because many patients have great reservations about participating in any sort of active treatment procedure. Agoraphobic patients often appear to have low motivation towards helping themselves, and will not contemplate anxiety-inducing treatments.

Although treatment methods in psychotherapy vary considerably, with many idiosyncratic procedures being used, there are a number of broad approaches. As Andrews (1966) in his review of psychotherapy of phobias concluded, the most frequent approach is to characterise phobic patients as showing excessive dependency, and avoidance of phobic situations, therefore the successful therapist must initially respond to the patient's need for protection, and then gradually bring the patient to confront the phobic situations, and encourage self reliance. Both supportive and intensive psychotherapy are based on this approach. Supportive therapy additionally tries to restore morale, and terminate

the common cycle of increasing dependency and diminishing self confidence.

There are a number of other approaches. Psychoanalytically orientated psychotherapy is based on trying to understand the agoraphobic behaviour in terms of presumed internal conflicts, the symptoms being removed by resolving the conflict. Beck (1976) described a cognitive approach, designed to reduce the anticipatory anxiety which is a major problem for many agoraphobics. Weekes (1973, 1976) has popularised a method called remote direction. She regards agoraphobia as being caused by deep-rooted conflicts accompanied by sensitization of somatic responses to stress. Her therapeutic procedure ignores the original conflict and aims only to remove the sensitisation, which is done by the patient accepting and enduring panic in a process of self-desensitization until it becomes unimportant.

Marks (1969) felt that psychotherapy should be reserved for cases in which:

1. there are troublesome interpersonal problems in addition to the agoraphobia
2. progress in the treatment of the phobia is being blocked by the secondary gains of the existing situation
3. a stable dynamic equilibrium has been reached, and removal of the agoraphobic behaviour would disrupt this equilibrium.

Such complications may be common. Hafner (1977) investigated the influence of the husbands of agoraphobic women on the outcome of treatment, and found that in many cases improvements in a

wife's condition led to an increase in dissatisfaction with the marriage on the part of the husband. Some men appeared to reinforce the continued dependency of their agoraphobic partners. He concluded that in such cases any treatment given would be of little value unless the husband was also included.

Behavioural Treatments

One of the more beneficial products of the behaviourist domination of psychology in the U.S.A. was the emergence of behavioural methods for the treatment of a wide variety of psychological problems. A number of different methods are currently used in the treatment of agoraphobia, but they all share a common approach, being goal oriented, having formalised procedures and using objective measures of both the initial state of the patient and any subsequent improvements. Prognosis is generally good, although many agoraphobics never fully lose their symptoms and occasional booster treatments may be needed.

Systematic desensitization is the most commonly used method. Marks (1969) described a long history of the concept of desensitization, but the method in use today can be reasonably attributed to the work of Wolpe (1958, 1961). A graded hierarchy of feared situations is constructed by the patient and the therapist. The therapist then induces a state of deep relaxation in the patient, who then imagines approaching the least feared situation in the hierarchy. This is stopped as soon as the patient reports feelings of anxiety, and the state of relaxation is re-established before the phobic

situation is again visualised. The patient does not progress to the next item in the hierarchy until visualisation of the first does not produce any feelings of anxiety or panic. This process continues over a number of sessions, usually 30 minutes to 1 hour in length, until the patient can visualise the most feared situations without any adverse reactions. During the course of treatment, the patient is encouraged to enter phobic situations that have been successfully desensitized in imagination. The whole procedure can be carried out in vivo but this is less common because of the greater practical problems entailed.

Systematic desensitization proved to be highly effective in the treatment of spider and snake phobias in non-clinical populations of students and other volunteers, but when it was compared with supportive psychotherapy using matched groups of severe agoraphobics (Gelder and Marks, 1966) the results were disappointing. Both groups showed improvements on their main phobia, with 40% of the desensitization group rated much improved at the end of treatment compared with 20% of the psychotherapy controls, but these results were not significantly different and the improvements were not maintained in either group over the course of nine (9) months of follow-up.

Gelder, Marks and Wolff (1967) studied forty-two (42) less severely handicapped patients with a variety of phobias. Twenty-two (22) of them were diagnosed as agoraphobic. The patients were split into three matched groups receiving systematic desensitization, group psychotherapy or individual psychotherapy. Treatment lasted on average nine months for desensitization,

eighteen months for group psychotherapy and one year for individual psychotherapy. The results showed that desensitization produced larger and more rapid improvements in main and other phobias than the psychotherapy treatments. However, the results also showed that patients who did badly on desensitization tended to be agoraphobic and have high initial anxiety. The conclusion drawn from these results was that systematic desensitization was highly effective in dealing with relatively mild specific and mixed phobias, but was of limited value in the treatment of severe agoraphobics.

Although McConaghy (1970) disputed these conclusions, attention turned to flooding as a method which might give better results. In contrast to systematic desensitization the technique of flooding sets out to induce and maintain high levels of anxiety. The patient is asked to visualise his or her most phobic situation, and to endure the feelings of fear and panic that this arouses. This is maintained over a number of sessions until the patient loses the adverse reactions. Flooding can be carried out in imagination or *in vivo*, and many clinicians use a mixed procedure in which the patient starts off imagining phobic situations and moves on to real life situations once some progress has been made.

Malleson (1959) gave an early indication of the efficacy of flooding in a single case study of examination phobia which was successfully treated. Boulourgouris and Marks (1969) gave flooding sessions twice a week to four patients, two agoraphobic, one spider phobic and one with

a severe fear of vomiting. The first three patients showed rapid improvements on main and other phobias over the course of eight weeks of treatment and these improvements were maintained over a four month follow-up period. The improvements were better than those usually obtained with systematic desensitization. A controlled comparison of flooding with systematic desensitization was carried out by Marks, Boulougouris and Marset (1971). Using a variety of clinical and physiological measures they found that flooding was significantly superior for reduction of phobias, and the effects were maintained during a one year follow-up. The superiority of flooding was most marked in their agoraphobic patients. Although Gelder, Bancroft, Gath, Johnston, Mathews and Shaw (1973) did not replicate the marked superiority of flooding over systematic desensitization for the treatment of agoraphobics, they did show that both of these treatments were much more effective than psychotherapy. This discrepancy in results may have been due to differences in the severity of the agoraphobic problems of the patients used in the two studies.

The session lengths used in the above studies varied from 30 minutes to 1 hour, but the optimum length was not known. Stern and Marks (1973) compared the efficacy of four brief (half hour) sessions of flooding with one long (2 hour) session, both in vivo and in imagination. There was little difference for imaginal flooding, but with in vivo flooding the long session produced a greater improvement than the four brief sessions. Unfortunately, the design of the experiment did not allow a direct comparison of in vivo flooding

with imaginal flooding, as the imaginal sessions were always given first, therefore any differences found may have been due to order effects.

This question of the relative efficacy of imaginal versus in vivo flooding has been investigated in a number of studies. Strictly speaking some of the comparisons have been between imaginal flooding and the slightly different technique of prolonged exposure in vivo. This treatment method was introduced by Watson, Gaind and Marks (1971), using outpatients with specific phobias as subjects. They exposed their subjects to phobic situations in real life for 2 - 3 hours at a time, but made no attempt to evoke and maintain high levels of anxiety as would be the case in flooding. All of their subjects showed marked clinical improvements, which were maintained at follow-up. These results prompted a second study with agoraphobics (Watson, Mullett and Pillay, 1973). Nineteen (19) women were treated with prolonged exposure either in vivo or in imagination. The results showed that in vivo exposure produced much greater improvements than imaginal exposure. This result was replicated by Emmelkamp and Wessels (1975) although their exact in vivo procedure was unclear.

Mathews, Johnston, Lancashire, Munby, Shaw and Gelder (1976) compared groups of agoraphobic women on three different treatment programmes. The first consisted of eight sessions of imaginal flooding followed by eight sessions of in vivo exposure. The second was sixteen sessions of combined imaginal flooding and in vivo exposure, and the third was sixteen sessions of in vivo exposure. All patients were encouraged

to practice entering phobic situations between sessions. In the results there was some evidence that the patients' responses were therapist-dependent, irrespective of treatment. All groups showed improvements but there were no significant differences between the groups either during treatment or at six month follow-up. The authors concluded that there is no difference in therapeutic efficacy between imaginal and in vivo sessions, particularly when there is practice between sessions.

One advantage that both flooding and prolonged exposure have over systematic desensitization is that they require much less therapist time. Another way to increase efficiency is to give treatment in groups. The prolonged exposure study of Watson, Mullett and Pillay (1973) used group sessions, and found only one patient out of nineteen who commented adversely on the group setting. All the other patients approved of the group approach, and the authors noted a high level of cameraderie in the groups, which they thought would make treatment in groups more effective than individually.

Hand, Lamontagne and Marks (1974) gave in vivo flooding to six small groups of four or five agoraphobics. Three of the groups were structured to increase social cohesion during flooding. This was enhanced by symptom centered group discussions before, during and after treatment. The other three groups were unstructured. On clinical ratings and behavioural tests the outcome for all groups was at least as good as that obtained in earlier trials with individual treatment. In addition the structured groups

were significantly better than the unstructured groups at 3 and 6 month follow-up assessments of main phobia and global improvement. They also showed gains in social skills and assertion.

Other studies have not shown such clear superiority for group treatments. Hafner and Marks (1976) treated 57 agoraphobics with in vivo exposure, and compared oral diazepam with placebo, group with individual exposure, and high with medium anxiety evocation during exposure. Patients were followed-up for six months. The major finding was that patients in all treatment conditions improved significantly in phobias and related areas. Diazepam was found to be a mild palliative during exposure, but did not affect outcome. Group exposure patients improved slightly but significantly more than individual exposure patients on non phobic measures, and the therapists found the group sessions easier to run. Exposure under high anxiety was no more effective than with lower anxiety. The conclusions were that the most therapeutic and cost-effective treatment method was drug-free group exposure without high levels of anxiety. The finding that there was little difference between group and individual exposure was also reported by Teasdale, Walsh, Lancashire and Mathews (1977).

One topic that is frequently raised in discussions of behavioural treatments of psychiatric disorders is that of symptom substitution. In considering the matter, Hafner (1976) contrasted the view of Eysenck (1960) - 'There is no neurosis underlying the symptom but merely the symptom itself' with that of Mowrer (1950) - 'symptoms are not the essence of neurosis ..... the models of

treatment that are aimed at their direct alleviation are as ill considered theoretically as they are futile practically'. Hafner went on to look at the results of a four day in vivo exposure programme carried out in groups and individually. Fifty-seven (57) patients were treated. He found fresh symptoms in twenty-six (26) patients during follow-up, and judged 18% of the patients to be adversely affected by the treatment.

It is important to note that the patients treated had a wide variety of symptoms. Hafner described them as 'all suffering from agoraphobic symptoms, but many were also abnormally obsessional, depressed, socially anxious, generally anxious, or complaining of troublesome and undiagnosed somatic symptoms'. Given that the treatment they received was only concerned with their agoraphobic symptoms, it is hardly suprising that twenty-six (26) showed fresh symptoms during follow-up. If one looks at the agoraphobic symptoms then almost all of the patients showed very marked improvements. Not even the most biased behaviourists would claim that treatment for agoraphobic symptoms would also eliminate the other problems of Hafner's patients.

Two other studies have looked at symptom substitution and their findings differ from Hafner's. Gelder, Marks and Wolff (1967) found no evidence for symptom substitution in their phobic patients treated by systematic desensitization. More recently, McPherson, Brougham and McLaren (1980) followed-up fifty-six (56) agoraphobics who had been treated by behavioural methods. Follow-up periods varied from 3 to 6.3 years (mean 4.3 years). Comparison of pre- and post-treatment

and follow-up self assessment data showed that improvements had been maintained on all variables assessed - main symptom, other phobias, depression, social relationships and disruption at work. Only one individual reported fresh symptoms. Although only ten described themselves as symptom-free, most of the remainder reported that their symptoms caused only slight distress and little disruption to their lives.

Drug Treatments

A number of drugs have been found to be useful in the treatment of agoraphobia but for the purposes of this review they are only discussed briefly.

General practitioners often prescribe tricyclic or monoamine-oxidase inhibiting antidepressants, or tranquillisors such as diazepam. A number of controlled trials have been carried out to assess their efficacy. Two studies have compared phenelzine with placebo (Solyom, Heseltine, McClure, Solyom, Ledwidge and Steinberg, 1973; Tyrer, Candy and Kelly, 1973). In both studies phenelzine was found to be significantly superior to placebo, although Tyrer et al., found no effect until the eighth week of continuous treatment, when improvements in both severity of symptoms and work adjustment appeared. They noted a negative correlation between improvement and ratings of depression, indicating that the drug was not acting primarily as an anti-depressant. A follow-up study of these patients (Tyrer and Steinberg, 1975) showed that phenelzine was comparable to other treatments for agoraphobia,

provided that it was given continously for at least six months. Withdrawal of the drug after a shorter period often produced relapses in the patients. Some of the patients continued to improve over a two year period, even when receiving no active treatment, indicating that spontaneous remissions occur with agoraphobics, although this is less common than with other phobias.

Lipsedge, Hajioff, Huggins, Napier, Pearce, Pike and Rich (1973) evaluated the effect of another monoamine-oxidase inhibitor, iproniazid, with sixty (60) patients, and found that this drug was also superior to placebo, particularly in reducing anxiety. It also reduced avoidance behaviour, but this effect was not statistically significant.

Imipramine has been the most widely studied tricyclic compound. Clinicians began to use it for treating phobic patients following a report by Klein and Fink (1962) of its value in reducing panic attacks. Once panic attacks have been brought under control the patient can learn to stop avoiding phobic situations, although some other form of therapy may be required to bring this about. Klein (1964, 1967) included psychotherapy in an overall treatment system with imipramine. The only problems with using imipramine are that relapses are common on drug withdrawal, and there are some undesirable side effects such as insomnia, irritability and nervousness.

Other drugs have produced less favourable results. Oral diazepam was found by Hafner and Marks (1976) to be a mild palliative during exposure sessions, but it had no effect on treatment outcome. Both Hafner and Milton (1977)

and Heiser and Defrancisco (1976) found propranolol to be of little value in treating agoraphobia, and similar results have been found with other beta blockers such as oxprenolol and alprenolol.

CONCLUSIONS

The above research shows that behavioural treatments play a significant part in the management of agoraphobia. However, many agoraphobics are unwilling to take part in any sort of behavioural treatments because they involve exposure to phobic situations. It therefore appears that there is a need for an exposure type of treatment which does not produce adverse anxiety reactions. One approach is to use drug therapy in combination with exposure, and a novel alternative would be to use subliminal presentation of agoraphobic situations. A test of such a procedure is reported in the next chapter.

CHAPTER 4: EXPERIMENT 1. TREATMENT OF AGORAPHOBIA USING SUBLIMINAL FILMS.

INTRODUCTION

The research reviewed in the last chapter indicated that behavioural treatments of agoraphobia are highly effective, but their use is limited by the reluctance of many patients to take part in procedures in which they will be required to expose themselves to presumed traumatic situations. Such patients either refuse treatment, or have such high levels of anticipatory anxiety that they are unable to participate effectively in the treatment. One possible way around this problem is to present the phobic material subliminally, thereby removing the most frightening element of the treatment.

Most studies of subliminal stimulation present material in the form of a brief tachistoscopic exposure of a fixed stimulus, which results in exposure times which are typically less than 10 milliseconds. This method has the disadvantage of not providing life-like situations, and of severely limiting the amount of material that can be presented in a given time. It was therefore decided to present the material in the form of a cine film, depicting a series of phobic situations, subliminality being achieved by lowering the illumination level.

Previous studies have shown that supraliminal cine film can be successfully used to reduce among other things, snake phobias in adults (Morris, Spiegler and Liebert, 1974), dog phobias in pre-school children (Hill, Liebert and Mott, 1968) and fear of dental treatment (Melamed, Weinstein, Hawes and Katin-Borland, 1975). Tyrer, Lewis and Lee (1978) also have shown that subliminal

presentation of cine film can alter the anxiety state of normal subjects and it was postulated that repeated exposure to subliminal phobic film might reduce the phobic fears and avoidance of chronic agoraphobic patients.

Therefore, the present experiment was carried out. Fifteen (15) agoraphobic patients were divided into three treatment groups - subliminal film presentation, supraliminal presentation and a control group. Each patient received six treatment sessions given at weekly intervals. On each occasion the patient was shown ten cine film sequences lasting four minutes each. Prior to the film session the patient was asked to complete a series of scales (Watson, Gaind and Marks, 1971) rating individual phobias, phobic avoidance, depression, panic, generalised anxiety and overall improvement. A separate set of ratings was then made by an assessor, who was not aware of the type of treatment that each patient received. In addition, a series of physiological measures and analogue scale scores were recorded during the course of the weekly treatment sessions.

PATIENTS

Twelve (12) female and three (3) male agoraphobic outpatients served as subjects in this experiment. They were told that a new treatment for agoraphobia was being investigated, but that it might be counterproductive if they knew the details. The patients had to meet the following criteria for inclusion:

1. they had failed to respond to or had refused treatment by behavioural methods,
2. their phobic symptoms had been continuous for at least five years,
3. they habitually avoided major phobic situations.

These criteria ensured that only severely agoraphobic patients took part in the study. All the patients had previously received treatment, but had failed to respond positively. Twelve (12) of the fifteen (15) had undergone behaviour therapy, chiefly in the form of systematic desensitization, and all of them had been taking drugs, including benzodiazepines (9 patients), tricyclic antidepressants (6 patients), monoamine oxidase inhibitors (10 patients) and major tranquillisers (2 patients). Six (6) patients were taking drugs at the start of the study, and provided they had been on a constant dosage level for at least three months they were allowed to continue on the same dose throughout the course of the study.

DESIGN

Each patient was randomly allocated to one of three groups - subliminal, supraliminal or control, and attended for treatment once a week for six weeks. Two (2) patients dropped out during the course of the study, one from the subliminal group and one from the control group, and they were replaced by two new patients. The three groups of five patients who completed the study were very similar (Table 4.1, page 77).

At the start of each weekly treatment session the patient first completed an assessment questionnaire rating phobias, phobic avoidance, depression, panic, generalised anxiety and overall improvement on nine (9) scales (Watson, Gaind and Marks, 1971). An assessor then made a separate set of ratings on similar scales. The assessor did not know which treatment the patient was receiving, and gave no instructions to the patients apart from reminding them that they should test themselves in their phobic situations to determine whether the treatment was having any effect. A follow-up clinical assessment was made six weeks after the end of treatment.

The patient was then taken to another room and electrodes attached for the physiological measures. The patient then sat in an armchair and was shown ten cine film sequences. These alternated between a four minute sequence of a potter working at his wheel making a large vase, and another four minute sequence that varied for each group.

The supraliminal group was shown a specially prepared silent black and white film which

	Subliminal	Supraliminal	Control
Sex	4F:1M	4F:1M	4F:1M
Mean age (yr)	41.4	38.8	34.6
Mean duration of agoraphobia (yr)	12.6	10.4	10.4
Initial mean phobic score (0-8)	6.04	6.26	5.67
Initial mean avoidance score (0-8)	5.75	4.67	4.12

Table 4.1: The Main Demographic Features of the Groups.

consisted of a series of situations that agoraphobics typically find disturbing (e.g. walking along and crossing a main road in heavy traffic conditions, travelling by bus to a market, being in a crowd of people). The film was taken from a subjective viewpoint, and ended with a sequence simulating the person experiencing a panic attack and then collapsing in the middle of a crowd of people.

The subliminal group saw the same film, but the illumination conditions were such that they were unaware of its presence. This was achieved by mounting a neutral density filter on the front of the cine film lens, thereby reducing the amount of light reaching the screen. In addition, a masking field was superimposed on the film image. A slide projector and a set of neutral density filter slides were used to create this masking field. The slide projector was fitted with a zoom lens so that the masking field could be matched in size to the film image. The transmission value of the neutral density filter used in the slide projector was selected at the beginning of the study so that five independent observers all agreed that the image on the screen was an unchanging, featureless, grey rectangle for the duration of the film.

The same procedure was followed for the control group as for the subliminal group except that the cine projector was run with the light source switched off. The film was still wound through the projector to ensure that the conditions were identical in terms of noise and duration.

The films were presented using a Bell and Howell 1680 cine projector and a Leisegang A30 35 mm

slide projector. The subject sat approximately 3 metres from the screen, and the projected image measured 65 cm x 90 cm. In order to minimise sources of distraction, all the physiological recording equipment and the projectors were located behind the patient, who sat in a specially constructed viewing area. This consisted of a 4 m x 2 m x 2 m black tubular steel frame covered in blackout sheeting. This ensured that the only item in the patient's field of view was the projection screen.

Visual Analogue Scales

At the end of each four minute section of film, the patient was asked to indicate how he was feeling by marking a set of seven (7) visual analogue scales. Each scale consisted of a 100 mm line with opposing descriptions at each end, i.e. sweating absent - severe sweating. The scales were used to record shaking or trembling, difficulty breathing, muscular tension, heart rate, sweating, and degree of excitement and relaxation. They were scored by measuring from the end of the line to the patient's mark, in the direction of increasing symptoms. Such scales are quick and simple to use, and have been shown to be effective in measuring changes in subjective feelings (Aitken, 1969; Bond and Lader, 1974; Luria, 1975).

Physiological Data Recording

Three (3) physiological measures were recorded during the study: heart rate, which I will refer to as the electrocardiogram, to avoid confusion with the analogue heart rate measure, respiratory rate and skin conductance level. These data were only recorded when there was a film being shown to the patient. During all data recording periods the patient sat in a chair with each arm on an armrest. Prior to each film presentation the patient was instructed to make himself comfortable, and then to remain as still as possible for the duration of the film.

The Electrocardiogram (E.C.G.)

The E.C.G. was recorded using three large metal electrodes strapped to the forearms. K-Y Lubricating Gel was used to ensure good electrical contact. The signals were fed into a Devices 3442 E.C.G. amplifier housed in a Devices M19 polygraph. A 10 Hz low pass filter was used to remove unwanted noise. The amplified signal was split three ways:

1. to one of the polygraph pens,
2. to one channel of a Racal Thermionics Store 4 FM tape recorder,
3. to a Devices 4520 ratemeter.
   This gives an output which is inversely proportional to the beat to beat interval, thereby giving an instant indication of heart rate changes. This output was also displayed on the polygraph.

An E.C.G. score for each section of film was obtained by counting the number of heartbeats over 180 seconds and converting this to rate per minute. This method was found to be more accurate than estimating the rate from the output of the ratemeter.

The Skin Conductance Level (S.C.L.)

Palmar sweat gland activity was measured using a skin conductance meter (Electronic Developments Ltd.). Two silver/silver chloride cup electrodes were used, one attached to the base of the thumb and the other at the base of the little finger. After amplification, the signal was displayed on the polygraph and recorded on tape. The polygraph record was calibrated by injecting signals of known size (1 or 10 microSiemens) and noting the meter readings at the points at which they were injected. An average conductance level could then be calculated for each section of film.

Respiratory Rate

The patient's respiratory rate was usually obtained from the sinus arrhythmia displayed in the E.C.G. rate records. This was found to be a reliable measure of respiration for almost all the experimental sessions. In the few instances where changes in E.C.G. rate were too small to give a reliable measure of respiration, a small thermistor was taped to the upper lip so that it was in the nasal air stream. The changes in air temperature during inhalation and exhalation caused corresponding changes in the resistance of

the thermistor. These changes were amplified using a Devices 3553 temperature amplifier, and displayed on the polygraph. Although this method is highly accurate, it was not used as a first choice because the patients found it very irritating to have the thermistor taped onto the face. Respiratory rate per minute was then calculated from the polygraph records for each section of film.

RESULTS

Clinical Assessments

The results of the clinical ratings were subjected to split plot analyses of variance. Full details of the method used are given in Appendix 1. The difference between initial and subsequent scores for each rating (difference scores) were calculated, and F ratios for groups were estimated against variance between subjects. F ratios for change over time, and interaction F ratios were estimated against residual variance. For significant F ratios a Newman-Keuls test (see Winer, 1970) was performed to determine significant differences between pairs of means. The F ratios for the clinical assessments are shown in Table 4.2 (page 84). The group totals and the results of the Newman-Keuls tests are shown in Table 4.3 (page 85).

Both the subliminal and supraliminal groups showed significantly greater improvement in phobic fears, avoidance and overall improvement than the control group (see Table 4.3, page 85 and Figures 4.1a, b and c, pages 86 to 88). There was little difference between the subliminal and supraliminal groups, except for the patients' ratings of depression, where the subliminal group showed a significantly greater improvement.

		Groups	Weeks	Interaction
Main phobia	Patient	4.10*	1.28	<1
Main phobia	Assessor	2.22	2.55*	<1
Secondary phobias	Patient	8.34**	<1	1.28
Secondary phobias	Assessor	2.60	<1	<1
Overall phobia	Patient	12.02**	1.05	1.37
Overall phobia	Assessor	2.37	3.29	1.58
Main avoidance	Patient	<1	<1	<1
Main avoidance	Assessor	2.43	<1	3.24**
Secondary avoidance	Patient	4.89*	2.56*	1.35
Secondary avoidance	Assessor	2.34	1.04	2.37*
Overall avoidance	Patient	3.04	1.27	1.02
Overall avoidance	Assessor	8.28**	<1	3.52**
Depression	Patient	6.86*	<1	<1
Depression	Assessor	<1	<1	1.81
Panic	Patient	1.59	2.11	3.38**
Panic	Assessor	<1	2.49*	1.56
Anxiety	Patient	<1	2.71*	<1
Anxiety	Assessor	<1	1.09	1.39
Overall improvement	Patient	6.16*	<1	1.31
Overall improvement	Assessor	<1	2.02	2.10*

* $p < 0.05$ ** $p < 0.01$

Table 4.2: F Ratios for the Clinical Ratings.

		Group Totals			
		Subliminal	Supraliminal	Control	Newman-Keuls Test
Main phobia	P	56.00	80.00	12.00	Sup>Cont*
Main phobia	A	32.00	45.00	- 9.00	
Secondary phobia	P	44.59	56.84	-14.92	Sub>Cont* Sup>Cont*
Secondary phobia	A	52.50	78.00	21.98	
Overall phobia	P	47.95	66.56	- 6.42	Sub>Cont** Sup>Cont**
Overall phobia	A	49.80	64.58	10.75	
Main avoidance	P	11.00	25.00	4.00	
Main avoidance	A	26.00	44.00	- 7.00	
Secondary avoidance	P	23.59	8.33	-37.90	Sub>Cont*
Secondary avoidance	A	27.00	63.00	- 6.91	
Overall avoidance	P	18.00	16.25	-22.42	
Overall avoidance	A	31.35	54.50	- 7.60	Sub>Cont* Sup>Cont**
Depression	P	36.00	-19.00	-41.00	Sub>Cont** Sub>Sup*
Depression	A	22.00	20.00	-17.00	
Panic	P	-23.00	30.00	-46.00	
Panic	A	16.00	51.00	0.00	
Anxiety	P	- 3.00	10.00	-26.00	
Anxiety	A	31.00	20.00	- 8.00	
Overall improvement	P	23.00	38.00	-14.00	Sub>Cont* Sup>Cont*
Overall improvement	A	34.00	33.00	14.00	

P = Patient A = Assessor * $p < 0.05$ ** $p < 0.01$

Table 4.3: Group Totals (difference scores) and Newman-Keuls Results for the Clinical Ratings. A Positive Score indicates an Improvement in Symptoms.

Patient Ratings

2
1
0
-1

2 3 4 5 6 12

Weeks

Assessor Ratings

3
2
1
0
-1

2 3 4 5 6 12

Weeks

——— Subliminal Group – – – – Supraliminal Group

.... Control Group

Figure 4.1a: Mean Difference Scores for Phobic Symptoms. A Positive Score Indicates an Improvement in Symptoms.

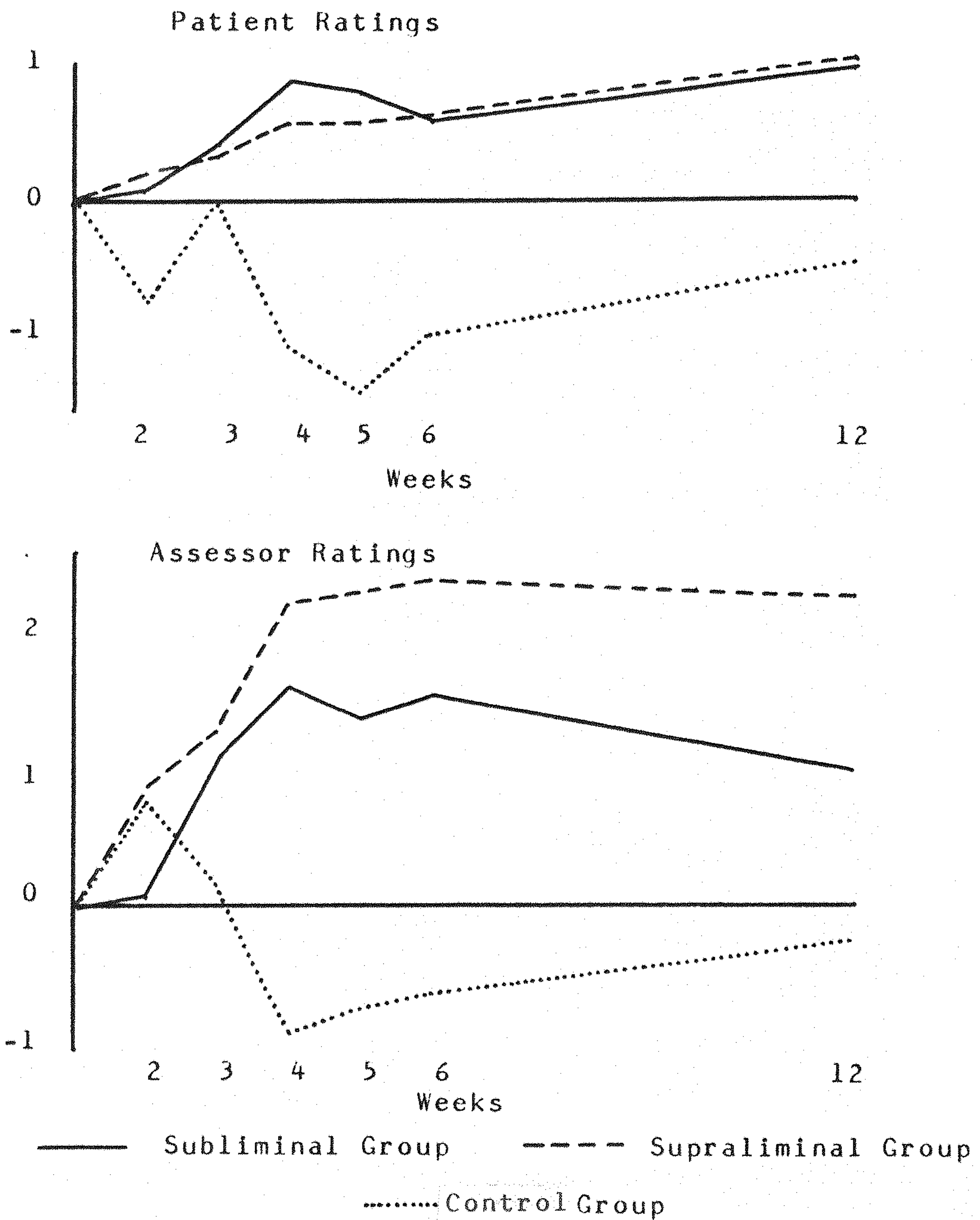


Figure 4.1b: Mean Difference Scores for Avoidance Symptoms.

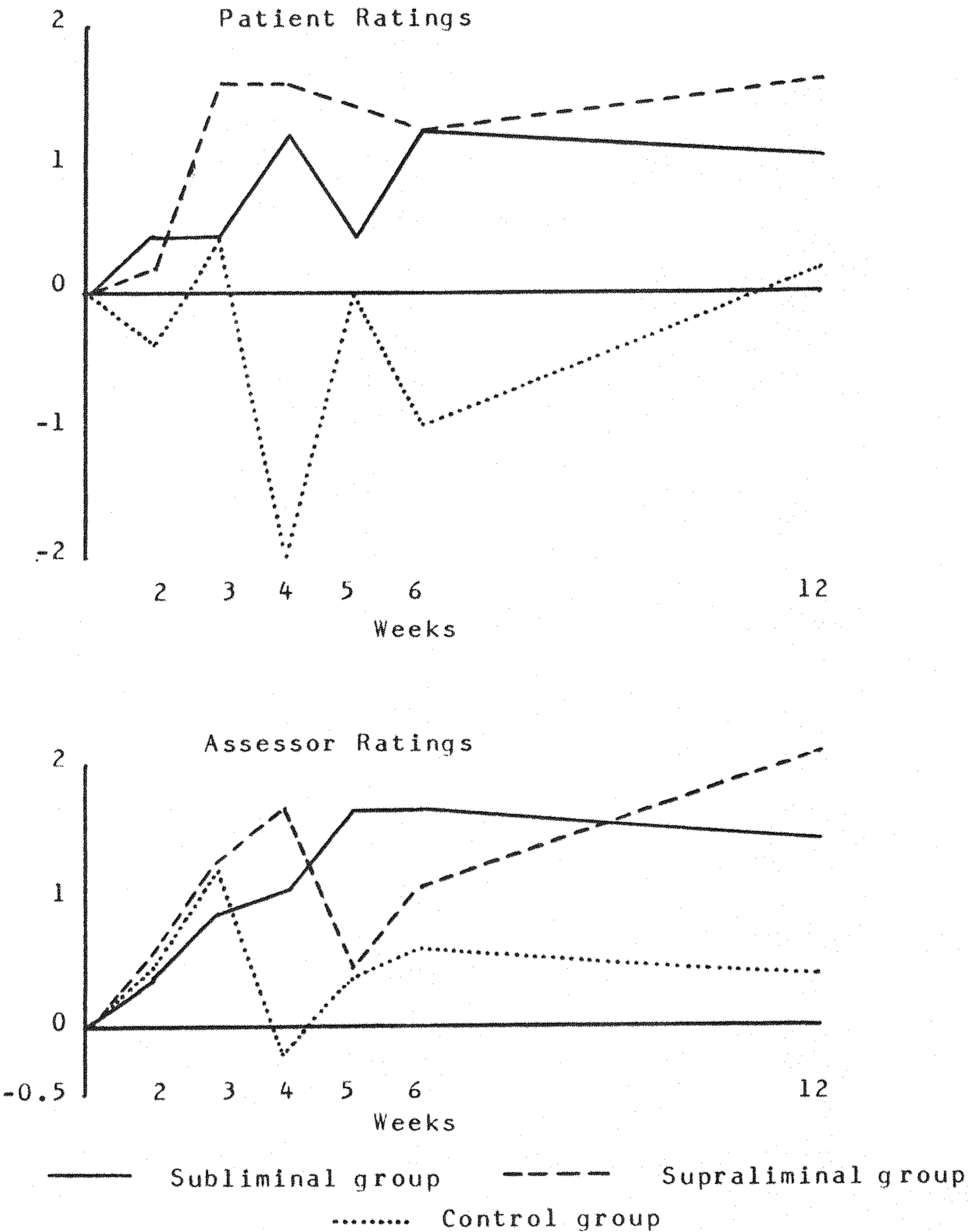


Figure 4.1c: Mean Difference Scores for Overall Improvement.

Analogue Scales and Physiological Measures

The scores for each of the ten dependent variables (7 analogue scales and 3 physiological measures) were analysed separately. In order to minimise the effects of any inequalities between the groups at the start of the study, all data analysis was performed using difference scores. These were obtained for any variable by substracting the raw score for each section of film from the baseline score for that variable. The baseline score for a variable was the mean of the five scores from the five sections of pottery film shown in the first session. Improvements in the form of reduced analogue scale and physiological scores appeared as positive difference scores. These scores were subjected to analysis of variance. Main effects were calculated for Groups (subliminal, supraliminal and control), Films (pottery and the other film that each individual was shown) and Weeks (1-6). Full details of the analysis used are given in Appendix 2.

A summary of the results of the analyses of variance can be seen in Table 4.4 (page 90). It should be noted that there were seventy (70) F ratios calculated, therefore one would expect four (4) of these to reach significance at the 5% level by chance. In all cases there were highly significant differences between the groups ($p < 0.01$ or less). The Group mean difference scores are shown in Table 4.5 (page 91). The analogue scales show a consistent pattern of results, with the control group scores all being close to zero, i.e. no improvement, the

	Groups	Films	Weeks	Interactions			
	G	F	W	G x F	G x W	F x W	G x F x W
Calm/excited	213.14***	1.86	23.65***	4.88*	14.65***	1.55	1.54
Relaxed/tense	43.60***	0.70	20.58***	8.67***	9.98***	1.09	2.17*
Sweating	89.69***	1.74	12.16***	3.01	6.14***	0.66	1.86
Shaking	47.38***	5.98*	15.14***	2.30	8.58***	0.48	2.00*
Difficulty breathing	138.06***	0.09	30.92***	1.69	15.32***	1.59	1.44
Muscular tension	184.82***	2.40	36.91***	3.38*	16.87***	0.88	1.12
Heart rate	123.50***	0.31	17.28***	2.52	6.74***	1.32	1.66
E.C.G.	7.39**	17.13***	37.35***	7.89***	15.31***	1.66	1.34
Respiration rate	21.20***	20.72***	11.62***	1.39	13.36***	3.05*	3.00**
S.C.L.	259.47***	26.82***	141.54***	6.07**	40.59***	1.09	1.42
Degrees of freedom	2,60	1,60	5,300	2,60	10,300	5,300	10,300

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Table 4.4: F Ratios for the Analogue Scale Scores

	Subliminal	Supraliminal	Control
Calm/excited	25.43	2.02	-2.86
Relaxed/tense	25.24	6.68	2.72
Sweating	15.50	3.07	0.91
Shaking	12.85	2.63	1.91
Difficulty breathing	22.95	3.83	2.05
Muscular tension	22.86	6.09	1.63
Heart rate	11.42	4.75	0.99
E.C.G.	0.25	0.47	1.16
Respiratory rate	-1.09	1.29	-0.87
S.C.L.	0.69	1.69	0.00

Table 4.5: The Subliminal, Supraliminal and Control Group Means (difference scores). A Positive Score indicates an improvement in Analogue Scale Ratings and a reduction in Physiological Measures.

supraliminal group showing a small improvement on all measures, and the subliminal group a much greater improvement on all the measures.

This pattern was not found with the physiological measures. The E.C.G. means show the largest reduction for the control group (1.16 beats per minute) with smaller reductions for the supraliminal group (0.47) and the subliminal group (0.25). The supraliminal group was the only one to show a reduction in respiratory rate during the study, with both the subliminal and the control groups showing increases in the rate. The skin conductance scores showed no difference between the control group mean level and the base level, whilst the subliminal group mean level was 0.69 mS below the base level and the supraliminal group was 1.69 mS below the base level.

The F ratios for Films, which measure the differences between the two films that each patient was shown, were not significant for any of the analogue scales except Shaking ($F = 5.98$, d.f. 1,60, $p < 0.05$). However, the three physiological measures all showed highly significant F ratios ($p < 0.001$) with levels of activity for the pottery film being lower than those for the phobic and control films.

The F ratios for Weeks were all highly significant ($p < 0.001$) for all measures. In the case of the analogue scales this reflected a steady improvement of scores over the six weeks, with the mean difference score for each measure being around zero at Week 1, and rising to between 8 and 20 at Week 6. The scores for the physiological measures did not show this steady rise, and there was no obvious trend in the scores from

week to week.

The Groups x Weeks interactions were highly significant in all cases ($p < 0.001$, Table 4.4, page 90 and Figure 4.2, page 94). Once again there is a clear pattern shown for the analogue scales, with the subliminal group showing marked improvements on all measures by the third week. These improvements were sustained to the end of the treatment. The supraliminal group showed an initial improvement followed by a return to near baseline scores on the third week. There was then a small improvement up to the sixth week, but in all cases this was smaller than that found in the subliminal group. The control group showed small fluctuations around the baseline level with no overall improvement.

The physiological measures did not show any clear patterns, (see Figure 4.3, page 95). The E.C.G. scores showed apparently random fluctuations over a small range (four beats per minute). Similar small fluctuations were apparent in the skin conductance level results. The supraliminal group differed from the other two groups on the respiratory rate measure in that they showed a slight reduction in respiratory rate from the base rate over the entire six week period, whereas the other groups showed small increases. Once again, however, the range of these differences was small.

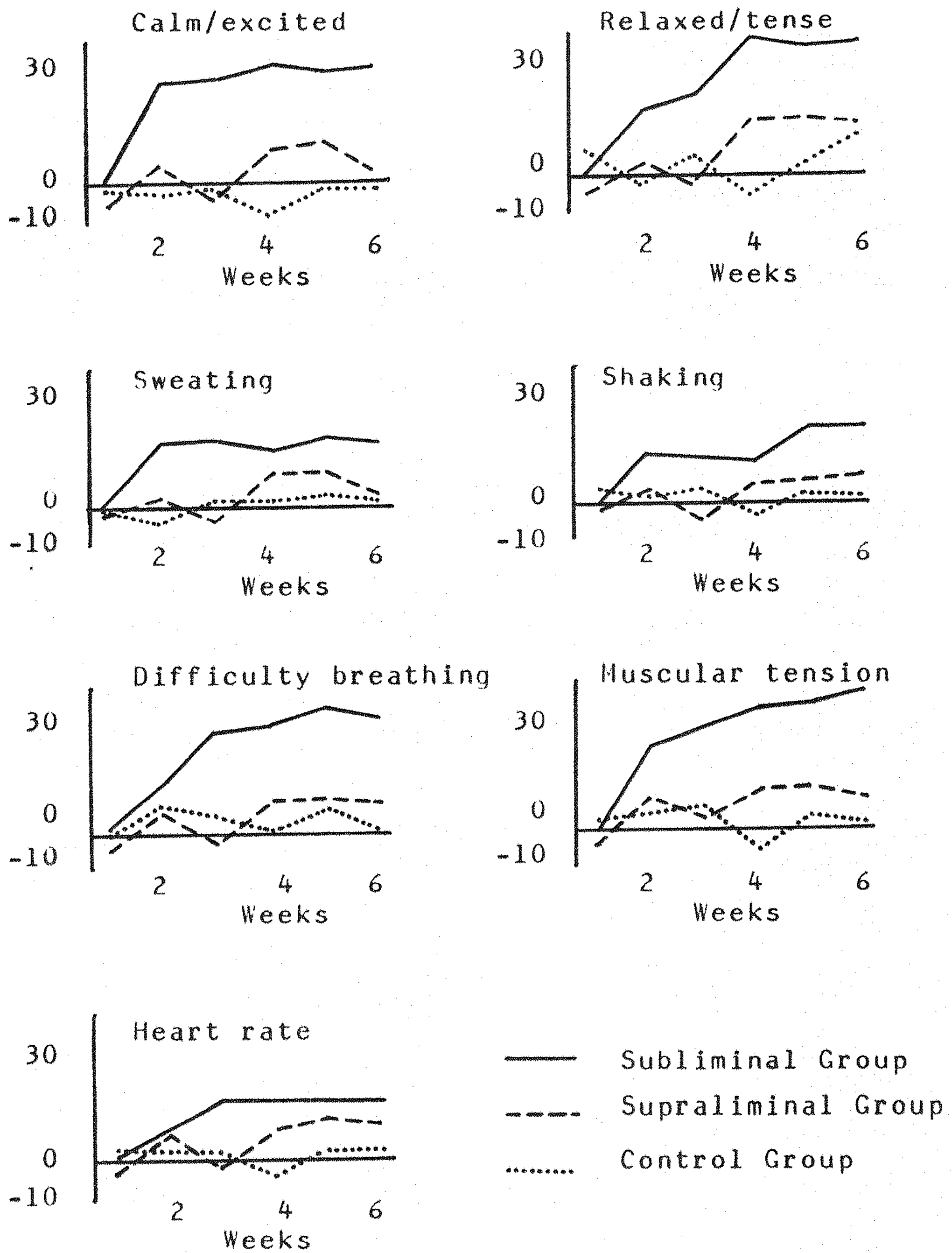
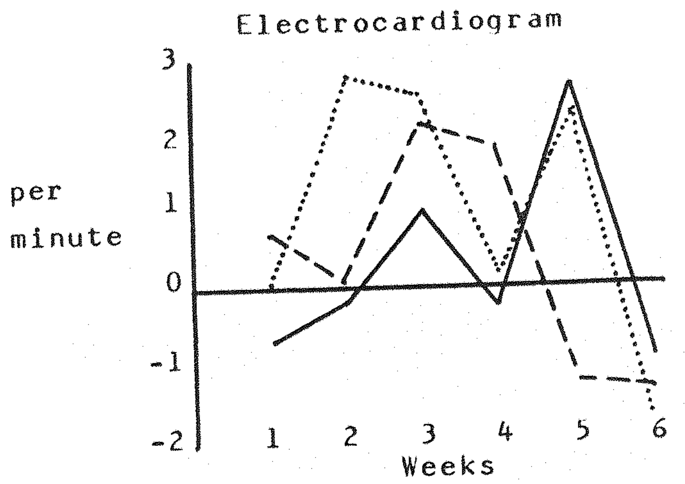
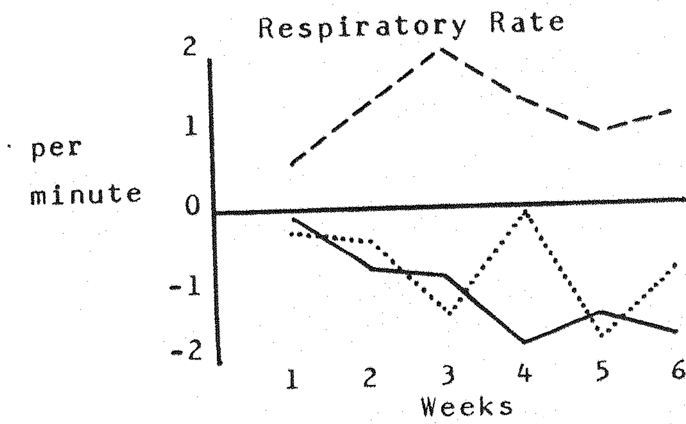
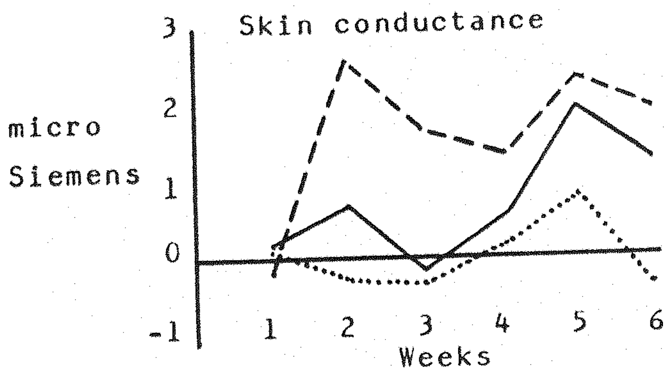


Figure 4.2: Mean Difference Scores for the Analogue Scales over the Treatment Period. The Units for the Analogue Scales are Millimetres. A Positive Score indicates an Improvement in Symptoms.







——— Subliminal Group ---- Supraliminal Group

.... Control Group

Figure 4.3: Mean Difference Scores for the Physiological Measures. A Positive Score indicates a Reduction in Level.

DISCUSSION

Considering the clinical assessments first, the results indicate that repeated exposure to agoraphobic stimuli in the form of cine film under both subliminal and supraliminal viewing conditions is effective in reducing phobic conditions. The frequent assessments might have led to some non-specific improvement, but such effects would also apply to the control group. The absence of a placebo response in the control group, who deteriorated slightly, emphasises the chronicity of the patients treated. The greater improvement in depression scores in the subliminal group suggests that subliminal exposure may be more suitable, at least initially, than supraliminal exposure for those patients who find phobic situations particularly distressing.

The patients in the subliminal group were at a loss to explain their improvement, and several concluded that the 'treatment' was a complex way of telling them that they had to solve their problems through their own efforts. When they did improve their self esteem was greatly enhanced as they believed that they had received very little external help.

The pattern of group differences shown in the analogue scale scores was not expected. Although there is no a priori reason to expect a high correlation between patients' feelings during treatment sessions and their responses to treatment, it was thought that they would show similar patterns of group differences. This was not the case. The large reductions in scores in the subliminal group indicate that they found

the treatment sessions much less stressful than the other two groups, who showed little change in analogue scale scores over the treatment period. This interpretation of subjective feelings about the treatment was supported by my experience of difficulties in getting patients to attend sessions. There were few problems with the patients in the subliminal group, more with the supraliminal group and the control group patients were the most difficult.

The results of the physiological measures showed that the films had different effects, with the pottery film producing lower scores than the other film on all three measures. Surprisingly, the analogue scales did not show the same changes, suggesting that either such scales are not sensitive to short term fluctuations in feelings, or that such fluctuations do not occur during repeated alternation of these relatively brief films.

As can be seen from Figure 4.2 (page 94) differences between the groups on the analogue scales were apparent by the second week of treatment, and they increased rapidly until the fourth week, after which there was little change. This was also true for the clinical assessments, and suggests that it might be possible to reduce the length of treatment without reducing its efficiency.

The results from the physiological measures differed from the analogue scale results in that no consistent group differences emerged, and there were no clear trends of improvement over the six week treatment period. Neither of the two active treatment groups showed any correspondence between

the physiological measures, the analogue scale scores and the patient and assessor ratings of phobia, avoidance and clinical improvement. This finding agrees with those of Mathews, Johnston, Shaw and Gelder (1974) who monitored heart rate and skin conductance levels in groups of patients receiving flooding, desensitization and non-specific therapy. They found no overall group differences for either measure, and no relationship between either measure and clinical improvement. They did note a steady reduction in heart rate during recording periods, but this was found in all three groups and was not related to the type of treatment received.

Other studies reporting physiological responses during treatment for phobias have found different patterns of results. Watson, Gaind and Marks (1971, 1972) treated specific phobics with prolonged exposure in vivo and in fantasy, and monitored heart rate and skin conductance levels before and after each treatment session. They found a steady habituation of physiological responses to imaginal phobic situations, and this paralleled the clinical improvement shown by the patients. Boulougouris and Marks (1969) continuously monitored heart rate and skin conductance levels during flooding sessions and found that fluctuations in these measures decreased as the patients' phobic fears were reduced. Boulougouris, Marks and Marset (1971) compared the efficacy of flooding and desensitization, and found that flooding was followed by a significant decrease in heart rate and skin conductance fluctuations, whereas desensitization did not produce any alteration in the physiological

responses.

It is clear from the above studies that at present no firm conclusions can be drawn concerning the presence or absence of significant physiological variations during treatment for phobias. It should be noted that the studies which demonstrated physiological changes did not contain control groups, whereas the Mathews study and the present study both had control groups included for comparison. Also recent studies of physiological responses (Cristoph, Luborsky, Kron and Fishman, 1978; Grey, Sartory and Rachman, 1979) have noted widely differing responses between individuals in the same situation. This may account for the differences in the results in the studies quoted above when one takes note of the relatively small numbers of subjects used in the studies.

The lack of correspondence between the patients' subjective feelings during treatment, as shown by the analogue scale scores, and the physiological measures is in keeping with the results from other studies. Tyrer and Lader (1976) recorded a number of physiological variables and a set of sixteen (16) analogue scales in thirty-two (32) subjects at rest and in anxiety inducing situations, and found consistently low correlation coefficients between the peripheral physiological measures and the mood ratings. Similarly, Morrow and Labrum (1978) found no significant relationship between psychological and physiological measures of anxiety. These findings taken together with the large individual variations noted above argue against the advisability of using physiological measures either as an indication of subjective reaction to treatment or as the basis for an

objective measure of the efficacy of treatment.

The results overall indicate that clinical improvement in the subliminal group was not due to non-specific factors, since the control group, who subjectively experienced the same treatment, did not show any improvement. This supports Mathews' view that agoraphobia is much less responsive than specific phobias to treatments based on non-specific factors (Mathews, 1978). Although the patient and assessor ratings of overall improvement were similar in the subliminal and the supraliminal groups, the marked differences between them on the analogue scale scores support the view that the film was truly subliminal, and that the subliminal presentation was much less stressful. Although one could not claim that this method of subliminal film presentation is superior to other treatments for phobias, it has been shown in this experiment to be a simple and effective treatment which could be of particular value in situations where the patient does not feel able to participate in other potentially traumatic procedures.

CHAPTER 5: EXPERIMENT 2. A PILOT STUDY USING FADED STIMULI

INTRODUCTION

In the previous chapter it was shown that the presentation of subliminal phobic films can be effective in reducing phobic behaviour. These reductions were obtained without the adverse reactions that are commonly found in patients undergoing exposure treatments. However, the group which saw supraliminal films showed a slightly better clinical response than the subliminal group. Therefore, it was hypothesized that a treatment method which combined the two types of presentation might give the benefits of both, i.e. a good clinical response with no adverse effects. A pilot study was carried out to test this hypothesis, using the same films as those used in the first experiment, but the stimulus presentation started off being fully subliminal, and it was made progressively more visible with each treatment session until it was finally fully supraliminal, i.e. the stimuli were faded in progressively.

This method of fading is commonly used in animal operant studies, and it has also been used in clinical settings on a number of occasions. Barlow and Agras (1973) used a fading technique with male homosexuals to try to increase their responses to heterosexual stimuli. They initially aroused the patients with homosexual stimuli and then faded in the heterosexual stimuli. Their results showed that the faded stimuli were effective in increasing heterosexual responsiveness, however, it was not clear whether this change was maintained after the end of the study.

Ost (1978 a, b) has used a fading technique in the treatment of phobic patients. In his first study, Ost used two patients with severe rat phobia as subjects. The primary aim was to create a state of calmness and positive sensations in the subject, and then gradually fade in phobic stimuli. This was done by the subject, using a projection system in which two slides were superimposed; one was a phobic scene with a number of rats, and the other was a pleasant scene eliciting positive responses. The subject operated a lever, which when moved to the left progressively dimmed the phobic slide and brightened the positive slide, and when moved to the right dimmed the positive slide and illuminated the phobic slide. When the lever was centred both slides were faintly visible. The hypothesis was that the stimulus control exerted by the phobic stimulus would decrease and finally be extinguished due to the antagonistic effects of observing and imagining positive scenes. Ten graded phobic slides were used, with the subject moving on to the next stimulus in the hierarchy after responses to each phobic slide were extinguished. It was also hypothesized that a technique in which the patient has control over the stimulus presentation would be effective in reducing anxiety reactions. The results showed that the method was effective in reducing phobic anxiety and avoidance, and these improvements were maintained over a six month follow-up.

In his second study of fading, Ost (1978 b) compared fading and systematic desensitization in the treatment of snake and spider phobias. A waiting list control group was also included in the study. The fading technique developed in his

earlier study was used. Patients were assessed on self-report, behavioural and physiological measures before and after treatment. Both of the active treatment groups showed marked improvements which were not shown by the control group. However, there were no significant differences between the results from the fading and the systematic desensitization groups. Ost concluded that the fading technique was successful for simple phobias, but speculated on its value for social phobics and agoraphobics, since he felt that patients treated using the fading technique might not show as much generalization as patients treated by other methods.

The pilot experiment reported in this chapter was designed to investigate whether fading could be successfully used in the treatment of agoraphobia.

METHOD

Two female agoraphobic patients served as subjects in this study.

Patient 1

The first patient was a 48 year old housewife who had been agoraphobic for 7 years. The phobic symptoms first appeared during an anaemic phase. She frequently experienced dizzy spells when out of doors, and subsequently developed an intense fear of fainting. She was completely housebound for two years and then she started to go out again, but only when accompanied. She remained in this state for four years, and during this time she constantly expected the phobic symptoms to disappear spontaneously, and therefore did not seek any treatment for the agoraphobia. However, she then suffered a heart attack and whilst recovering from this she became depressed, feeling that she would never improve and that life was slipping by. In addition, her children were ready to leave home and this would have severely restricted her mobility. Therefore, she decided to agree to treatment for her agoraphobia.

There was no family history of psychiatric problems, and the patient was generally lively and energetic. She was not interested in drug therapy, but readily agreed to take part in the present experiment.

Patient 2

The second patient was a 33 year old housewife who had been agoraphobic for 3 years. The symptoms started when she was 7 months pregnant and experienced a panic attack in a lift. She could not breathe and almost fainted. Following this she was not able to travel in lifts, and felt panicky whenever in enclosed spaces, including buses, trains, cars, shops and supermarkets. The patient was a rather shy and reserved character, somewhat submissive and sensitive to criticism. Her agoraphobic symptoms caused feelings of inadequacy, but apart from this she had no other problems.

Design

Each patient attended for treatment once a week for seven weeks. Treatment sessions were similar to those used in Experiment 1, with the same two films being shown alternatively five times in each session. Prior to each session the patient completed the same set of clinical ratings as used in Experiment 1, but since this was only a pilot study no independent clinical assessments were made. Heart rate, respiratory rate and skin conductance level were recorded during film presentations, and following each film the patient completed analogue scales estimating the degree of excitement and relaxation, sweating, shaking, difficulty breathing, muscular tension and heart rate. Within each session the phobic film was shown at a constant level, but during the first session the projection system was set so that the

phobic film was shown at a fully subliminal level. On each subsequent session the system was altered so that the phobic film became progressively more visible, until it was fully supraliminal in the last session.

RESULTS

The results of the study are shown in Figures 5.1a, 5.1b, 5.2 and 5.3 (pages 109 to 112). In Figures 5.1a and 5.1b, the results of the analogue scales are shown. The graphs show the average score for the five phobic films presented in each session. Patient 1 showed very little change on any of the scales, but it should be noted that her scores were very low in all cases. A definite improvement was apparent in four out of the seven variables in Patient 2, although after initial improvement her scores started to increase again as the phobic films became visible.

Figure 5.2 (page 111) shows the results of the physiological measures. As in the last study there was no clear change in the three variables during the course of treatment, although there were slight increases in respiratory rate and SCL as the phobic film became visible.

In Figure 5.3 (page 112) the results of the clinical ratings are shown. Patient 1 showed an improvement in mean phobia and mean avoidance ratings towards the end of the treatment, and an early reduction in anxiety ratings. The self-ratings of overall improvement showed a steady decline over the course of treatment. Patient 2 showed a similar pattern of improvement on all ratings. Informal follow-up of both patients was continued over a 12 month period, and both patients had completely recovered, with no signs of relapse.

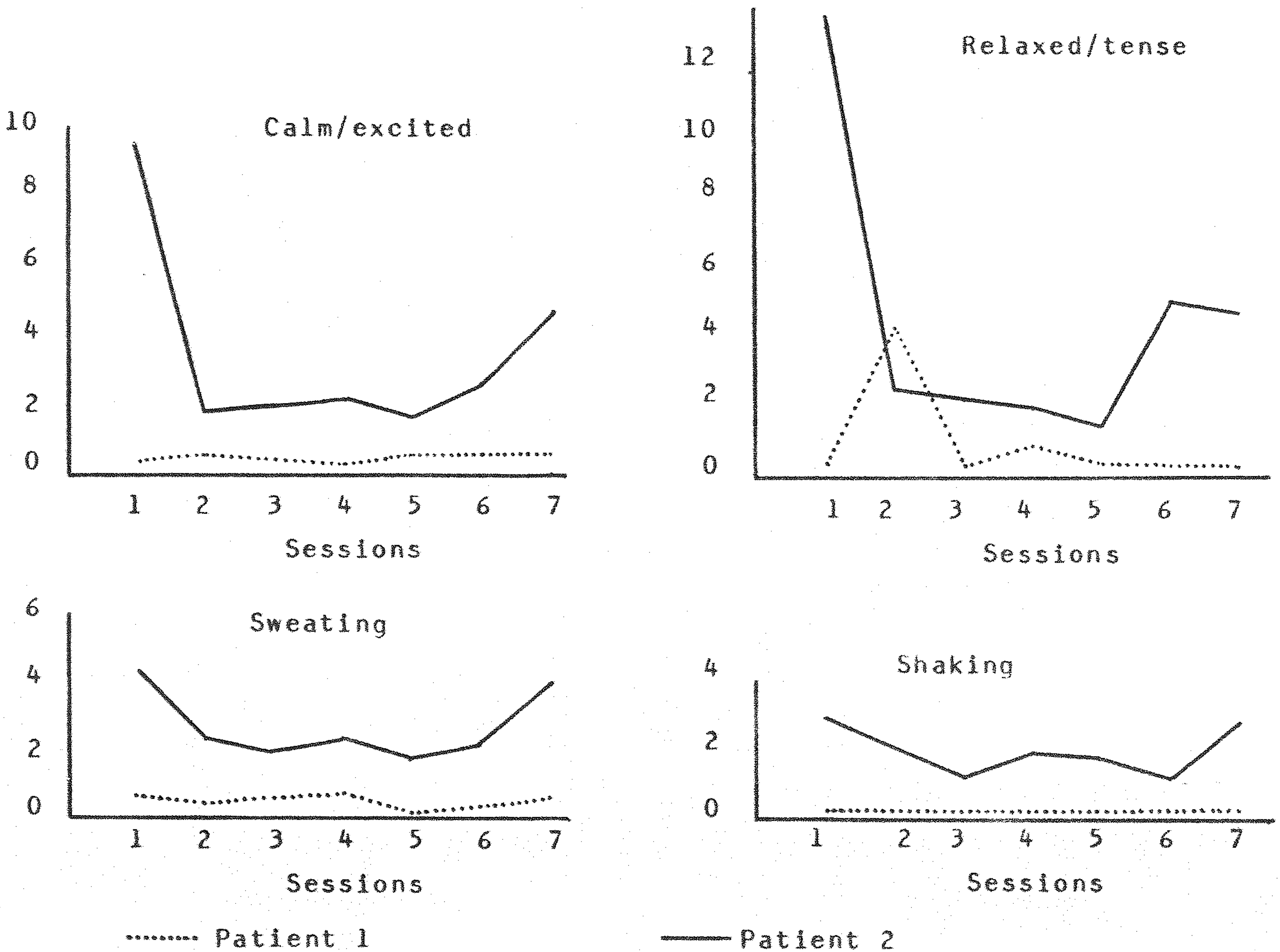


Figure 5.1a: Results of the Analogue Scale Measurements.

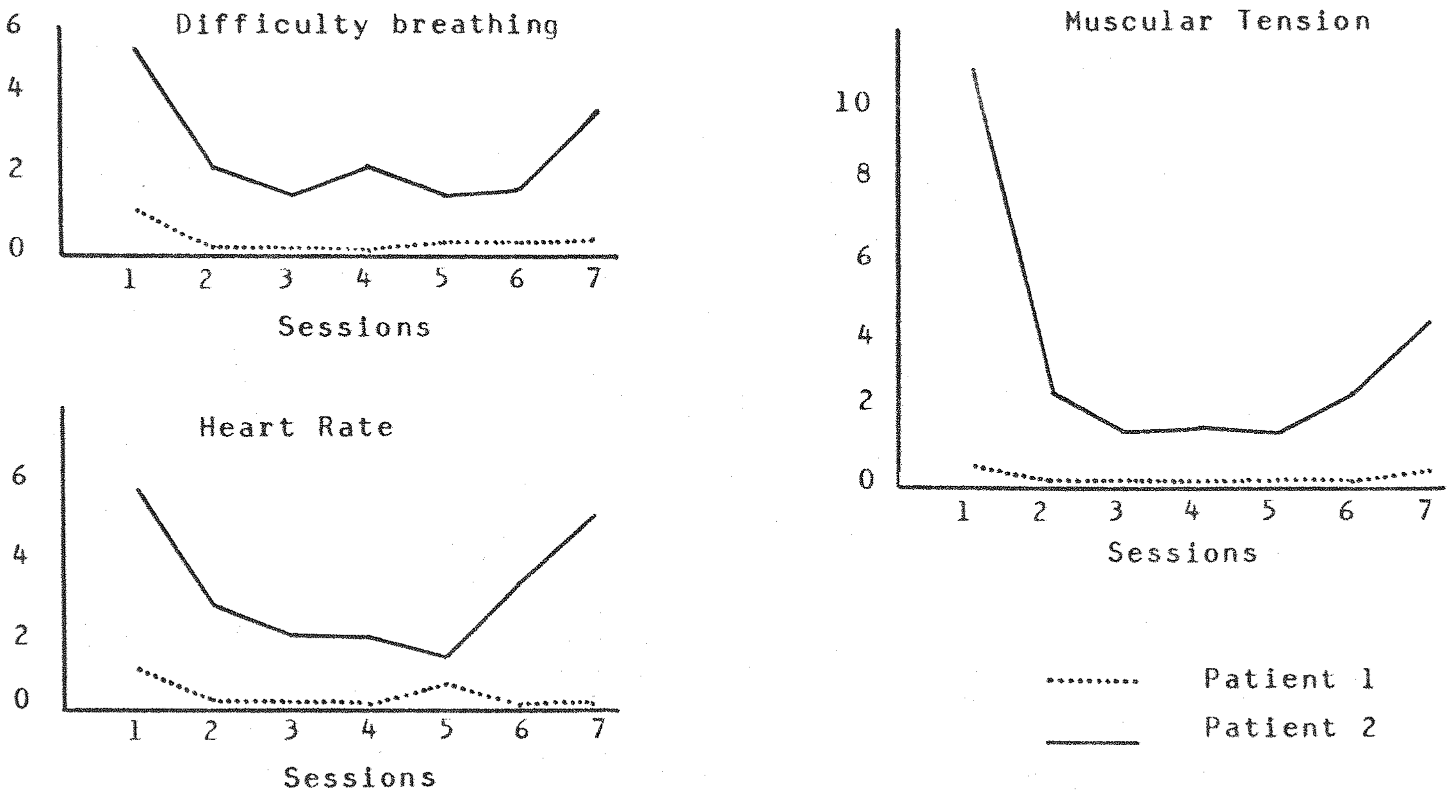


Figure 5.1b: Results of the Analogue Scale Measurements

E.C.G.

per minute

90
80
70
60

1 2 3 4 5 6 7

Sessions

Respiratory Rate

per minute

20
16
12
0

1 2 3 4 5 6 7

Sessions

S.C.L.

micro Siemens

2
1
0

1 2 3 4 5 6 7

Sessions

.... Patient 1 —— Patient 2

Figure 5.2: Results of the Physiological Measures

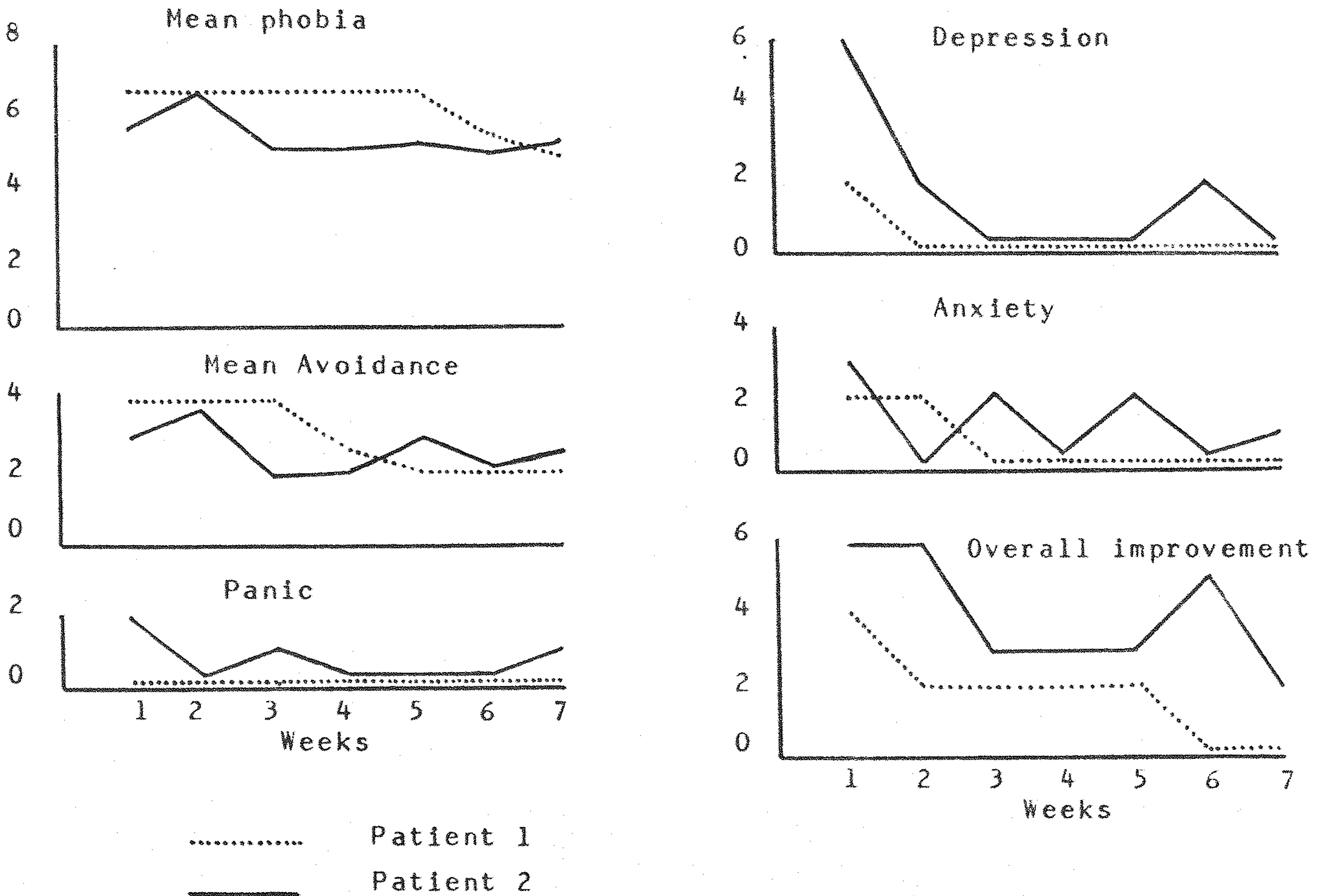


Figure 5.3: Results of the Clinical Assessments

DISCUSSION

The hypothesis proposed at the beginning of this chapter was that use of faded stimuli would combine the benefits of subliminal and supraliminal presentation. The results from the two patients support this hypothesis, as both showed good clinical improvements. It is not possible from this study to say whether better improvements would have been obtained using the same presentations as used in Experiment 1, but the results were good enough to justify a fully controlled comparison of subliminal, supraliminal and faded presentations. This study is reported in the next chapter.

CHAPTER 6: EXPERIMENT 3. A COMPARISON OF SUBLIMINAL, SUPRALIMINAL AND FADED FILMS IN THE TREATMENT OF AGORAPHOBIA.

INTRODUCTION

In the two previous chapters it has been shown that subliminal, supraliminal and faded films can be effective in the treatment of agoraphobia. However, there were only five subjects per group in the first experiment, and two subjects in the second experiment. Additionally, as noted earlier, studies in which subliminal effects have been found have often proved difficult to replicate. Therefore, a third experiment, reported in this chapter, was carried out to replicate and extend the previous experiments by providing a controlled comparison of subliminal, supraliminal and faded films using larger groups of subjects.

PATIENTS

Twenty-seven female and five male agoraphobic outpatients took part in this study. In order to qualify as subjects they had to meet the following criteria:

1. they had failed to respond to or had refused treatment by other methods
2. their phobic symptoms had been continuous for at least 6 months
3. they habitually avoided major phobic situations.

These criteria were less severe than those used in Experiment 1, and comparison of the demographic features of the subjects shown in Tables 4.1 (page 77) and 6.1 (page 116) shows

	Sub	Sup	F	C
Sex	7F:1M	7F:1M	7F:1M	6F:2M
Mean age (yr)	40.50	44.25	41.38	43.25
Mean duration of phobia (yr)	9.00	10.80	8.44	11.75
Initial mean phobic score (0-8)	5.54	5.58	5.63	5.58
Initial mean avoidance score (0-8)	6.46	5.50	5.42	6.29

Sub = Subliminal   F = Faded

Sup = Supraliminal   C = Control

Table 6.1: Demographic Features of the Subjects

that the patients in the present study were on average slightly older, had shorter mean duration of phobia and lower initial mean phobic scores, but slightly greater initial mean avoidance scores. Overall the group of subjects used in the present study were not as severely agoraphobic as those used in Experiment 1.

Patients who were assessed as suitable, and agreed to take part, were told that a new form of treatment for agoraphobia was being tested, and that they would be shown a series of films over a four week period. The three different types of film presentation were explained to the subjects, and the analogue scales and physiological measures to be recorded were described. Subjects were not told which group they had been assigned to. As in Experiment 1, those patients taking drugs at the start of the experiment were allowed to continue on the same dosage throughout the course of the treatment.

DESIGN

Each patient was randomly allocated to one of four groups (subliminal, supraliminal, faded or control) and attended treatment sessions twice a week for a total of seven sessions. There was then a three month follow-up.

The subliminal and supraliminal presentations were the same as those used in Experiment 1, and the faded presentation was the same as that used in Experiment 2. The control group also received faded presentations, but not of phobic films. Instead they were shown the pottery film, i.e. they were a control for the faded group. There

were no significant differences between the four groups in terms of demographic features (see Table 6.1, page 116).

The treatment sessions were slightly different to those used in the first two experiments. At the start of the first, third, fifth and seventh sessions the patient first completed the clinical assessment questionnaire, which included ratings of phobias, avoidance, depression, panic, anxiety and overall improvement (Watson et al., 1971). An independent assessor then interviewed the patient and then completed a similar set of ratings. The assessor was not aware of the treatment that the patient was receiving.

The projection and recording equipment was the same as that used in the previous experiments. The films used were based on those used in the earlier experiments, but were extended to run for eight minutes. The phobic film included several extra typically agoraphobic situations. The films were shown four times in each session and the patient completed the analogue scales immediately after each film. Physiological measures were again recorded during film presentation.

In summary, the patients in the subliminal group saw four subliminal phobic films in each session; those in the supraliminal group saw four supraliminal phobic films in each session; those in the faded group saw four phobic films in each session with exposure level varied over sessions, and those in the control group saw four pottery films in each session, with exposure level varied over sessions.

RESULTS

Clinical Assessments

The difference between the initial and subsequent scores for each clinical rating (difference score) was calculated, and these scores subjected to a two way analysis of variance with repeated measures. Full details of the method used are given in Appendix 3 . The results of these analyses are shown in Table 6.2 (page 120). In cases where significant F ratios were obtained between groups, Newman-Keuls tests were performed to determine significant differences between pairs of treatments. The treatment group totals and the Newman-Keuls test results are shown in Table 6.3 (page 121). The results of the overall phobia, overall avoidance and overall improvement ratings are shown in Figures 6.1a, b and c (pages 122 to 124).

There were only two variables in which there were significant differences between groups: overall phobia (assessor) and overall improvement (patients). In the first case the subjects in the faded group showed a significantly greater improvement in overall phobia than the subjects in the supraliminal group ($p < 0.05$). All other group comparisons were non-significant. In the second case the faded group showed a significantly greater overall improvement than the control group ($p < 0.05$).

On most of the clinical assessments there was a marked improvement over sessions, as would be expected. However, the lack of any significant group x session interactions indicates that these improvements occurred in all groups.

		Groups (A)	Sessions (B)	AxB
Overall phobia	P	<1	7.39***	<1
Overall phobia	A	3.19*	6.02***	<1
Main phobia	P	<1	5.32***	<1
Main phobia	A	2.60	4.70***	<1
Secondary phobias	P	<1	6.15***	<1
Secondary phobias	A	1.42	5.08***	<1
Overall avoidance	P	<1	7.90***	<1
Overall avoidance	A	1.76	7.04***	<1
Main avoidance	P	<1	4.84***	<1
Main avoidance	A	2.35	6.40***	<1
Secondary avoidance	P	<1	6.61***	<1
Secondary avoidance	A	1.15	4.48***	<1
Depression	P	<1	<1	1.22
Depression	A	<1	<1	<1
Panic	P	<1	1.34	<1
Panic	A	<1	3.17**	<1
Anxiety	P	1.01	3.59**	1.04
Anxiety	A	<1	<1	<1
Overall improvement	P	2.45*	5.79***	<1
Overall improvement	A	1.97	9.12***	1.32

P = patient ratings   * $p < 0.05$
A = assessor ratings   ** $p < 0.01$
*** $p < 0.001$

Table 6.2: Results of the Analyses of Variance for the Clinical Assessments (F Ratios).

		Sub	Sup	F	C	
Overall phobia	P	230	251	306	206	
Overall phobia	A	273	151	418	253	*
Main phobia	P	102	78	145	95	
Main phobia	A	88	36	156	73	
Secondary phobia	P	128	172	159	111	
Secondary phobia	A	202	120	255	164	
Overall avoidance	P	209	108	234	134	
Overall avoidance	A	210	107	329	246	
Main avoidance	P	71	69	127	68	
Main avoidance	A	56	32	133	103	
Secondary avoidance	P	130	42	107	68	
Secondary avoidance	A	153	79	196	151	
Depression	P	16	18	-24	-15	
Depression	A	-14	12	-18	-12	
Panic	P	2	8	19	45	
Panic	A	34	-23	13	8	
Anxiety	P	33	60	-13	33	
Anxiety	A	- 7	- 2	14	-11	
Overall improvement	P	106	91	123	69	+
Overall improvement	A	66	41	67	33	

P = patient   * Faded > Supraliminal ($p < 0.05$)
A = assessor   + Faded > Control ($p < 0.05$)

Sub = subliminal Sup = Supraliminal C = Control
F = Faded

Table 6.3: Group Totals (difference scores) and Newman-Keuls Test Results for the Clinical Assessments.

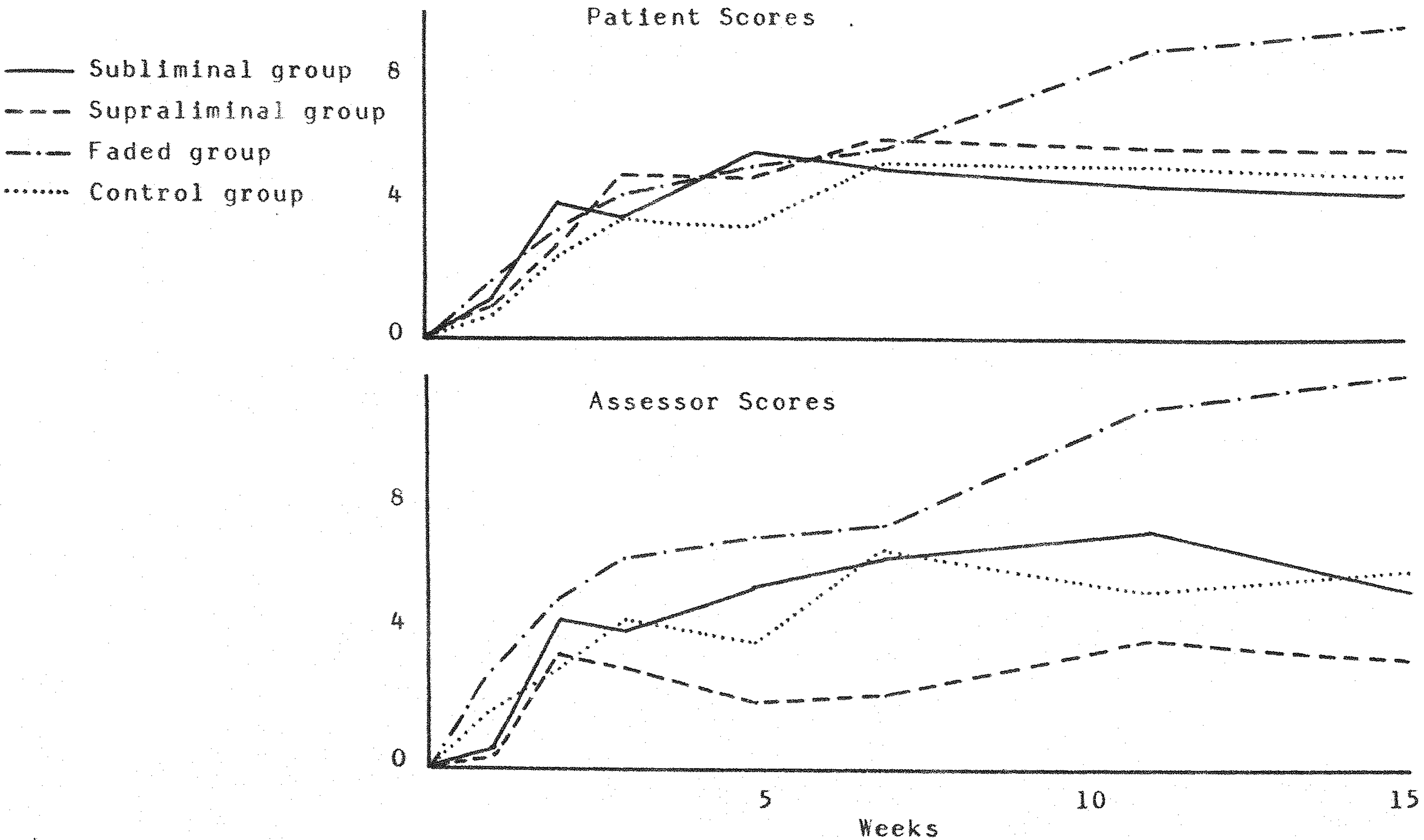
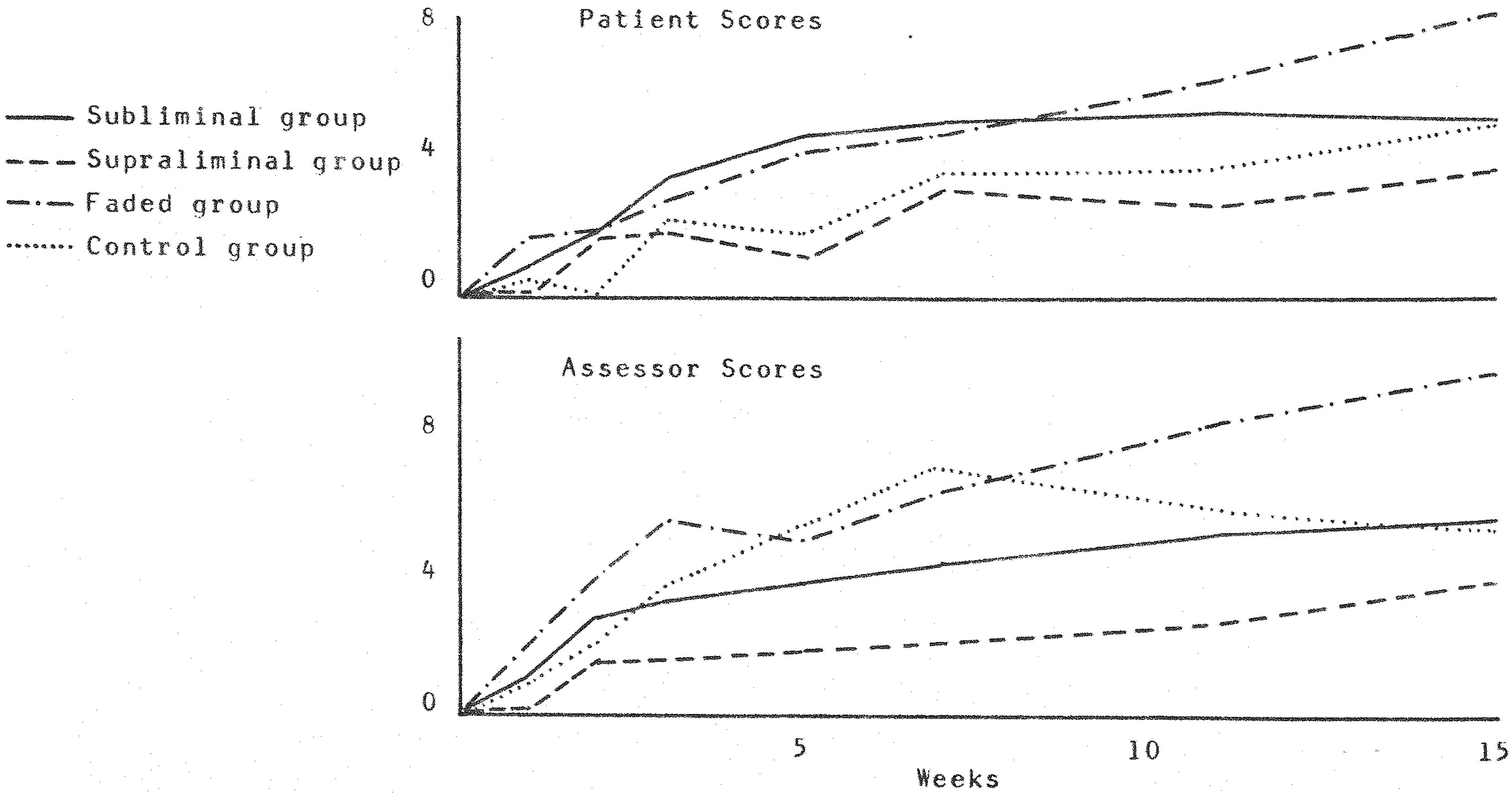


Figure 6.1a: Mean Difference Scores for Overall Phobia. A Positive Score Indicates an Improvement in Symptoms.



<u>Figure 6.1b:</u> Mean Difference Scores for Overall Avoidance.

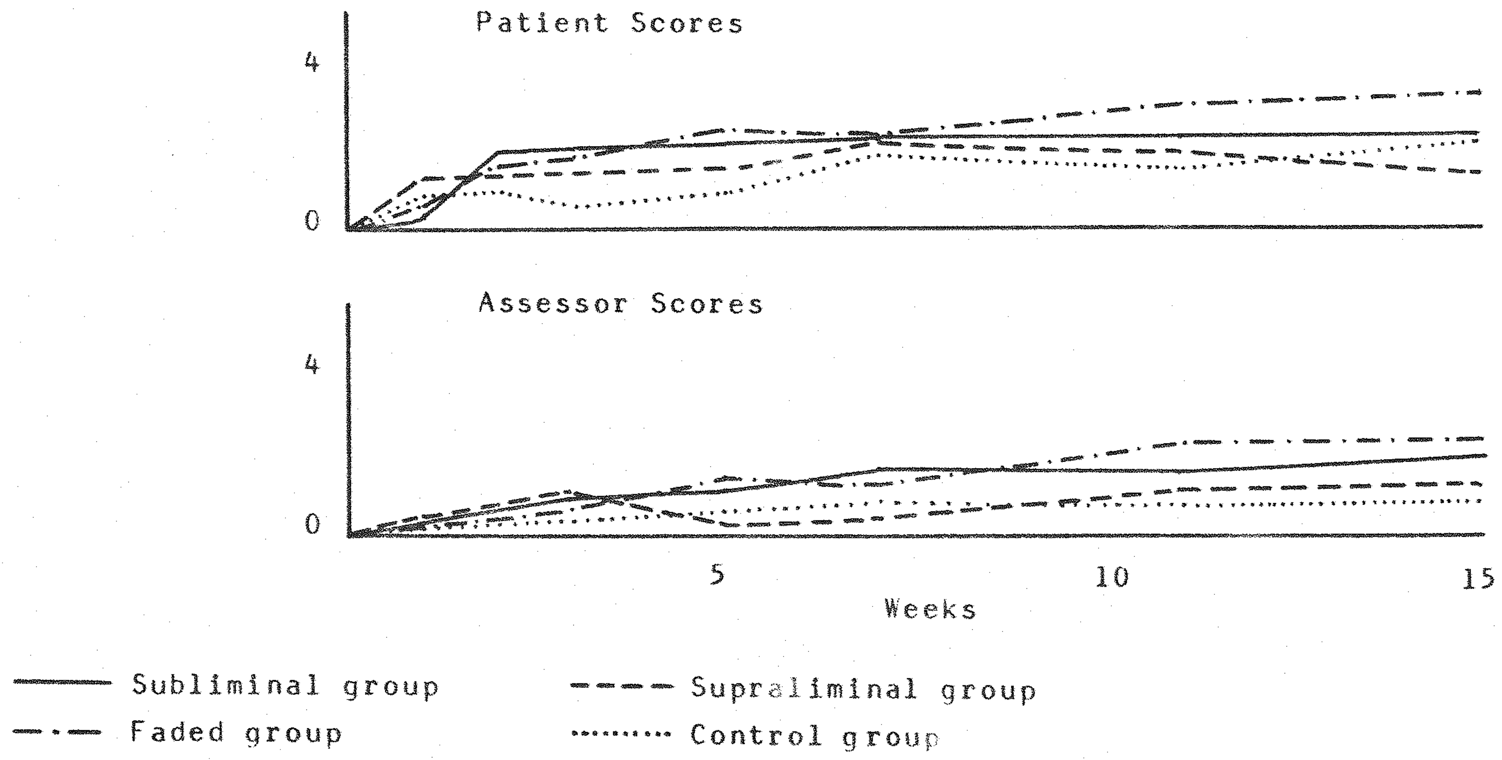


Figure 6.1c: Mean Difference Scores for Overall Improvement.

Figures 6.1a, b and c show that the results of the clinical assessments differ from those in Experiment 1, in that:

1. the results from the subliminal and supraliminal groups were similar, but the subliminal group showed a better overall improvement, whereas in Experiment 1 the supraliminal group showed better improvements
2. the control group in the present study showed marked improvements on most of the ratings. This was not the case in Experiment 1.

Analogue Scales and Physiological Measures

Difference scores were calculated for these variables in the same way as in Experiment 1. The difference scores were analysed using a two way analysis of variance, which is described in detail in Appendix 4 . The results of these analyses are shown in Table 6.4 (page 126). In cases where significant group F ratios were obtained, the differences were analysed using Newman-Keuls tests. The group totals and the results of the Newman-Keuls tests are shown in Table 6.5 (page 127).

In Figures 6.2a, b and c (pages 128 to 130) the variation in analogue scale scores over the treatment sessions is shown. Figure 6.3 (page 131) shows the results of the physiological measures.

From Table 6.4 it can be seen that there were only three variables which produced significant group differences: Relaxed/tense, where the

	Groups (A)	Sessions (B)	AxB
Calm/excited	2.20	26.12***	6.62***
Relaxed/tense	6.32**	23.81***	9.50***
Sweating	< 1	3.75**	5.32***
Shaking	4.15*	9.36***	4.75***
Difficulty breathing	1.87	9.64***	4.37***
Muscular tension	3.61*	26.92***	7.51***
Heart rate	2.38	16.11***	4.81***
E.C.G.	< 1	17.05***	19.74***
Respiratory rate	1.04	3.40**	8.17***
S.C.L.	< 1	27.38***	22.39***

* $p < 0.05$
** $p < 0.01$
*** $p < 0.001$

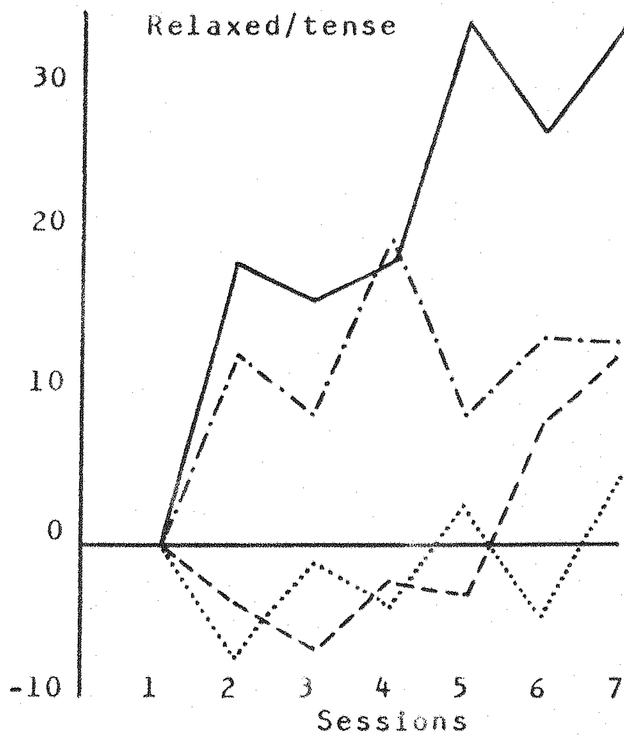
Table 6.4: Results of The Analyses of Variance for the Analogue Scales and the Physiological Measures (F Ratios).

	Sub	Sup	F	C	
Calm/excited	2225	4401	1144	155	
Relaxed/tense	4729	98	2368	-365	Sub > C** Sub > sup**
Sweating	1029	801	196	-377	
Shaking	1357	1761	-277	-671	Sup > C*
Difficulty breathing	1012	2303	491	306	
Muscular tension	3486	2083	331	-339	Sub > C** Sub > F** Sup > C*
Heart rate	3558	1238	164	512	
E.C.G.	- 44	-581	-318	149	
Respiratory rate	62	-197	- 96	-104	
S.C.L.	111.30	72.02	- 23.47	28.80	

* $p < 0.05$ ** $p < 0.01$

Sub = subliminal Sup = supraliminal C = Control F = faded

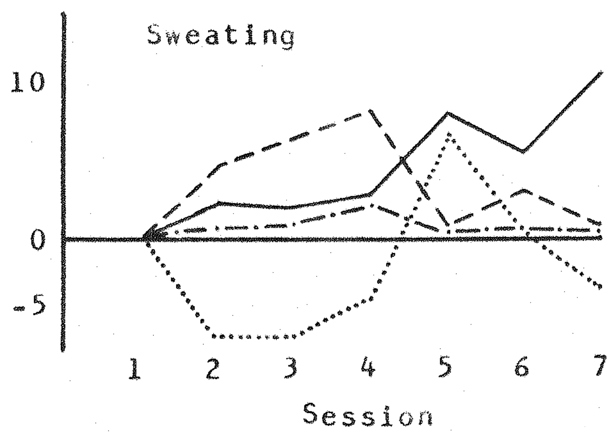
Table 6.5: Group Totals (difference scores) and Newman-Keuls Test Results for the Analogue Scales and Physiological Measures.

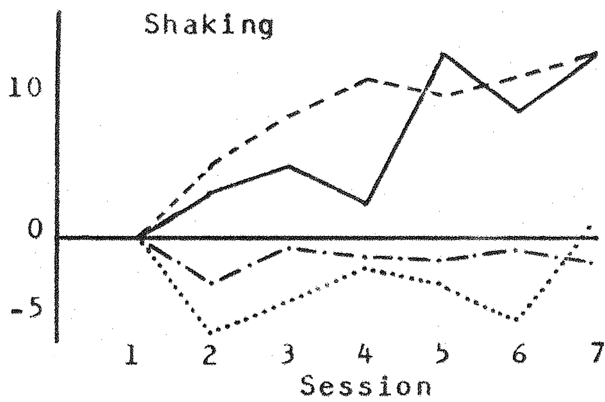


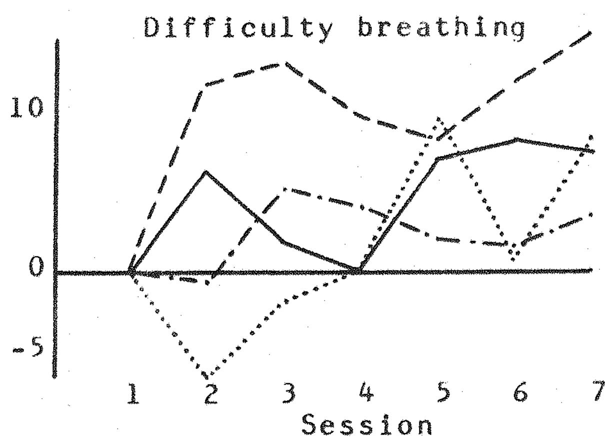
——— Subliminal Group   - - - Supraliminal Group

—·— Faded Group   ······· Control Group

<u>Figure 6.2a:</u> Mean Difference Scores for the Analogue Scales. A Positive Score indicates a Reduction in Symptoms.



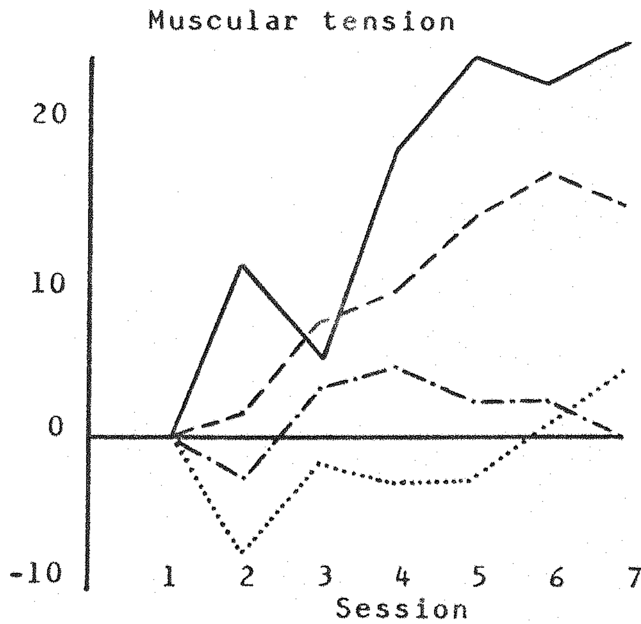


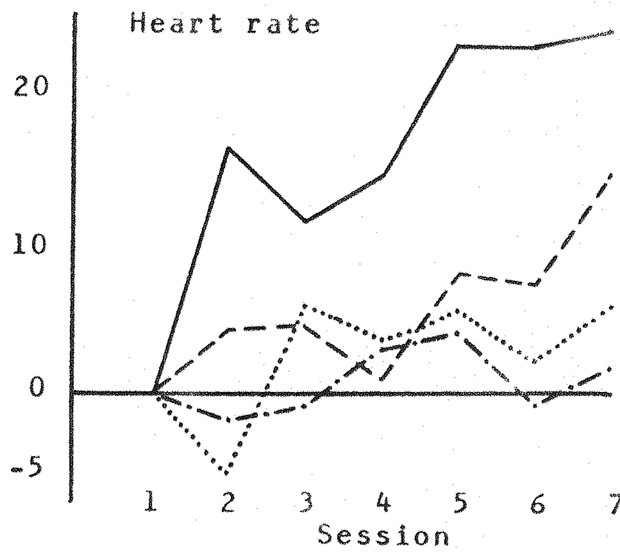


Subliminal Group — Supraliminal Group

Faded Group — Control Group

Figure 6.2b: Mean Difference Scores for the Analogue Scales.





——— Subliminal Group ---- Supraliminal Group
—·— Faded Group ·········· Control Group

<u>Figure 6.2c</u>: Mean Difference Scores for the Analogue Scales.

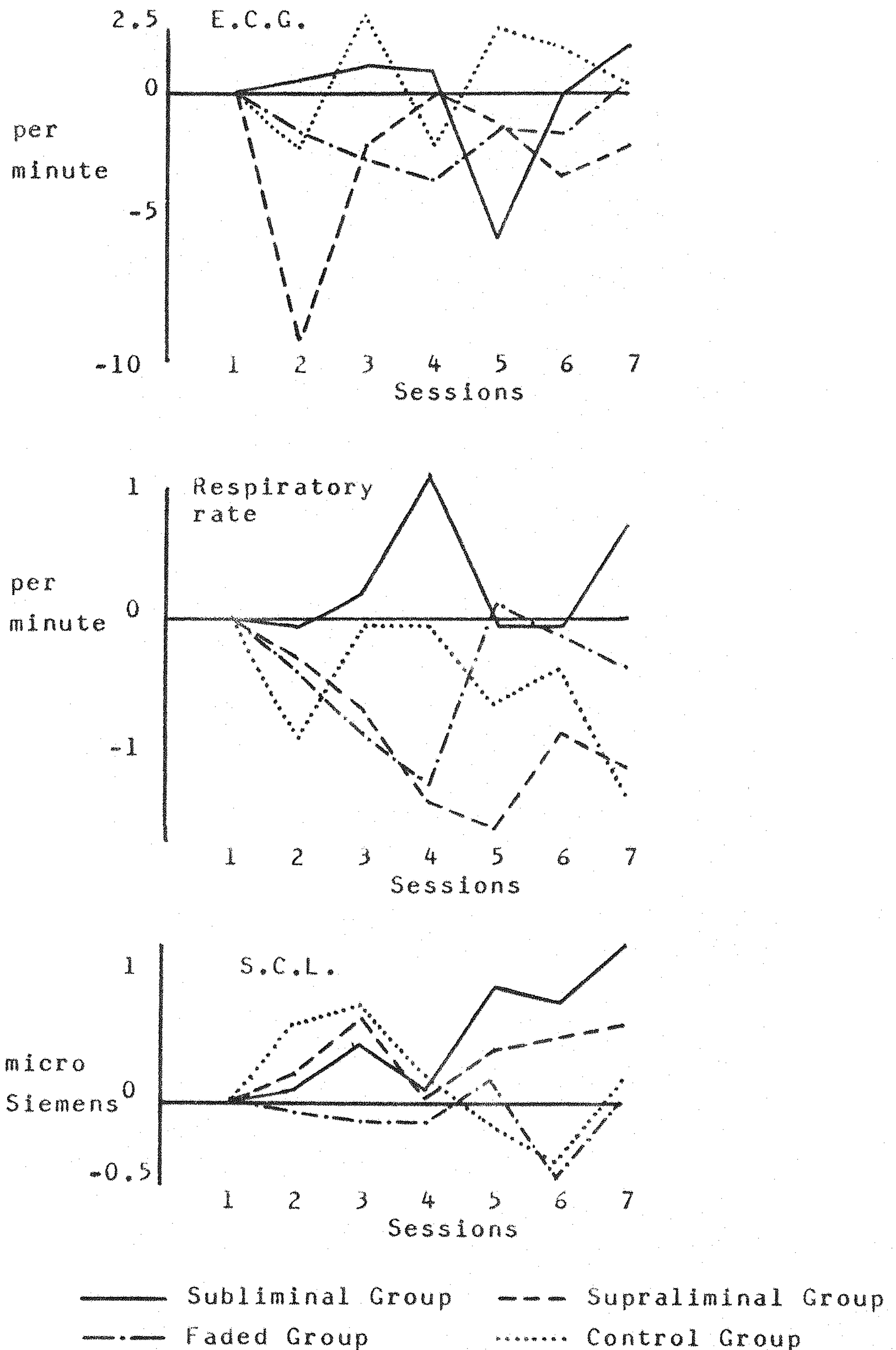


Figure 6.3: Mean Difference Scores for the Physiological Measures. A Positive Score indicates a Reduction in Level.

subliminal group showed significantly greater improvement than the supraliminal group ($p < 0.01$) and the control group ($p < 0.01$); shaking, where the supraliminal group showed significantly greater improvement than the control group ($p < 0.05$); and muscular tension, where the subliminal group showed significantly greater improvement than the control and faded groups ($p < 0.01$), and the supraliminal group showed significantly greater improvement than the control group ($p < 0.05$).

In all cases the F ratios for sessions, and for the interactions between groups and sessions, were highly significant. Figures 6.2a, b, c and 6.3 (pages 128 to 131) show these differences more clearly.

Unlike the results from Experiment 1, where there was a clear and consistent pattern on all variables, the present results show some variation in the response of the four groups on different variables. The subliminal group showed marked improvement on the Relaxed/tense, muscular tension and heart rate variables, but smaller improvements on the remaining four variables. The supraliminal group showed a marked improvement on the calm/excited variable and small improvements on all other variables. The faded and control groups showed little improvement on any of the variables.

As in Experiment 1, there was no consistent pattern in the results from the physiological measures, with all three variables showing only minor variations over the treatment period.

RESULTS OF THE FOLLOW-UP

In addition to the clinical ratings that were made during the three month follow-up period, each patient was asked to keep a diary recording their behaviour. This diary covered avoidances, attempts without success, and successful completion of previously phobic activities.

Unfortunately, patient compliance in completing the diaries was poor, and therefore no numerical analysis has been carried out on the results obtained. However the results are shown in Table 6.6 (page 134) and Figures 6.4, 6.5 and 6.6 (pages 135 to 137). They show that the success rate was highest in the subliminal and faded groups, and was very low in the control group at the end of the folow-up period. Number of attempts was variable, with the faded group showing the lowest total. This may have been a result of their high success rate. The avoidance rate in all groups declined to very low levels at the end of the follow-up period. This may have been because the patients were less phobic, or because the patients had become disillusioned with the treatment and had given up completing their diaries.

	Weeks											
	1	2	3	4	5	6	7	8	9	10	11	12
Successes												
Sub	3.25	5.25	3.50	1.75	5.50	4.75	4.50	6.33	9.67	7.67	9.00	5.67
Sup	3.00	2.60	2.20	2.00	2.80	3.40	3.20	5.00	4.20	3.40	4.40	4.60
F	5.33	6.17	7.17	6.67	7.17	8.17	5.00	6.67	8.67	11.17	7.17	7.00
C	3.20	4.20	5.20	5.80	5.40	7.40	6.00	4.50	3.00	2.00	0.50	1.00
Attempts												
Sub	9.50	3.00	5.50	7.00	2.50	3.50	4.50	3.00	5.50	6.00	7.00	3.50
Sup	9.83	5.83	7.50	6.67	8.25	9.00	8.75	5.33	10.00	5.67	7.67	7.00
F	5.29	4.86	3.29	2.71	1.86	1.71	2.71	1.57	1.86	2.00	2.00	2.29
C	7.33	5.83	6.17	4.67	7.50	4.50	3.80	5.00	3.33	3.33	2.50	5.00
Avoidances												
Sub	3.50	5.25	4.25	7.00	7.00	4.00	3.25	3.50	2.50	2.75	1.00	2.75
Sup	7.75	11.50	4.33	12.00	6.67	1.67	2.33	1.00	1.50	1.00	0.00	0.00
F	3.67	1.67	1.67	1.67	2.67	1.00	0.67	0.33	1.33	0.00	0.67	0.33
C	1.50	1.50	2.50	2.50	1.25	0.75	2.67	2.67	2.00	2.50	2.50	1.50

Sub = subliminal Sup = supraliminal F = faded C = control

Table 6.6: Diary Records during the Follow-up Period.

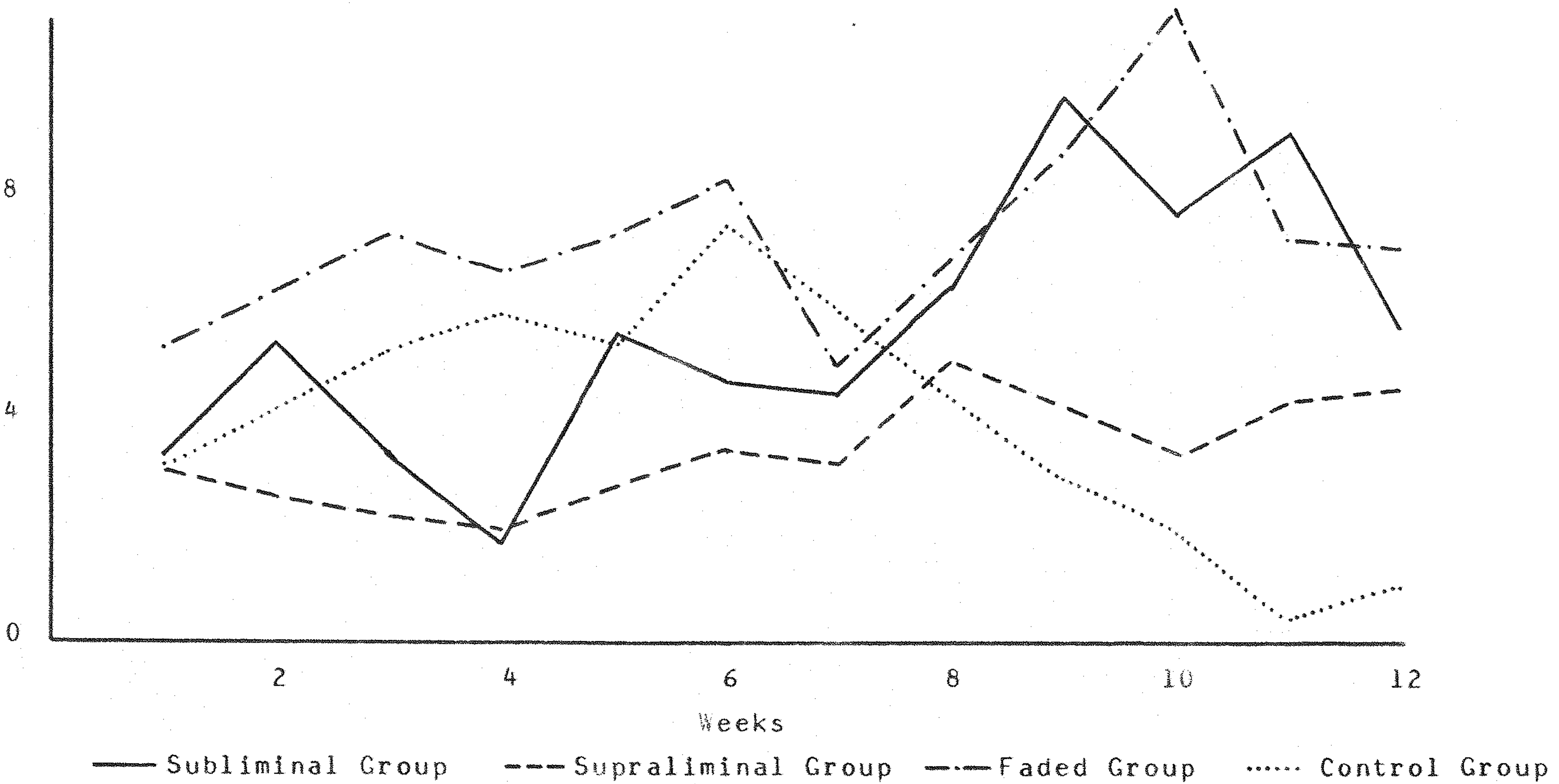


Figure 6.4: Mean Success Rate during Follow-up

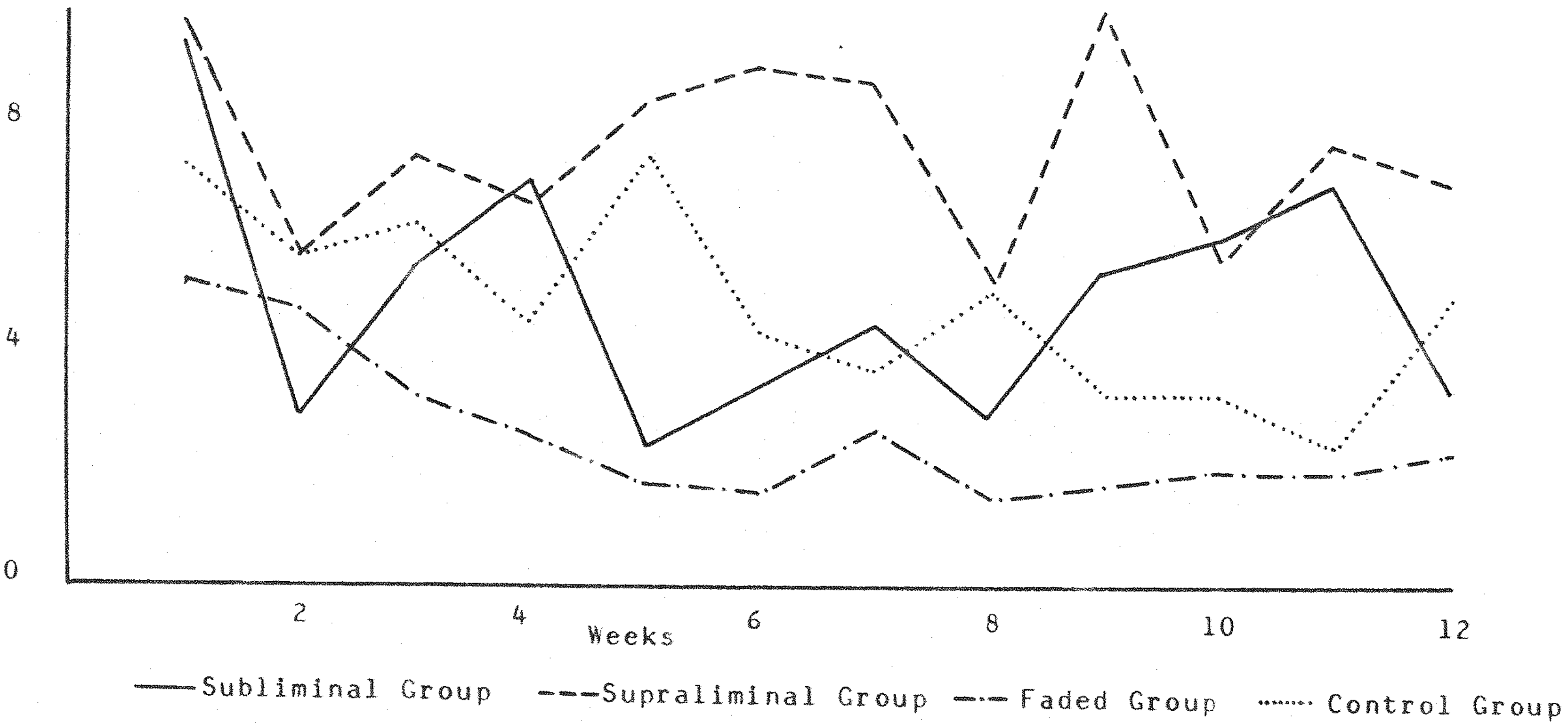


Figure 6.5: Mean Attempt Rate during Follow-up.

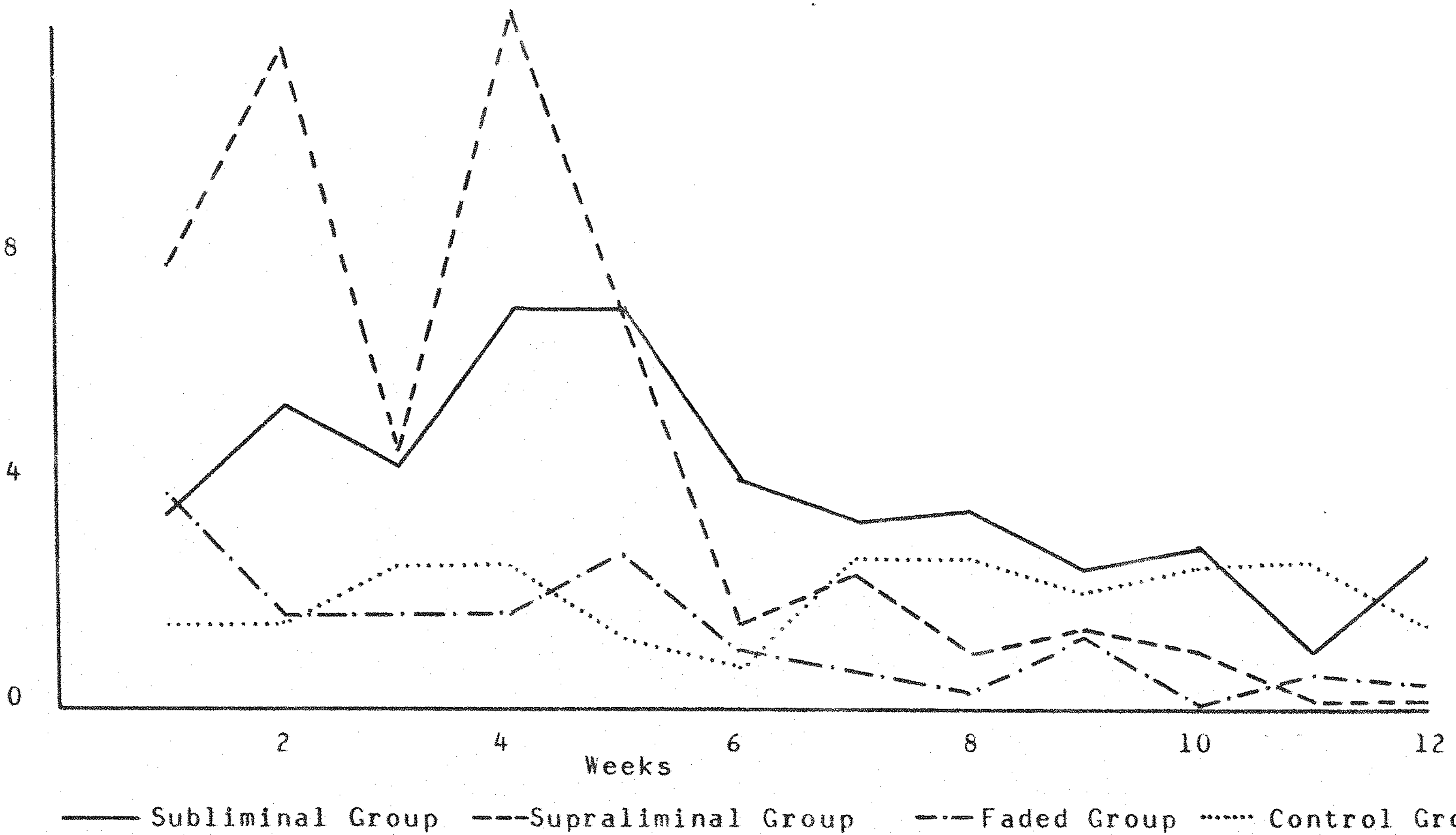


Figure 6.6: Mean Avoidance Rate during Follow-up.

DISCUSSION

The purpose of this experiment was twofold: the first was to try to replicate the results of Experiment 1, namely that subliminal and supraliminal films are effective in reducing agoraphobic symptoms; and the second was to examine the efficacy of fading as a therapeutic method, and compare it with subliminal and supraliminal methods.

This experiment was not an exact replication of Experiment 1, in that the films used were different, as was the procedure used in each session. In addition, the patients used in this study were not as severely agoraphobic as those used in Experiment 1.

The results of the clinical assessments were similar to those obtained in Experiment 1, with both subliminal and supraliminal presentations producing marked improvements in patient behaviour, with these improvements being maintained throughout the follow-up assessments.

The results from the physiological measures were also similar to those obtained in Experiment 1, with no clear patterns emerging on any of the three measures, and very little variation occurring over the treatment period. The analogue scale results were somewhat different to those obtained in the earlier study, where the subliminal group showed rapid and sustained improvements on all measures and the supraliminal group showed little improvement. In the present experiment the subliminal group made rapid improvements on three measures, and small improvements on the remaining four measures. However, the supraliminal group also showed large improvements on a number of measures, which was not

the case in the first experiment. This would indicate that the supraliminal group in the present experiment did not find the procedure as disturbing as did the supraliminal group in the first experiment.

Overall the results from this experiment support the earlier findings that both subliminal and supraliminal presentation of phobic films can be effective in reducing agoraphobic behaviour, and that the two methods are similar in terms of their efficacy. However, the finding that the patients in the subliminal group found the treatment much less traumatic than those in the supraliminal group was not replicated. The present results indicate that both groups did not find their treatment to be traumatic or aversive.

If we now consider the second aspect of this experiment, namely to investigate the efficacy of a faded procedure for the treatment of agoraphobia, the results indicate that this method is most effective. On almost all of the clinical measures, the faded group showed the largest improvements. This was the case for both the patient and the independent assessor ratings, and it confirms the hypothesis that the faded procedure combines the benefits of the subliminal and supraliminal methods. On the analogue scales the faded group showed relatively little improvement on any of the measures, but none complained about the treatment method, and there were no more problems with the patients in the faded groups than with those in the other three groups. The follow-up records indicate that the faded group had a high rate of success with previously phobic activities, with very little avoidance and failed attempts.

A noticeable feature of this experiment was the improvements shown in the control group patients. This was evident in the clinical ratings, the analogue scales and the follow-up records. This was not expected, since the control group in the first experiment showed no improvements, and it is normally the case with agoraphobic patients that there is little improvement due to non-specific factors. The reasons for this improvement are unclear, although it may have been due in part to the control group not being aschronic a group as the one in the first experiment. It appeared that the improvement in the control group was not maintained, as their success rate was very low by the end of the follow-up period.

The results obtained from the follow-up diaries were of limited value because of the poor compliance of the patients. The daily record of patient behaviour is potentially highly informative, therefore in future studies it may be possible to enlist the aid of a close relative or some similar person to ensure that the diary is completed at the end of each day.

In conclusion, the results of the present experiment show that subliminal, supraliminal and faded presentation of phobic films can be effective in reducing agoraphobic symptoms. The faded method gave the best clinical response, but in view of the variability of results between the present experiment and Experiment 1, it would be prudent to conduct further comparisons before making any firm conclusions about the best method.

This concludes the experimental work on agoraphobia in this Thesis. The experiments on agoraphobia were initiated as a result of the study

by Tyrer, Lewis and Lee (1978), in which it was found that subliminal presentation of cine film could alter the anxiety state of normal subjects. In the next chapter an experiment is reported which replicates and extends this original experiment.

CHAPTER 7: EXPERIMENT 4. RESPONSES OF NON-CLINICAL SUBJECTS TO SUBLIMINAL STIMULI.

INTRODUCTION

The experiments on agoraphobia that have been reported in this Thesis were inspired by the study of Tyrer, Lewis and Lee (1978) who demonstrated that it is possible to induce anxiety in normal subjects by exposing them to subliminal emotive material. Two groups of subjects matched on the Trait Anxiety Scale of the State-Trait Anxiety Inventory (Speilberger, Gorsuch and Lushene, 1970) were shown either a subliminal emotive or a subliminal neutral film. Subliminality was achieved by lowering the illumination level of the film, and then superimposing a masking field on it. Pre- and post-measures of anxiety showed that the emotive group experienced an increase in anxiety, and the neutral groups showed a corresponding decrease.

The authors concluded that the effects obtained were due to the differences in content between the two films, but noted that there were two possible artefactual causes. The first was that some of the subjects reported the presence of flickering during the film, and although none of them could give details of the content of the films, there is a possibility that partial cues were perceived and were responsible for the effects obtained. Secondly, the two films differed markedly in the physical characteristics of the amount of movement present and variations in contrast. These differences may have contributed to the results found, as Guthrie and Wiener (1966) have demonstrated that variations in physical characteristics of stimuli such as angularity and thickness of lines can give rise to systematic variations in responses

to those stimuli, even when the content is held constant.

As noted in Chapter 1, the lack of acceptance of subliminal findings, and general scepticism concerning subliminal phenomena is no doubt due in part to the fact that the effects obtained are often weak and difficult to replicate. With this in mind, it was felt appropriate to try to replicate the previous findings, and at the same time modify the experimental procedure to eliminate the possible sources of artefact noted above.

Zenhausern and his colleagues (Zenhausern and Hansen, 1974; Zwotsa and Zenhausern, 1969) have suggested that there is a U shaped curve relating observer performance to level of accessory stimulation, with worst performance around the threshold and increasing improvements above and below the detection threshold. Consideration of this hypothesis led to the experiment being enlarged to include not only fully subliminal and supraliminal film presentations, but also a range of conditions in which partial cues were increasingly present.

SUBJECTS

Forty-eight (48) third year Medical Students (24M:24F) aged between 20 and 28 years, served as subjects in the study. They were paid £1 for their participation. Each subject was randomly assigned to one of six groups, with the constraint that each group consisted of four (4) males and four (4) females.

DESIGN

Films

Three different films were used, and these were shown in different ways. The first film was of a swan floating on a lake. This film was termed a neutral film, as it was not expected to produce any strong emotional reaction. The second film was of a car travelling through congested city traffic filmed from the passenger seat, but the sequence was shown at five times the normal speed in order to induce anxiety. These two films were the ones used by Tyrer, Lewis and Lee (1978). The third film was made up of a random assortment of spots, lines, flashes of light, irregular shapes and continuous contrast variations. The film was designed to have the physical characteristics of a normal film, i.e. shapes, movement, light and dark variations, but there was no semantic content. This control film was shown at two different speeds, once at 18 f.p.s. and once at 24 f.p.s. This was done to produce two sequences having a constant semantic content (none), but with differing physical characteristics.

Therefore, there were four films; the swan (neutral), the traffic (emotive), the fast control and the slow control. Each film ran for 90 seconds, and was shown both subliminally and supraliminally to each subject.

Film Projection

The film projection system was the same as that used in the other experiments in this Thesis.

Procedure

The films were shown to the eight subjects in each group in counterbalanced order, using an 8 x 8 Latin square design. In order that each film was followed by every other film an equal number of times, the first film of each series of eight was repeated, therefore each subject saw nine films. The treatment of the six groups differed only in the level at which the subliminal films were shown. Group 1 was shown the material at such a level that none of them detected the presence of anything during the subliminal sequences. Group 6 was shown the material at a level at which all of the subjects could recognise the film being presented. Groups 2-5 were shown the subliminal films at a range of intermediate levels. The filters used for Groups 1 and 6 were determined prior to the experiment using independent observers.

Subjects were tested individually. The subject was brought into the projection room and the recording electrodes and blood pressure cuff were attached. It was then explained that nine films

would be presented, and that a range of self report and physiological measures would be recorded. The subject was then shown the analogue scales. These were the same as those used in the previous experiments, measuring subjective estimates of sweating, shaking, difficulty breathing, muscular tension, heart rate and degree of excitement and relaxation. The subject completed them after each film. The subject was told to make himself/herself comfortable and to try and remain as still as possible during the film presentation. The films were then shown and the data collected. At the end of the session the subject was questioned about the subliminal films to determine whether he had detected anything, and if so whether he could recognise what was being presented.

Physiological Measures

Heart rate, respiratory rate and skin conductance level were recorded and scored as in the previous experiments. In addition, forearm and frontalis electromyogram (E.M.G.) and blood pressure were recorded.

Three small silver/silver chloride cup electrodes were used to record from the forehead. Small plate electrodes were used on the forearms. Standard electrode placements were used (Lippold, 1967). The signals were amplified (Devices 3542 Ac high gain amplifiers), recorded on tape and integrated (Devices 3520 EMG integrators). The integrated signals were displayed together with the other signals on a polygraph (Devices M19).

The EMG signals were quantified using power spectral analysis. The raw EMG signal is viewed as a complex curve consiting of a series of pure sine waves of varying frequency and power. The power spectral analysis breaks down the signal into the constituent sine waves and produces a power: frequency graph. Integration of such a graph produces an accurate measure of the power in the original signal. A computer program was written which acquired the data, performed analogue to digital conversion, power spectral analysis and integration to determine power in the bandwidths 0-4 Hz, 4-13 Hz and 13-90 Hz. Pilot studies had shown that there is very little power in the frequencies above 100 Hz. In order to eliminate the effects of mains interference the value of the frequency band from 48 to 52 Hz was set to zero prior to integration. The computer program used is given in Appendix 5 .

Blood pressure was measured immediately after each film by an assistant who was blind with respect to the order of film presentation. A London School of Hygiene Mk 4 sphygmomanometer was used (Cinetronics Ltd., Mildenhall, England). This machine removes observer bias because the mercury manometers are not visible to the operator while the reading is being made. Systolic and both diastolic pressures were measured.

RESULTS

The data from each group of subjects were analysed separately. A two way analysis of variance was used for each dependant variable (see Appendix 6). Table 7.1a and b (pages 150 and 151) shows the F ratios for the analogue scale scores, and Table 7.2a, b and c (pages 153 to 155) shows the F ratios for the physiological measures. In cases where the interactional term gave a significant F ratio, a Newman-Keuls test was performed to determine significant differences between treatment means. These means are shown in Table 7.3a and b (pages 156 and 157) and the results of the Newman-Keuls tests are shown in Table 7.4a and b (pages 158and 159).

Considering the results from the analogue scales first, the significant F ratios in Group 1 (calm/excited, relaxed/tense, sweating, difficulty breathing, muscular tension and heart rate) were in all cases due to the supraliminal emotive film giving rise to significantly higher ratings than the other seven films. There were no significant differences in ratings for any of the other films.

This was also the case in Group 2 for the ratings of degree of excitement and relaxation, difficulty breathing and heart rate. The ratings for muscular tension showed significant differences between the supraliminal emotive film and the subliminal emotive and slow control films. All other differences were non-significant.

For Group 3 the supraliminal emotive film again produced significantly higher ratings than all the other films for three variables (calm/excited, relaxed/tense and muscular tension). In the case of heart rate the supraliminal emotive film gave

Group 1	Subliminal/ supraliminal	Films	Interaction
Calm/excited	14.31***	8.38***	9.48***
Relaxed/tense	9.36***	5.50**	8.35***
Sweating	3.44	2.51	4.36*
Shaking	4.01	2.33	2.39
Difficulty breathing	2.53	1.19	4.15*
Muscular tension	5.78*	3.75*	5.83*
Heart rate	4.11*	3.35*	3.27*
Group 2			
Calm/excited	5.38*	3.56*	5.07*
Relaxed/tense	3.12	1.72	3.15*
Sweating	1.90	2.79	<1
Shaking	1.18	<1	<1
Difficulty breathing	<1	1.81	3.43*
Muscular tension	1.14	<1	3.04*
Heart rate	3.72	2.83*	5.16*
Group 3			
Calm/excited	24.84***	3.97*	7.40***
Relaxed/tense	7.63**	2.76	3.40*
Sweating	6.97*	<1	<1
Shaking	6.19*	1.06	3.42*
Difficulty breathing	<1	1.09	1.13
Muscular tension	5.72*	1.12	6.03*
Heart rate	2.25	<1	3.95*
Group 4			
Calm/excited	6.00*	4.69**	3.57*
Relaxed/tense	3.18	1.79	<1
Sweating	3.83	2.73	2.33
Shaking	<1	<1	<1
Difficulty breathing	<1	<1	<1
Muscular tension	2.93	2.10	<1
Heart rate	<1	1.08	<1

Table 7.1a F ratios for the analogue scale measures.

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

	Subliminal/ supraliminal	Films	Interaction
Group 5			
Calm/excited	2.57	<1	2.04
Relaxed/tense	<1	<1	1.49
Sweating	<1	<1	<1
Shaking	<1	2.05	<1
Difficulty breathing	<1	<1	2.01
Muscular tension	<1	<1	<1
Heart rate	<1	<1	<1
Group 6			
Calm/excited	<1	4.14*	<1
Relaxed/tense	<1	<1	1.38
Sweating	<1	1.78	<1
Shaking	<1	<1	<1
Difficulty breathing	4.67*	<1	<1
Muscular tension	<1	1.42	<1
Heart rate	1.48	<1	1.28

Table 7.1b F ratios for the analogue scale measures.

* $p < 0.05$

significantly higher ratings than the subliminal emotive film, and for shaking the supraliminal emotive film gave higher ratings than the subliminal emotive and fast control films and the supraliminal slow control film. In this group there was an overall tendency for the ratings to be higher for the supraliminal films.

Only one variable (calm/excited) produced significant results in Group 4, and once again the supraliminal emotive film produced much higher ratings than the other films. The Group 5 results showed no significant F ratios for any variable, and for Group 6 the emotive film gave higher ratings of excitement than the other films, and the supraliminal films gave higher ratings of difficulty breathing.

The physiological measures produced far fewer significant results than the analogue scales. The only variable which gave significant results in all the groups was respiratory rate. The treatment means for each group are illustrated in Figure 7.1 (page 160).

Group 1	Subliminal/ supraliminal	Films	Interaction
Respiratory rate	9.61**	1.56	6.43**
E.C.G.	2.65	<1	<1
S.C.L.	1.04	<1	1.38
Blood pressure 1	2.13	<1	1.09
Blood pressure 2	<1	<1	<1
Blood pressure 3	<1	<1	<1
EMG Forearm 0-4	1.72	1.12	<1
EMG Forearm 4-13	<1	<1	<1
EMG Forearm 13-90	<1	1.11	1.48
EMG Frontalis 0-4	<1	<1	<1
EMG Frontalis 4-13	<1	<1	1.59
EMG Frontalis 13-90	<1	<1	1.56
Group 2			
Respiratory rate	11.96**	9.02***	4.96**
E.C.G.	<1	1.42	2.50
S.C.L.	5.00*	1.55	4.03*
Blood pressure 1	4.28*	1.74	<1
Blood pressure 2	<1	2.30	<1
Blood pressure 3	<1	<1	<1
EMG Forearm 0-4	<1	<1	2.08
EMG Forearm 4-13	<1	<1	2.48
EMG Forearm 13-90	<1	<1	1.44
EMG Frontalis 0-4	4.02	1.07	1.11
EMG Frontalis 4-13	<1	1.69	1.93
EMG Frontalis 13-90	<1	<1	1.29

Table 7.2a F ratios for the Physiological Measures.

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

	Subliminal/ supraliminal	Films	Interaction
Group 3			
Respiratory rate	5.14*	3.45*	<1
E.C.G.	<1	<1	<1
S.C.L.	8.77**	<1	<1
Blood pressure 1	1.66	1.69	<1
Blood pressure 2	<1	1.65	<1
Blood pressure 3	2.41	<1	<1
EMG Forearm 0-4	3.08	2.44	2.11
EMG Forearm 4-13	<1	<1	1.91
EMG Forearm 13-90	1.92	1.64	2.85*
EMG Frontalis 0-4	<1	<1	<1
EMG Frontalis 4-13	<1	<1	1.94
EMG Frontalis 13-90	<1	<1	1.92
Group 4			
Respiratory rate	1.85	5.28**	<1
E.C.G.	1.54	3.26*	1.92
S.C.L.	2.59	<1	<1
Blood pressure 1	<1	<1	2.17
Blood pressure 2	3.26	1.57	2.05
Blood pressure 3	4.18	1.88	2.80
EMG Forearm 0-4	<1	2.34	<1
EMG Forearm 4-13	1.19	<1	1.08
EMG Forearm 13-90	<1	<1	<1
EMG Frontalis 0-4	<1	2.25	<1
EMG Frontalis 4-13	2.33	<1	2.24
EMG Frontalis 13-90	<1	1.14	1.97

<u>Table 7.2b</u> F ratios for the Physiological Measures.

* $p < 0.05$ ** $p < 0.01$

	Subliminal/ supraliminal	Films	Interaction
Group 5			
Respiratory rate	4.26*	5.52**	2.10
E.C.G.	1.16	< 1	< 1
S.C.L.	1.05	1.57	2.52
Blood pressure 1	1.45	1.27	< 1
Blood pressure 2	< 1	< 1	< 1
Blood pressure 3	< 1	1.52	< 1
EMG Forearm 0-4	< 1	< 1	1.82
EMG Forearm 4-13	< 1	< 1	< 1
EMG Forearm 13-90	< 1	1.88	< 1
EMG Frontalis 0-4	2.29	1.98	< 1
EMG Frontalis 4-13	< 1	< 1	< 1
EMG Frontalis 13-90	< 1	< 1	< 1
Group 6			
Respiratory rate	< 1	7.99**	2.14
E.C.G.	< 1	1.71	< 1
S.C.L.	< 1	1.99	< 1
Blood pressure 1	< 1	< 1	< 1
Blood pressure 2	< 1	< 1	< 1
Blood pressure 3	< 1	1.08	2.62
EMG Forearm 0-4	< 1	< 1	1.03
EMG Forearm 4-13	< 1	< 1	1.45
EMG Forearm 13-90	< 1	< 1	< 1
EMG Frontalis 0-4	< 1	< 1	< 1
EMG Frontalis 4-13	< 1	< 1	1.26
EMG Frontalis 13-90	< 1	< 1	< 1

Table 7.2c F ratios for the Physiological Measures.

* $p < 0.05$ ** $p < 0.01$

	Sub E	Sub N	Sub F	Sub S	Sup E	Sup N	Sup F	Sup S
Group 1								
Calm/excited	4.63	4.75	5.88	6.00	32.63	5.13	8.88	7.25
Relaxed/tense	5.63	7.25	11.50	6.50	35.13	6.75	9.13	11.13
Sweating	7.63	9.50	7.50	10.63	16.63	10.00	8.00	9.00
Difficulty breathing	3.38	5.13	5.00	5.25	10.38	4.25	5.63	4.38
Muscular tension	5.25	8.25	7.25	6.63	27.00	7.13	7.13	7.88
Heart rate	16.38	16.50	17.63	14.25	33.63	17.38	15.75	17.13
Respiratory rate	15.88	16.38	15.75	15.50	17.13	15.38	17.00	16.75
Group 2								
Calm/excited	4.13	5.25	5.88	4.63	18.13	6.00	5.00	5.13
Relaxed/tense	5.25	6.88	9.00	4.88	19.50	7.25	6.25	7.75
Difficulty breathing	3.00	3.75	3.38	3.88	7.00	3.38	2.88	2.38
Muscular tension	3.63	4.88	8.13	3.63	11.38	5.50	4.25	5.00
Heart rate	20.25	20.50	22.13	19.63	28.50	22.13	18.13	22.25
Respiratory rate	16.25	15.88	15.00	14.88	18.63	15.00	16.75	16.00
S.C.L.	2.62	2.76	2.82	2.75	3.45	2.86	2.77	2.78
Blood pressure 1	114.88	111.13	113.25	110.63	116.00	114.13	114.13	114.25

Table 7.3a Treatment Means for the Variables Producing Significant F ratios.

	Sub E	Sub N	Sub F	Sub S	Sup E	Sup N	Sup F	Sup S
Group 3								
Calm/excited	8.13	10.75	8.88	13.25	39.00	15.25	21.38	14.25
Relaxed/tense	16.50	18.00	14.88	22.75	33.00	18.50	20.63	22.88
Sweating	6.38	8.25	9.38	9.13	11.25	10.50	9.88	12.00
Shaking	3.63	5.00	3.75	4.88	7.38	5.50	5.13	4.25
Muscular tension	6.25	14.88	10.38	10.50	27.38	7.50	13.13	17.00
Heart rate	12.00	16.25	16.38	18.50	24.88	17.13	16.50	15.25
Respiratory rate	16.63	15.88	16.13	15.88	18.00	16.00	17.13	16.38
S.C.L.	1.82	1.74	1.78	1.71	2.19	2.07	1.93	1.89
EMG forearm 13-90	7.88	26.25	27.25	5.25	13.13	9.50	10.00	12.13
Group 4								
Calm/excited	10.38	9.50	10.63	6.00	25.63	5.38	13.75	12.63
E.C.G.	76.38	76.00	76.38	74.00	73.88	73.63	77.63	74.25
Respiratory rate	15.88	14.25	15.28	15.25	16.88	14.63	15.50	15.63
Group 5								
Respiratory rate	14.63	13.13	14.38	14.63	17.38	13.88	14.50	14.63
Group 6								
Calm/excited	18.50	13.63	11.88	11.13	25.13	11.88	12.38	10.38
Difficulty breathing	3.13	3.63	3.50	2.75	5.38	5.75	5.13	3.25
Respiratory rate	16.63	15.63	15.63	15.63	16.63	14.63	16.13	16.75

Table 7.3b Treatment Means for the Variables Producing Significant F ratios.

Group 1								
Calm/excited	Sup E	Sub E	Sub N	Sub F	Sub S	Sup N	Sup F	Sup S
Relaxed/tense	Sup E	Sub E	Sub N	Sub F	Sub S	Sup N	Sup F	Sup S
Sweating	Sup E	Sub S	Sup N	Sub N	Sup S	Sup F	Sub E	Sub F
Difficulty breathing	Sup E	Sub N	Sub F	Sub S	Sup N	Sup F	Sup S	Sub E
Muscular tension	Sup E	Sub E	Sub N	Sub F	Sub S	Sup N	Sup F	Sup S
Heart rate	Sup E	Sub E	Sub N	Sub F	Sub S	Sup N	Sup F	Sup S
Respiratory rate	Sup E	Sup F	Sup S	Sub N	Sub E	Sub F	Sup N	Sub S
Group 2								
Calm/excited	Sup E	Sub E	Sub N	Sub F	Sub S	Sup N	Sup F	Sup S
Relaxed/tense	Sup E	Sub E	Sub N	Sub F	Sub S	Sup N	Sup F	Sup S
Difficulty breathing	Sup E	Sub E	Sub N	Sub F	Sub S	Sup N	Sup F	Sup S
Muscular tension	Sup E	Sub F	Sup N	Sup S	Sub N	Sup F	Sub E	Sub S
Heart rate	Sup E	Sup S	Sub F	Sup N	Sub N	Sub E	Sub S	Sup F
Respiratory rate	Sup E	Sub E	Sub N	Sub F	Sub S	Sup N	Sup F	Sup S
S.C.L.	Sup E	Sup N	Sub F	Sup S	Sup F	Sub N	Sub S	Sub E

Table 7.4a Results of the Newman-Keuls Tests. Treatments not underlined by a common line differ significantly from each other. ($p < 0.05$)

Group 3								
Calm/excited	Sup E	Sub E	Sub N	Sub F	Sub S	Sup N	Sup F	Sup S
Relaxed/tense	Sup E	Sup S	Sub S	Sup F	Sup N	Sub N	Sub E	Sub F
Shaking	Sup E	Sup N	Sup F	Sub N	Sub S	Sup S	Sub F	Sub E
Muscular tension	Sup E	Sup S	Sub N	Sup F	Sub S	Sub F	Sup N	Sub E
Heart rate	Sup E	Sub N	Sub F	Sub S	Sup S	Sup N	Sup F	Sub E
EMG forearm 13-90	Sub F	Sub N	Sup E	Sup S	Sup F	Sup N	Sub E	Sub S
Group 4								
Calm/excited	Sup E	Sup F	Sup S	Sub F	Sub E	Sub N	Sub S	Sup N

Table 7.4b Results of the Newman-Keuls Tests. Treatments not underlined by a common line differ significantly from each other ($p < 0.05$).

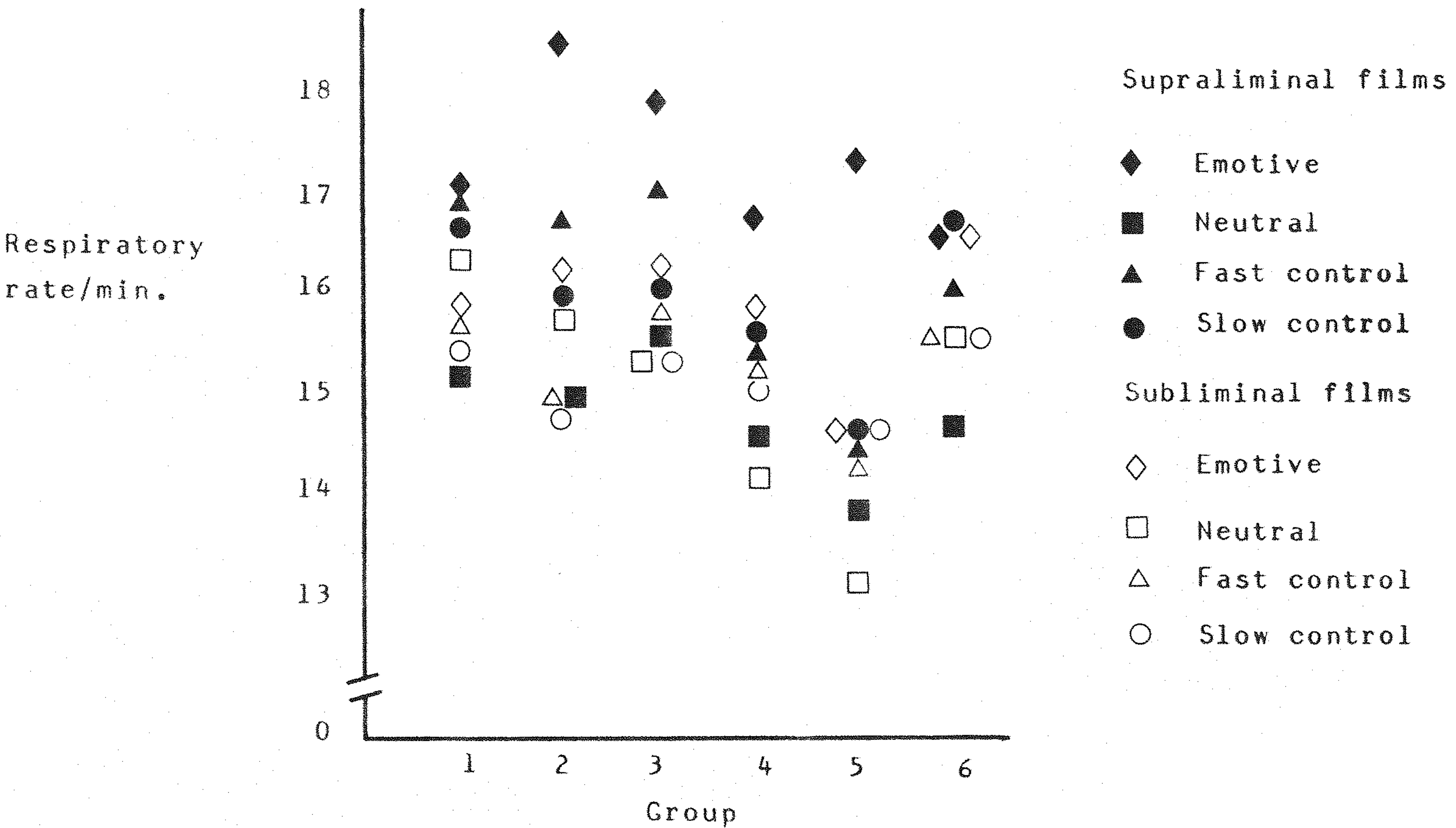


Figure 7.1: Mean Respiratory Rate during each Film.

DISCUSSION

The main finding of this study is that the only film which consistently induced symptoms of anxiety was the supraliminal emotive film. The subliminal films did not produce differential responses, even when partial cues were available. This lack of variation was apparent in both the analogue scale scores and the physiological measures. Therefore the finding of Tyrer *et al*. (1978) that subliminal emotive material can induce anxiety has not been replicated. There are a number of possible explanations for the discrepancy in results between the two studies. The first and most obvious is that the subliminal emotive material cannot induce anxiety, and the Tyrer *et al*. results were due to some other cause. Problems with this explanation are that:-

1. the possible alternative explanations noted by Tyrer *et al*. were investigated in the present study, and neither the presence of partial cues nor variations in the physical characteristics of the films caused any variations in responses, and
2. other independant studies have demonstrated that symptoms of anxiety can be induced using subliminal emotive stimuli, e.g. O'Grady (1977) found increases in skin conductance following the presentation of subliminal emotive pictorial stimuli.

If we accept the notion that subliminal emotive material can induce symptoms of anxiety in certain situations, then either the present experimental procedure was not suitable for obtaining such effects, or emotional effects were produced, but these are not apparent in the results. With regard to the first

alternative, many authors (e.g. Dixon, 1971; Henley, 1975; Sackheim, Packer and Gur, 1977) have noted that unless conditions are ideal for subjects in subliminal studies then few effects will be obtained. Good conditions for producing subliminal effects are those in which the subject is in a relaxed, comfortable state with a low arousal level. Henley (1975) found that fatigue effects were apparent in her studies after only a few experimental trials, and it may be that in the present experiment the subjects found the presentation of nine short films in rapid succession to be fatiguing or disturbing in some other way, and this was not conducive to a relaxed, passive state in which subliminal effects might have been produced. The Tyrer et al. experimental sessions were much shorter, with only two films being presented, therefore such disruptive effects would not have been operative in that study.

Another possibility is that the subjects in the present study (all medical students) were less susceptible to subliminal stimuli than those used by Tyrer et al. (housewives and nurses). Eagle (1962) reviewed the literature on personality correlates to susceptibility to subliminal stimuli and concluded that the most sensitive subjects were those in which their cognitive orientation minimised accuracy and precision, and maximised intuition, projection and fantasy. It is plausible that medical students have a more analytical attitude, particularly in an experimental situation, than housewives and nurses, and this influenced the results.

The number tested in each group (only 8) was small and it is possible that more of the differences would have been significant if larger numbers had

been used. Nevertheless, the consistently large differences between the supraliminal emotive condition and the others illustrates that the numbers were adequate to show significant differences at this order of magnitude. The absence of any trends in the other film conditions also suggests that larger numbers would not have altered the results materially.

If the alternative explanation that the subliminal emotive film produced effects which were not shown in the results is considered, there is a possible reason for this. The responses to a subliminal stimulus do not necessarily appear immediately after the presentation of that stimulus. Many studies on the Poetzl phenomenon (reviewed in Dixon, 1971) have shown that the effects of subliminal stimulation may not appear for periods of up to two days after presentation. Both Henley (1975) and Lee and Tyrer (1980) have found such delayed responses. If this were happening in the present case then responses to a particular subliminal film would be confounded, and since each subject in a group saw the films in a different sequence, this would tend to cancel out any systematic differences present.

It is also possible that a supraliminal stimulus may have a masking effect on a subsequent subliminal stimulus. The present experiment differs in an important way from the Tyrer _et al._ study in that a balanced design was used to counteract any order effects. All of the subjects in the earlier study saw the subliminal film first. Although this made analysis of the results difficult, it meant that there was no possibility that subliminal effects were masked by previous supraliminal stimuli. In

the present experiment the order of presentation was balanced, therefore if supraliminal masking effects were present it could account for the lack of positive findings.

Complex balanced designs are efficient in terms of number of subjects required, but one problem with their use is that although pronounced order effects will be balanced in the statistical analysis, they may swamp any other effects present. To overcome possible delayed and masking effects, it may be necessary to use large groups of subjects, with each group receiving only one experimental treatment. The additional practical problems in running such experiments would be offset by the ease of interpretation of the results.

CHAPTER 8: SUMMARY OF EXPERIMENTAL WORK, OVERALL CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH.

INTRODUCTION

The aim of the work reported in this Thesis was to investigate psychological and physiological effects of subliminal stimulation. This work was initiated following the findings of Tyrer, Lewis and Lee (1978) that anxiety could be induced in normal subjects by exposure to subliminal emotive films and slides, and it progressed in two directions:

1. investigating the possibility of using subliminal material in the treatment of agoraphobia (Experiments 1, 2 and 3) and,
2. investigating more thoroughly the responses of a non-clinical population to a variety of subliminal stimuli (Experiment 4).

Following this introduction, the research work is briefly summarised, and a series of overall conclusions are drawn and discussed. Finally, there is a section of suggestions for further research.

SUMMARY OF RESEARCH WORK

In the first experiment, groups of agoraphobic patients were treated by exposure to subliminal or supraliminal phobic cine films. A control group was included to evaluate non-specific factors. A wide variety of clinical, psychological and physiological variables were monitored throughout the course of treatment. The results showed that both types of exposure were effective in reducing agoraphobic behaviour, with the patients in the supraliminal group showing a slightly better clinical improvement, but the patients in the subliminal group found the treatment far less stressful. The physiological measures did not show any group differences, and there were no consistent changes in any measure over the treatment period. There was no correspondence between the physiological measures and either the clinical rating or the analogue scale scores. In addition, there was no evidence of improvement due to non-specific factors in the control group.

In an attempt to combine the benefits of subliminal and supraliminal presentations, a pilot study (Experiment 2) was carried out using the same procedure as Experiment 1, except that the phobic material was initially presented at subliminal levels, but through the course of treatment the films were made progressively more visible until they were fully supraliminal in the final treatment session. The two agoraphobics who took part in this experiment both showed marked clinical improvements, and these were maintained throughout the follow-up period.

Following the success of this faded procedure, a fully controlled comparison was made between subliminal, supraliminal and faded treatment methods. This experiment also served to replicate the first experiment, although it was not a strict replication since slightly different treatment procedures were used.

The results from this experimental work showed that all three treatment groups made good clinical progress, with the faded procedure being the most effective. The psychological measures taken during treatment sessions were somewhat variable, but indicated that the subliminal procedure was the least stressful, although no subject in any group found the treatment aversive or traumatic. Once again the physiological measures showed no consistent variations. An unusual feature of the results of this experiment was that the control group showed some improvement, although they were not shown any phobic films. Such improvements due to non-specific factors are uncommon with agoraphobic patients.

The final experiment (Experiment 4) was a replication and extension of the Tyrer et al., (1978) study, presenting a wider variety ofstimuli and using forty-eight (48) undergraduates as subjects. They were shown emotive, neutral and two types of meaningless film both subliminally and supraliminally. Psychological and physiological measures were recorded during film presentations. The results did not replicate those of Tyrer et al., in that no subliminal effects were obtained. However, the study did eliminate partial cues and physical characteristics of films as causes of the results obtained by Tyrer et al. The lack of subliminal effects were probably caused by either fatigue

effects, or the responses to individual films being delayed and therefore confounded, or masking effects of a supraliminal film on a subsequent subliminal film.

OVERALL CONCLUSIONS

The results of the four experiments reported above allow one to draw a number of general conclusions concerning the effect of subliminal stimuli, and the treatment of agoraphobia.

1. Subliminal, supraliminal and faded phobic films can all be effectively used in the treatment of agoraphobia.

2. The faded procedure gives the best clinical improvements.

3. The subliminal procedure is the least stressful. This may be of particular importance in cases where patients are unwilling to undertake any sort of potentially traumatic treatment.

4. Physiological measures can be used to distinguish emotive or phobic supraliminal films from neutral supraliminal films.

5. Physiological measures are neither a good indication of a subject's response to treatment, nor a reliable objective measure of the efficacy of treatment.

6. When designing experiments to investigate subliminal effects, particular care should be taken to avoid:
    - i. fatique effects,
    - ii. masking of subliminal stimuli by preceding supraliminal stimuli,

iii. confounding of delayed responses
in repeated measures designs.

More general questions, such as the causes of agoraphobia, or the mechanism of subliminal perception are beyond the scope of the present work, and it is not proposed to deal with them here. Interested readers are referred to Marks (1969) and Dixon (1971) for hypotheses and speculations on these matters.

DIRECTIONS FOR FURTHER RESEARCH

Any piece of research work should provide the foundation for further studies. In the present case these studies may divided into two categories:

1. studies intended to replicate the original findings,
2. studies intended to explain and extend the original findings.

The first category is particularly relevant in the case of subliminal work, where there are frequent failures to replicate results, and in cases where experimental work may subsequently be incorporated into therapeutic procedures. Therefore, the comparison of subliminal, supraliminal, and faded phobic films in the treatment of agoraphobia (Experiment 3) should be repeated to ensure that the results obtained are valid.

In addition, the fourth experiment should be repeated with a modified experimental design to remove the sources of confusion that were identified. Such a replication would allow one to draw conclusions about:

1. whether anxiety effects can be induced by subliminal emotive material,
2. whether variations in the content of subliminal films can be detected using physiological or psychological measures.

Turning to further studies in the second category, a series of experiments should be carried out to explore improvements to the procedures used

in the agoraphobia studies. In particular, information is required on the optimum number and duration of film presentations in a treatment session, the optimum interval between sessions, and the optimum number of sessions. Studies should be carried out to try to identify those patients for whom subliminal therapy is particularly appropriate and effective. In addition, it should be possible to use subliminal therapy in a group setting, thereby increasing efficiency. Finally, the use of this technique should be investigated in the treatment of specific phobias.

In the area of subliminal studies with non-clinical subjects, it is my opinion that the most pressing need is for information on the causes of variable responses to constant stimuli. Such fluctuating responses are presumably caused by small variations in the subjects used or by small variations in experimental procedures or conditions. Following Experiment 4 a number of such variables could be investigated:

1. the personality profiles of the subjects,
2. the emotional states of the subjects,
3. the effort required by the experimental task,
4. the masking effect of supraliminal stimuli on subsequent subliminal stimuli.

In addition, the causes of delayed responses in subliminal studies should be investigated, since such delayed responses are extremely confusing. It is only by carrying out such experiments that it will be possible to make any progress in the difficult area of subliminal perception, where

traditionally experiments generate more heat than light.

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APPENDIX 1

The clinical data from Experiment 1 were analysed using two way analyses of variance (Factor A, three groups; Factor B, six sessions) with repeated measures on Factor B. A typical set of data is shown in Table A1.1. The data were used to provide the following totals:

(1) $T^2/90$

(2) $\sum x^2$

(3) $\sum A^2/30$

(4) $\sum B^2/15$

(5) $\sum (AB)^2/5$

(6) $\sum S^2/6$

The summary table of the analysis is shown below.

Source of variation	Sum of squares	Degrees of freedom	Mean square	F
Between subjects	6-1	14		
A	3-1	2		
Subjects within groups	6-3	12		
Within subjects	2-6	75		
B	4-1	5		
A x B	5-4-3+1	10		
B x subjects within groups	2+3-5-6	60		
Totals	2-1	89		

Session	Subliminal					Supraliminal					Control				
	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15
2	1	1	0	2	0	2	-1	1	3	4	1	-1	-4	-1	3
3	3	2	0	-4	1	2	2	2	0	2	0	2	0	-3	-2
4	4	2	0	2	3	3	2	0	1	4	-1	3	2	0	-1
5	3	2	4	2	1	4	2	5	3	2	1	2	3	-4	-2
6	3	2	2	4	2	3	5	2	2	3	-3	2	-1	-2	3
7	2	2	2	4	4	2	3	2	5	4	2	2	1	2	-3

Table A1.1 A typical set of data used in the analysis.

APPENDIX 2

The analogue scale and physiological data from Experiment 1 were analysed by means of five way analyses of variance. Since it is impractical to carry out such analyses by hand, they were done on a computer. Thos required a specially written programme, supplied by Mr. J.R. Alexander, Lecturer in Medical Statistics, University of Southampton. The model used is outlined below.

T = Grand Total^2/ 900

Source of variation		Degrees of freedom	Sum of squares
1	Groups	2	$\Sigma G^2/300 - T$
2	Patients	12	$\Sigma P^2/60 - \Sigma G^2/300$
3	Films	1	$\Sigma F^2/450 - T$
4	Groups x Films	2	$\Sigma (GF)^2/150 - T - 1 - 3$
5	Patients x Films	12	$\Sigma (PF)^2/30 - T - 2 - 3 - 4$
6	Weeks	5	$\Sigma W^2/150 - T$
7	Weeks x Groups	10	$\Sigma (WG)^2/60 - T - 1 - 6$
8	Weeks x Patients	60	$\Sigma (WP)^2/10 - T - 2 - 6 - 7$
9	Films x Weeks	5	$\Sigma (WF)^2/75 - T - 3 - 6$
10	Groups x Films x Weeks	10	$\Sigma (WFG)^2/25 - T - 1 - 3 - 4 - 6 - 7 - 9$
11	Weeks x Films x Patients	60	By subtraction
12	Total between cells	179	$\Sigma (WFGP)^2/5 - T$
13	Total within cells	720	14 - 12
14	Total	899	$\Sigma (WFGPR)^2 - T$

APPENDIX 3

The clinical data from Experiment 3 were analysed using two way analyses of variance (Factor A, four groups; Factor B, seven sessions) with repeated measures on Factor B. A typical set of data is shown in Table A3.1 (page 208). The data were used to provide the following totals:

(1) $T^2/224$

(2) Σx^2

(3) $\Sigma A^2/56$

(4) $\Sigma B^2/32$

(5) $\Sigma (AB)^2/8$

(6) $\Sigma S^2/8$

The summary table of the analysis is shown below.

Source of variation	Sum of squares	Degrees of freedom	Mean square	F
Between subjects	6-1	31		
A	3-1	3		
Subjects within groups	6-3	28		
Within subjects	2-6	192		
B	4-1	6		
A x B	5-4-3+1	18		
B x subjects within groups	2+3-5-6	168		
Totals	2-1	223		

Subliminal Group

Session	Subject 1	2	3	4	5	6	7	8
1	0	0	2	-2	10	-2	1	0
2	2	2	2	2	8	-4	5	16
3	0	3	6	2	10	-6	4	10
4	0	6	6	10	4	-2	6	16
5	2	7	9	9	6	-6	-2	16
6	2	6	9	0	6	-2	0	16
7	2	8	9	-4	4	-2	2	16

Supraliminal Group

Session	Subject 1	2	3	4	5	6	7	8
1	0	0	0	3	0	0	2	4
2	0	0	0	5	4	2	6	6
3	4	-2	3	5	14	6	8	2
4	4	0	4	-1	10	4	10	8
5	6	0	5	1	12	6	10	8
6	4	4	9	1	4	6	8	10
7	6	-2	13	1	6	6	10	6

Faded Group

Session	Subject 1	2	3	4	5	6	7	8
1	5	6	4	0	-2	2	-2	1
2	11	8	6	4	0	4	-2	-5
3	9	8	7	4	2	4	-2	3
4	9	10	9	8	2	5	-2	-1
5	12	10	9	8	2	6	-2	1
6	12	11	11	12	6	8	0	9
7	10	13	10	13	8	7	4	11

Control Group

Session	Subject 1	2	3	4	5	6	7	8
1	0	1	2	4	0	0	-1	0
2	0	5	4	6	4	2	0	0
3	1	9	4	12	0	6	-1	-2
4	-2	5	7	14	2	0	3	-2
5	-1	6	13	12	4	8	2	-2
6	4	2	10	10	4	7	5	0
7	1	0	13	14	4	0	6	1

Table A3.1 A typical set of data used in the analysis.

APPENDIX 4

The analogue scale and physiological data from Experiment 3 were analysed using two way analyses of variance (Factor A, four groups; Factor B, seven sessions) with repeated measures on Factor B. The analysis differs from that described in Appendix 3, in that there are four replications per cell. A typical set of data is shown in Table A4.1 (page 211). Each analysis used four such sets, one for each group. The data were used to provide the following totals:

(1) $T^2/896$
(2) Σx^2
(3) $\Sigma A^2/224$
(4) $\Sigma B^2/128$
(5) $\Sigma (AB)^2/32$
(6) $\Sigma S^2/28$
(7) $\Sigma (ABS)^2/4$

The summary table of the analysis is shown below.

Source of variation	Sum of squares	Degrees of freedom	Mean square	F
Between subjects	6-1	31		
A	3-1	3		
Subjects within groups	6-3	28		
Within subjects	7-6	192		
B	4-1	6		
A x B	5-4-3+1	18		
B x subjects within groups	7-6-5+3	168		
Total between cells	7-1	223		
Total within cells	2-7	672		
Totals	2-1	895		

Subliminal Group

Session	1	2	3	4	5	6	7
Subject 1	-8.5	34.5	28.5	33.5	38.5	38.5	21.5
	-4.5	38.5	36.5	17.5	43.5	33.5	30.5
	4.5	32.5	31.5	33.5	41.5	42.5	37.5
	8.5	32.5	38.5	34.5	43.5	45.5	30.5
Subject 2	8.0	0.0	44.0	11.0	22.0	16.0	20.0
	-9.0	-4.0	2.0	7.0	16.0	16.0	22.0
	4.0	4.0	0.0	8.0	9.0	3.0	27.0
	-3.0	11.0	-5.0	5.0	11.0	13.0	17.0
Subject 3	-1.0	22.0	-1.0	28.0	27.0	16.0	23.0
	12.0	-9.0	13.0	33.0	34.0	27.0	40.0
	-5.0	13.0	11.0	49.0	35.0	24.0	28.0
	-6.0	3.0	-8.0	43.0	44.0	34.0	25.0
Subject 4	13.5	17.5	41.5	32.5	34.5	36.5	32.5
	-8.5	13.5	40.5	32.5	31.5	24.5	30.5
	-9.5	12.5	15.5	37.5	23.5	40.5	34.5
	4.5	10.5	23.5	37.5	34.5	29.5	33.5
Subject 5	3.5	4.5	3.5	9.5	18.5	18.5	26.5
	-0.5	11.5	4.5	5.5	11.5	9.5	25.5
	0.5	10.5	8.5	6.5	4.5	15.5	28.5
	-3.5	9.5	20.5	15.5	14.5	20.5	26.5
Subject 6	6.5	4.5	3.5	6.5	6.5	5.5	5.5
	6.5	2.5	1.5	7.5	3.5	2.5	5.5
	-9.5	1.5	5.5	6.5	8.5	3.5	5.5
	-3.5	4.5	6.5	7.5	3.5	9.5	4.5
Subject 7	-6.0	-7.5	-4.0	5.0	4.0	2.0	4.0
	0.0	-4.0	2.0	3.0	7.0	4.0	9.0
	4.0	1.0	4.0	3.0	-2.0	-4.0	6.0
	2.0	-4.0	3.0	-2.0	-3.0	5.0	4.0
Subject 8	6.0	11.0	13.0	18.0	22.0	25.0	18.0
	-5.0	9.0	11.0	10.0	24.0	19.0	22.0
	-3.0	5.0	11.0	23.0	20.0	15.0	17.0
	2.0	4.0	4.0	30.0	25.0	17.0	33.0

Figure A4.1 A typical set of data for one group.

APPENDIX 5

The computer program used to analyse the EMG data is outlined below. It was written using a software package produced by the Institute of Sound and Vibration Research, University of Southampton. In the interest of clarity the controlling parameters for each governing statement, which would appear in the brackets, have been omitted.

ACQUIR (...)	Acquires the data and performs analogue to digital conversion.
BUTTER (...)	Filters the data (-3dB 100Hz).
NORM (...)	Removes any DC shift in the data.
PSD (...)	Performs the power spectral analysis.
ALTER (...)	Removes any 50Hz mains interference.
INTEG (...)	Integrates the results of the power spectral analysis.
GIVE (...)	Outputs numerical values of the power in various bandwidths.

APPENDIX 6

The data from Experiment 4 were analysed using two way analyses of variance with repeated measures on both factors (Factor A, subliminal/supraliminal; Factor B, four films). A typical set of data is shown in Table A6.1. The data were used to provide the following totals.

(1) $T^2/64$
(2) Σx^2
(3) $\Sigma A^2/32$
(4) $\Sigma B^2/16$
(5) $\Sigma (AB)^2/8$
(6) $\Sigma S^2/8$

The summary table of the analysis is shown below.

Source of variation	Sum of square	Degrees of freedom	Mean square	F
Between subjects	6-1	7		
Within subjects	2-6	56		
A	3-1	1		
B	4-1	3		
A x B	5-4-3+1	3		
Residual	2-5-6+1	49		
Total	2-1	63		

Subject	Subliminal				Supraliminal			
	E	N	F	S	E	N	F	S
1	1	3	5	2	3	4	2	6
2	1	3	3	7	7	3	2	6
3	6	3	2	0	4	2	2	6
4	4	4	2	4	8	4	3	2
5	9	3	2	8	4	3	5	2
6	10	4	2	7	19	3	5	2
7	6	7	3	8	11	7	9	10
8	6	4	7	7	16	10	7	12

Table A 6.1 A typical set of data used in the analysis.

PSYCHIATRIC RATINGS : INDEPENDENT ASSESSOR

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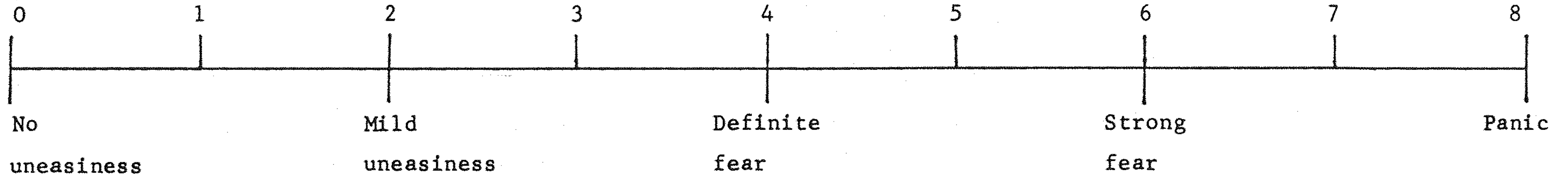
PHOBIAS : FEAR

Rate the fear you think the patient would experience if he were in these phobic situations.

This is the scale.



Write your rating for phobia 1 (......................................) in box 12

Write your rating for phobia 2 (......................................) in box 18

Write your rating for phobia 3 (......................................) in box 24

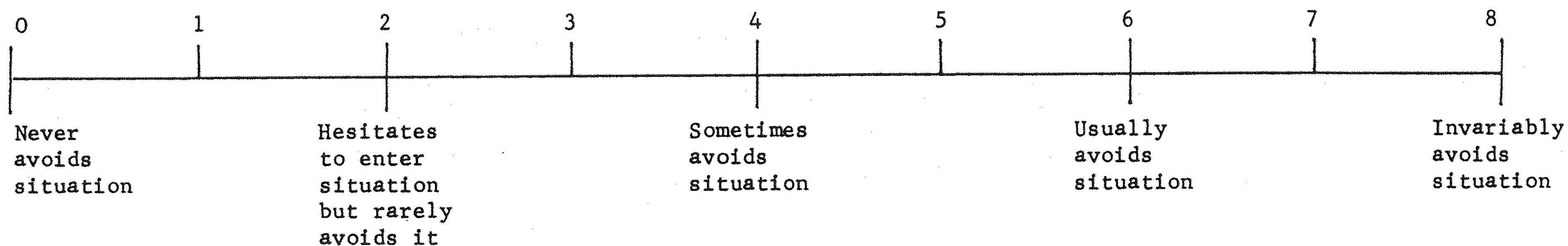
Write your rating for phobia 4 (......................................) in box 30

Write your rating for phobia 5 (......................................) in box 36

PHOBIAS : AVOIDANCE

Rate the patient's tendency to avoid these phobic situations.

This is the scale.



Write your rating for phobia 1 (...) in box 15

Write your rating for phobia 2 (...) in box 21

Write your rating for phobia 3 (...) in box 27

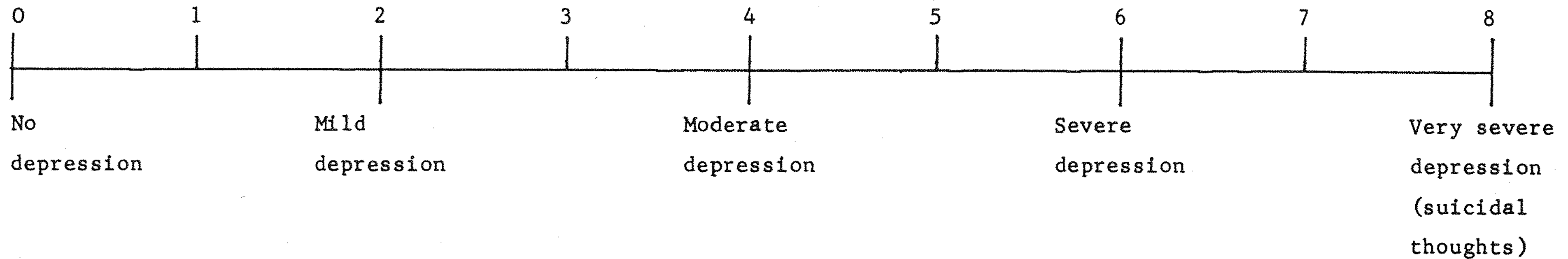
Write your rating for phobia 4 (...) in box 33

Write your rating for phobia 5 (...) in box 39

DEPRESSED MOOD

RATER - take note of loss of interest, pessimistic outlook, sadness, tearfulness, anergy, early waking, mood variation, suicidal thoughts, guilt.

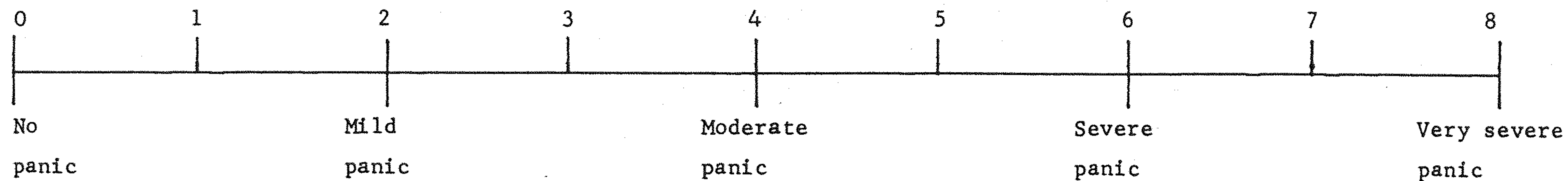
Base your rating on the patient's mood during the past 3 days.



Write your rating in box 42.

PANIC

Rate the attacks of panic, anxiety or palpitations which the patient has had for no obvious reason during the previous 3 days. Rater take note of frequency, intensity and duration. (Do NOT include persistent background tension, or specific phobias).

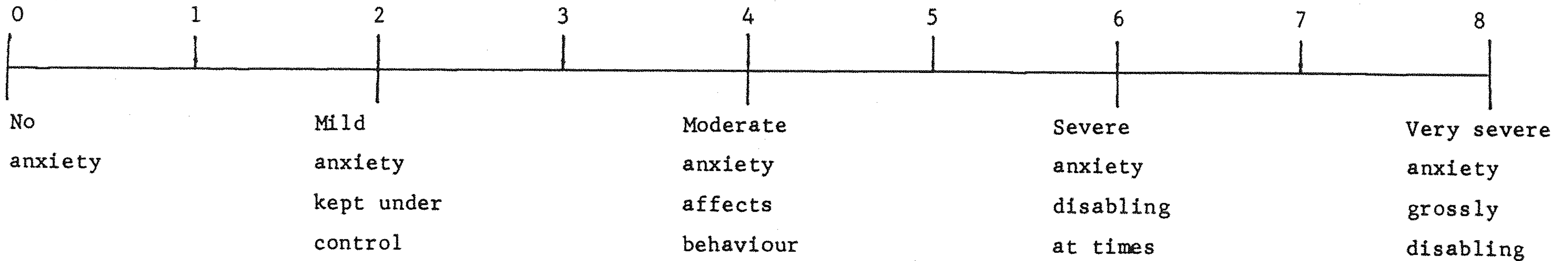


Write your rating in box 45.

ANXIOUS MOOD

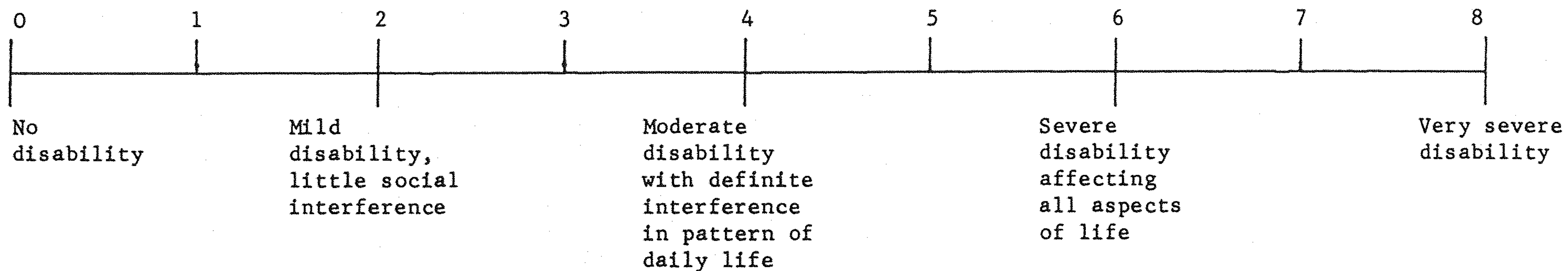
RATER - take note of persistent anxious mood, subjective tension, physical manifestations, poor concentration and motor restlessness.

Base your assessment on the patient's state during the previous 3 days.



Write your rating in box 48.

Taking the patient's condition in all its aspects, including phobic and additional symptoms, frequency of panics, level of free-floating anxiety and extent of social disability, how would you rate the patient?



Write your rating in box 68.

PATIENT'S SCALES

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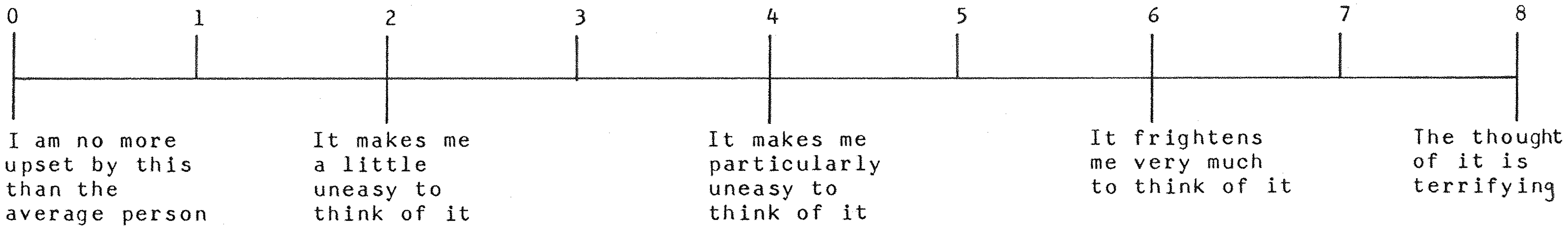
Date:

Time:

Name of Patient:

This booklet contains a number of scales on which you are asked to rate your symptoms.
At the top of each page is a question about your symptoms, and beneath this is a scale to rate them on.
Each rating should be written in a box at the bottom of the page.
When rating, choose that number from 0 to 8 which most nearly describes how you feel. Please check that each rating is written into the appropriate box.

You are asked to rate on this scale some of the situations, events, objects, and people which make you frightened. This is the scale.



Write your rating for phobia 1 (.................................) in box 13

Write your rating for phobia 2 (.................................) in box 19

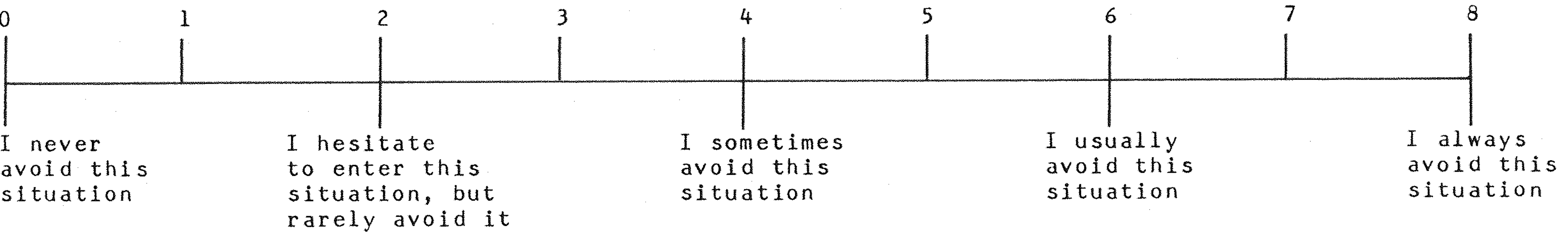
Write your rating for phobia 3 (.................................) in box 25

Write your rating for phobia 4 (.................................) in box 31

Write your rating for phobia 5 (.................................) in box 37

You are asked to rate on this scale the degree to which you tend to avoid certain situations.

This is the scale.



Write your rating for situation 1 (....................................) in box 16

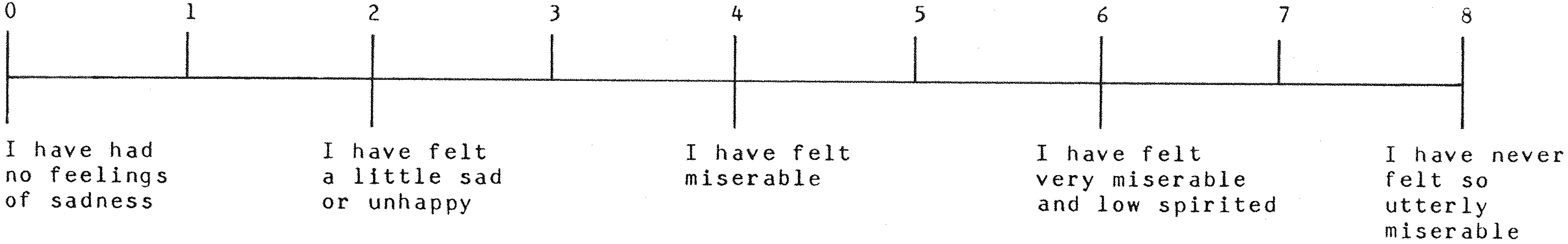
Write your rating for situation 2 (....................................) in box 22

Write your rating for situation 3 (....................................) in box 28

Write your rating for situation 4 (....................................) in box 34

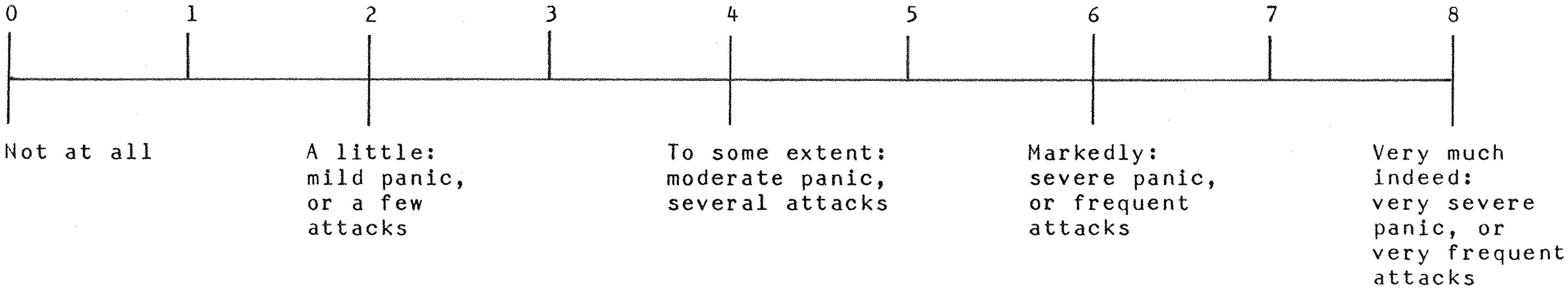
Write your rating for situation 5 (....................................) in box 40

How have your spirits (mood) been in the past 3 days? Have you felt depressed, sad, tearful or unhappy? When rating choose that number from the scale below which most nearly describes your mood.



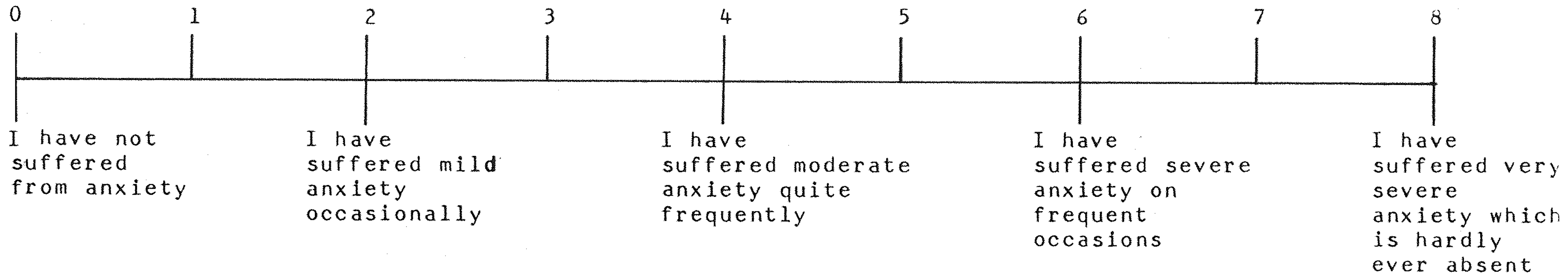
Write your rating in box 43

Have you suffered from acute attacks of panic, anxiety, or palpitations for no obvious reason during the past 3 days? (Do Not include persistent background tension or your specific phobias).



Please write your rating in box 46.

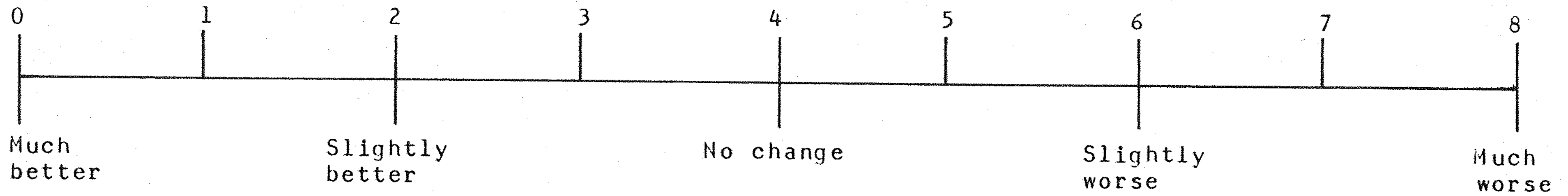
Have you suffered from anxiety, tension, poor concentration or restlessness during the past 3 days? If so, how severe and persistent have these symptoms been?



Please write your rating in box 48.

Taking all your symptoms into consideration, would you say that the treatment you have received has affected them in any way?

Rate your answers on this scale.



Please write your rating in box 66.