THE DETERMINANTS OF THE STIMULUS-VALUE OF MENTAL IMAGERY

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ABSTRACT

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The use of the stimulus-value of mental imagery (SVMI) in psychotherapy offers many advantages. However, studies investigating the role of SVMI in psychotherapy have produced mixed results. This study tests a theoretical model of the determinants of SVMI in hopes of providing a means of understanding these mixed results.

Undergraduate Ss completed measures of personality variables and imaged twenty scenes, rating both SVMI and the characteristics of the image while experiencing the image. Half of the trials were conducted before three weeks of progressive relaxation training and half after. The hypothesized model was tested through causal analysis and path analysis.

While nineteen of twenty-two predicted correlations supported the hypotheses, the path analysis and causal analysis produced partially conflicting results. It was concluded that this study provides support for basic assumptions involved in the use of imagery in psychotherapy but does not provide an empirically supported model of the processes involved.

ACKNOWLEDGMENTS

I would particularly like to thank the members of my thesis committee: Dr. Dozier Thornton who provided sound advice, encouragement, and support; Dr. Gordon Williams who raised important methodological and theoretical questions; and Dr. Ralph Levine who worked closely with me on the statistical analyses. Through them this thesis was transformed from a rite of passage to a valuable experience.

In addition, it would like to thank Dr. Auke Tellegen for providing me with the Differential Personality Questionnaire, Dr. Alan Richardson for providing me with information on several measures of image quality, and Dr. F. D. McGlynn for sharing some unpublished data with me. Their cooperation has greatly facilitated this research.

Most importantly I would like to thank my friends and colleagues who provided support, encouragement, and advice and who helped me to persevere with a complex, time-consuming study. My special thanks go to Barb, Howard, and Cheryl who supported me throughout the project.

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STATEMENT OF THE PROBLEM

The successful use of mental imagery in a variety of psychotherapeutic techniques holds potential for increasing the effectiveness of psychotherapy (Beck, 1970; Wilkins, 1974). Imagery techniques have been used with a wide range of psychological and behavioral problems (Wilkins, 1974) and are often reported to be more effective and more efficient than verbal techniques (Sheikh & Panagiotou, 1975). Though there are some difficulties in using imagery techniques, the advantages of these techniques are often believed to outweigh the disadvantages (Cautela, 1973). These reported advantages include greater experience of self-control by clients, increased flexibility due to decreased reliance on equipment, freedom to work with situations which cannot be dealt with practically in vivo, and avoiding a high drop-out rate and occasional overgeneralization when using aversive stimuli (Cautela, 1973). Mental imagery is also reported to provide a more accurate recreation of a situation than a verbal description does (Gordon, 1972) and to evoke a stronger emotional response (Kosab, 1974).

The enthusiasm of proponents of imagery techniques is often based on clinical experience rather than more controlled investigation. Despite the number of hypotheses and theories which have been generated, much remains to be investigated concerning the

function of mental imagery in psychotherapy (Wilkins, 1974; Singer, 1973).

Psychotherapeutic techniques which use mental imagery can be divided into those techniques which rely on the stimulus properties of imagery and those which rely on the symbolic properties of imagery. Stimulus-oriented techniques such as sytematic desensitization, covert conditioning, and covert modeling are typically based on a behavioristic approach to psychopathology and treat the mental images as interchangable with real stimuli. Techniques using the symbolic properties of imagery such as Reyher's Emergent Uncovering Therapy (Reyher, 1963) and Jung's "active imagination" are often based on a psychodynamic approach to behavior and imagery is seen as a product of the individual's personality which can be used as a source of insight or information.

Stimulus-oriented imagery techniques are more widely used than symbolic techniques and are both more amenable to scientific investigation and more thoroughly investigated. Research into the nature and function of the stimulus properties of mental imagery has supported the assertion that mental imagery is potentially useful in psychotherapy and has shown that mental imagery is superior to verbal description for recreating a stimulus or experience in some situations (Gerst, 1969). However, research into psychotherapy techniques using the stimulus properties of imagery has not consistently supported the hypothesis that imagery is a crucial variable in the effectiveness of these techniques (Beere, 1971). It has been suggested (Beere, 1971) that the characteristics of imagery

experienced during psychotherapy are multiply determined and that an understanding of the determinants of the stimulus value of mental imagery experienced in clinical settings would resolve the discrepancy between the imagery research which supports the use of imagery techniques and the psychotherapy research which fails to support the importance of imagery. This study investigates the determinants of the stimulus value of mental imagery.

RELATED LITERATURE

The Stimulus Properties of Mental Imagery

Mental imagery has consistently been defined by contemporary researchers in terms of sensation or perception in the absence of the stimuli which customarily evoke such sensations or perceptions (Sheehan, 1972). In this study a definition of mental imagery is used which is based on the definition used by Gordon (1972). The term mental image (image) is defined as perception in any modality in the absence of the appropriate stimulus. Often no distinction is made between images and hallucinations; when such a distinction is made images are seen as being less vivid and more controlled than hallucinations. There is no commonly accepted criterion available which reliably discriminates between vivid, spontaneous images and hallucinations.

A variety of typographies for imagery have been proposed, ranging from Richardson's (1969) discussion of four types of imagery to Horowitz's (1970) complex, four-fold categorization of imagery based on vividness, context, interaction with perception, and content. This study is focused on imagery produced upon request by subjects (Ss) either from memory or from imagination and, unless otherwise indicated, the term imagery refers specifically to this phenomena.

Obviously imagery is a subjective experience which cannot be measured directly. The actual data available consists of self-reports of imagery, performance measures of imagery, and physiological correlates of imagery. For the sake of brevity the term image is used and we will speak of images "occurring" or "being experienced" and of scenes or objects "being imaged" without ignoring the source of the data and its limitations.

Though systematic use of mental imagery as a mnemonic device antedates Aristotle, the scientific study of imagery dates from Sir Francis Galton's early survey of the varieties of imagery experience. Early psychologists considered the study of imagery an important part of the study of the mind and used a variety of introspective methods to collect data. However, both the Anssage method used by Titchener at Cornell and the Ausfrage method used by the Wurzburg school reached the limits of their usefulness in the famous controversy over the existence of imageless thought (Holt, 1964).

The two new approaches to psychology which developed in the years preceding World War I, behaviorism and psychoanalysis, both focus primarily on behavior, through their viewpoints differ considerably, and both assume that the contents of consciousness explain little. In the reaction against introspectionism which accompanied the rise of behaviorism in academic circles, imagery, attention, states of consciousness, and other subjective phenomena were rejected as mentalistic and received little scientific attention (Hebb, 1960).

While the theoretical bias against imagery research continued at least into the 1960s, a number of factors pressed for the re-emergence of imagery research. The practical concern which developed when spontaneous, vivid images were involved in accidents by radar operators, long-distance truck drivers, and jet pilots could not be dismissed by the argument that talk of images is "mentalistic." The subsequent discovery of "experimental hallucinations" during sensory deprivation (Hebb, 1960) both spurred interest in this area of imagery research and demonstrated that images could be studied in the laboratory.

Among advances in neuropsychological research which encouraged imagery research were Pennfield's studies in direct stimulation of the cortex (discussed in Holt, 1964). This research demonstrated that experiences were recorded in unexpected detail and provided a neurological basis for understanding eidetic imagery and memory imagery.

Research suggesting a relationship between EEG alpha waves and visual imagery raised the hope that imagery research could be made objective by the development of a physiological measure of the occurrence of imagery. Subsequent research has shown that the relationship between the occurrence of imagery and various physiological measures is complex (Morishige & Reyher, 1975; Sheehan, 1973) but studies in this area have further developed methods for imagery research.

The emergence of information theory, high-speed computers, and artificial intelligence has provided models for relating

cognitive processes to behavior. "Cognitive behaviorism" with its recognition of the impact of expectations, verbal mediation, and other cognitive processes on behavior has provided a place for imagery in contemporary theoretical psychology.

A powerful, non-scientific force in the re-emergence of imagery research is the pattern of socio-cultural change which has led to an upsurge in interest in mysticism, drug-induced experiences, meditation, para-psychology, encounter groups, and similar phenomena. Psychologists, being human, have reflected this trend to some degree in changing research interests.

In responding to psychologists who argue that the study of imagery cannot be scientific, Sheehan (1966) distinguishes between subjective research where introspective reports are assumed to be valid and objective research which examines the relationship between variations in introspective reports and variations in behavior. An example of the objective approach would be Marks' (1972) statement that research into the function of vividness of visual imagery is directed towards the question, "In what ways does the behavior of a man who says he experiences vivid visual imagery differ from that of another who says that his imagery is vague and dim?" Certainly this approach to research can be methodologically rigorous and scientific.

Of the many properties of imagery which have been the subject of research or speculation, one property which is directly relevant to many imagery techniques is the functional similarity between imaging and perceiving. Research on the stimulus properties

of imagery has focused on the relationship between imaging and perception of stimuli, the similarities between responses to images and responses to stimuli, and the use of images as stimuli in performing a variety of tasks.

Much of the research on the relationships between imaging and perception has been based on the Perky phenomenon. Perky, a student of Titchener, demonstrated (Perky, 1910) that if a subject imagined an image projected on a screen and the experimenter (E) projected a faint image of the imagined object on the screen the S was unable to detect the projected image. Segal (1972) has carried out extensive work on this phenomenon exploring the variables influencing its occurrence. She has shown that this is a genuine effect, replicable with naive Ss and that it is modality specific, i.e., that visual images affect only visual perception while auditory images affect only auditory perception. Similar conflicts between imagery and perception in the same modality have been found by Antrobus, et al. (1970) in a study of daydreaming during signal detection tasks, Brooks (discussed in Neisser, 1972) in cognitive tasks where the response involved a conflict between imagery and perception, and Fusella (1973) in a visual signal detection task during which Ss were asked to experience visual imagery. Though, for normal Ss, imagery can only block perception of weak stimuli, the demonstration of modality specific interference between imagery and perception is seen as evidence that imaging is a quasi-perceptual process (Neisser, 1972) or that the same neurological process is involved in both phenomena (Hebb, 1968).

Clear evidence of the stimulus properties of imagery has come from research on the similarity between physiological responses to stimuli and physiological responses to images of stimuli. After a thorough review of psychophysiological studies of systematic desensitization (SD) and related procedures, Matthews (1971) concluded that the research had demonstrated that the physiological effects of phobic imagery are consistently different from the effects of neutral imagery. The consensus is that physiological and subjective responses to phobic imagery are qualitatively similar to responses to actual stimuli but are less intense.

Evidence that Ss respond physiologically to phobic imagery in the same way as they respond to phobic objects has been reported by Wolpe and Flood (1970), Van Egeren (1970), Van Egeren, Feather, and Hein (1971), Marks and Huson (1973), Haney and Euse (1976), and May (1977). Craig (1968) demonstrated that this relationship held for other types of imagery by showing that physiological response to an imagined cold stressor was qualitatively similar to Ss response to the actual stressor.

A sophisticated demonstration that physiological and subjective responses to imagery discriminates between phobic and neutral imagery was provided by Chapman and Feather's (1971) sensory decision theory analysis of the data reported by Van Egeren, Feather, and Hein (1971). This study in conjunction with the other research shows that responses to imagery resemble responses to actual stimuli and that responses to imagery reliably discriminate between types of images.

A striking example of the stimulus properties of imagery is the performance of Stromeyer's eidetiker "Elizabeth" (Stromeyer, 1970; Stromeyer & Psotka, 1970). Elizabeth was able to summon up a sufficiently clear image of a 10,000 dot random stereogram seen the day before to combine it with the second stereogram of the pair and report the figure formed by their stereoscopic combination. She was also able to duplicate the Land Color Phenomenon by superimposing an eidetic image of a picture projected through a red filter on the picture projected through a green filter and perceiving the picture in full color with remarkable accuracy. These tests do not rely on memory and cannot be faked easily.

A less unusual demonstration of the use of imagery as a stimulus is the use of imagery by normal Ss to improve performance on a variety of cognitve tasks. A number of studies which have investigated hypotheses related to Betts' statement, "In all places where we would welcome the percept but cannot have it, the image may serve as a very acceptable substitute" (Betts, 1909, p. 93) are discussed by Sheehan (1972b) in his examination of the use of imagery in unexpected recall. In a number of these studies imagery orienting instructions improved incidental learning, concrete (high imagery-evoking) noun pairs were more easily recalled, and Ss high in imagery ability performed better in unexpected recall tasks. Bugelski (1970) found that Ss who were instructed to image but not to learn were unable to prevent learning.

In Sheehan and Neisser's (1969) study of the use of imagery in reconstruction of a pattern of geometric figures two Kohs Block

Design patterns were used as an intervening task to control S activity. When Ss were unexpectedly asked to recall the Kohs design and were asked whether they had employed imagery in doing so most Ss reported that imagery was intimately involved in their recall process (Sheehan, 1972b). This finding spurred a more systematic examination of the role of imagery in incidental learning. In a series of experiments based on a verbal learning paradigm (Sheehan, 1971a, 1971b, 1972c) Sheehan found that when high imagery-arousing and low imagery-arousing nouns were equated for meaningfulness and frequency, high imagery-arousing nouns were more frequently recalled in an unexpected recognition task and that, for high imagery nouns, incidental learning was not significantly less efficient than intentional learning (Sheehan, 1972b).

In a series of studies involving a "pattern construction" task in which Ss were asked to duplicate patterns made of geometric forms Sheehan (1966) found that Ss made fewer errors when asked to duplicate the pattern by using a mental image of the pattern as a stimulus than when they were asked to duplicate the pattern without imaging the pattern. This relationship held if Ss inspected the elements of the pattern before the stimulus pattern was presented but the opposite result was found when Ss were not allowed to inspect the elements of the pattern. This apparent inconsistency was explained in terms of the vividness of the imagery experienced. Inspection of the elements of the pattern resulted in reports of more vivid imagery and Ss who reported vivid images made fewer errors than Ss who reported dim images or Ss who were asked to

use memory without imagery. In a second portion of this study Sheehan (1966a) investigated the possibility that differential demand characteristics confounded his findings and once again found that reproduction of geometric patterns by Ss who reported vivid images was more accurate than the performance of Ss who reproduced the pattern from memory without using imagery. Further research into the role of image vividness in this type of task and into the processes involved has supported the belief that images can be used to reproduce stimuli and that this use of imagery results in a significant change in performance (Marks, 1972).

The Stimulus-Value of Mental Imagery in Psychotherapy

The psychotherapy techniques which rely on the stimulus properties of imagery share the common assumption that mental imagery effectively recreates stimuli and is governed by the same laws which govern overt behavior (Cautela, 1973). These techniques assume that imaged stimuli, behavior, and consequences have the same effects as if they had actually occurred. Although research into the stimulus properties of imagery offers partial support for these assumptions, studies directly investigating the role of imagery in these psychotherapy techniques have not offered consistent support for the assumption that imagery is a functional component of these techniques.

Research into the role of imagery as a stimulus in psychotherapy has used two basic approaches--comparing a procedure using imagery with a procedure using real stimuli and comparing the effects of imagery which accurately recreates the desired stimulus with the

effects of imagery which does not accurately recreate the desired stimulus.

The studies which compare imagery procedures with procedures using real stimuli cannot investigate the role of imagery directly. A comparison showing that imagery techniques are as effective as other techniques does not prove that imagery is a functional component of the technique because it cannot discount the alternative hypothesis that some other variable is responsible for the effectiveness of both procedures. Similarly, a comparison showing differences in effectiveness can investigate the role of imagery only if all other variables are controlled, a circumstance which is difficult to achieve.

Studies investigating the relationship between image quality and outcome of treatment rest on the assumption that images which are very similar to the perception of the desired stimulus will be more effective than images which are dissimilar to the desired stimulus either in terms of quality or content. These studies directly investigate the role of imagery in imagery techniques and make it possible to systematically control other variables which may influence treatment outcome.

The psychotherapy technique in which the role of imagery has been most thoroughly investigated is systematic desensitization (SD). As Paul (1966) has pointed out, SD is not one technique but a collection of similar techniques based on Wolpe's original procedure. Despite the extensive debate concerning the process or processes responsible for the effects of SD, the effectiveness of SD is not

questioned. SD is probably the most thoroughly researched psychotherapeutic technique and has been empirically demonstrated to be effective.

Yates (1975) presented an increasingly common view when he wrote:

> The original technique of systematic desensitization was precisely, if complexly, specified. Over the years, however, each and every one of the components of systematic desensitization have been shown to be neither necessary nor sufficient--like the Cheshire cat left with only its smile, systematic desensitization seems to work, but there seems to be no component parts that cannot be removed, and the technique will then fail or be significantly reduced in its efficiency. . . . (can) we then continue to accept that we are dealing with a form of therapy that can be meaningful called systematic desensitization . . .? . . . (A) major reappraisal would appear to be required.

During the past five years the theoretical underpinnings of SD have been under a continuous assault and increasingly authors have suggested that it may be no more than a singularly effective placebo. However, in a recent review of the role of non-specific treatment factors in SD, Kazdin and Wilcoxon (1976) discuss a number of methodological flaws common to much of the SD research which raise questions concerning the validity and generalizability of many of the findings.

As is true of much psychological research, research on SD has generally relied on undergraduate college students as Ss because of their availability and convenience. Unfortunately, it has been discovered that undergraduates with fears of small animals, tests, and public speaking bear little resemblance to persons with clinical phobias (Olley & McAllister, 1975) and there is no evidence to

support the common practice of generalizing findings based on undergraduate Ss to the treatment of persons with clinical phobias.

Also much research on SD has attempted to control for placebo effects by comparing SD with a pseudotherapy or attention placebo. A series of studies (Borkovec & Nau, 1972; Nau, Caputo, & Borkovec, 1974; McGlynn & McDonnel, 1974) has demonstrated that SD, pseudotherapies, and attention placebos are not equally credible and that SD is consistently more credible than most procedures used to control for placebo effects. These findings suggest that placebo effects were not adequately controlled and that superior outcomes of SD could be due to placebo effects. Since the credibility of treatments was typically not assessed it is impossible to judge the importance of this flaw without further research.

Another methodological flaw which is present in many studies but which is rarely discussed is the unwitting use of control groups which may have therapeutic effects. An example of this appears in a study by McGlynn and McClaren (1975) where the treatment designed to control for non-specific effects consisted of visualization of pleasant imagery. It was assumed that, since the treatment included neither phobic imagery nor relaxation training, it was inert. However, research has demonstrated that visualization of pleasant images can be used to reduce pain, discomfort, and anxiety (Horan, Layling & Pursell, 1976; Horan, 1973). Thus though McGlynn and McClaren (1975) interpreted the lack of a significant difference in outcome between treatment groups as evidence that placebo effect were responsible for decreases in avoidance

behavior it is quite possible that all treatments had specific, though different, therapeutic effects. This type of flaw leads to misinterpretation of results primarily when there is no significant difference between control and treatment groups.

The three methodological flaws discussed could result in a lack of generalizable findings, false positive results, and false negative results. Though the research on SD is voluminous much of it is of doubtful value and is best regarded as merely suggestive (Kazdin & Wilcoxon, 1976). Little is definitely known about SD but that it works for a range of problems.

The reciprocal inhibition theory of SD postulates that muscle relaxation or some other inhibitory response is essential for SD to be effective and early studies supported this view (Yates, 1970, 1974). More recently, SD has been found to be effective with or without relaxation training with both undergraduate subjects (Crowder & Thornton, 1970; Water, McDonald, & Koresko, 1972; Waters & McDonald, 1973; Henkel & Bastine, 1972) and clinical phobics (Agras, et al., 1971; Craighead, 1973). Some studies with undergraduate Ss have found that muscle tension is an effective as muscle relaxation (Proctor, 1969; Sue, 1972) but other studies have suggested that, while muscle relaxation is not essential, it facilitates SD (Nawas, Welsh, & Fishman, 1970; Matthews, 1971).

Muscle relaxation, as used in SD, resembles the conditions of reduced sensory stimulation which have been found to increase the vividness of imagery in other situations (Singer, 1973) and it has been suggested that relaxation functions in this way in SD.

Wolpe and Flood (1970), Van Egeren, Feather, Hein (1971), Van Egeren (1970), and Chapman and Feather (1971) found that relaxed Ss had stronger physiological responses to phobic imagery than non-relaxed Ss and this may indicate that the images were more vivid or realistic for relaxed Ss. Wolpin and Kirsh (1974) found that relaxation affected the quality of the imagery by making the images more benevolent and increasing the Ss' feeling of involvement but a previous study (Henkel & Bastine, 1972) found that relaxation did not affect image quality.

The role assigned to construction of a hierarchy of phobic scenes was central in Wolpe's original formulation of SD because it was theoretically important that the client not experience anxiety intense enough to overcome the inhibitory effect of relaxation. The research in this area clearly implies that the construction of a hierarchy is unnecessary (Yates, 1975) but the research is inconclusive because all of the studies reviewed by Yates (1975) used undergraduate Ss rather than clinical phobics. The research shows that hierarchies are unnecessary with undergraduates with subclinical fears but generalization to clinical populations is of doubtful validity. Clinically, proceeding through a graduated hierarchy of phobic scenes minimizes clients' negative emotional reactions to treatment and decreases the probability of their terminating therapy prematurely (Bandura, 1969).

With the mounting evidence that the theory of reciprocal inhibition could not adequately explain SD and that none of the components of SD were necessary or sufficient, it has been

visualize hierarchy scenes do not respond to SD (Lazarus, 1964), and difficulty experiencing vivid imagery has been considered a major cause of failure of SD (Darwin & McBreaty, 1969; Richardson, 1972; Wolpe and Lazarus, 1966). In his discussion of the treatment of phobias Marks (1969) suggests that inability to obtain images, dissociation of anxiety from phobic imagery, or dilution or intensification of the phobic value of imagery will result in failure of SD. Clinical reports that some clients who are unable to experience phobic imagery and thus do not respond to SD respond well to "in vivo" desensitization (Bonem, 1976) suggest that imagery does serve a functional role in SD. However, many of the studies which have directly investigated the role of imagery (Davis, McLemore, & London, 1970; McLemore, 1971; Beere, 1971; Hyman, 1973) have not supported this hypothesis.

In the first reported empirical research on this topic Davis, McLemore, and London (1970) investigated the relationship between a measure of "visual imagery ability" and outcome of SD. This study found a non-significant relationship between "visual imagery ability" and a behavior change score with pre-therapy performance controlled; however, a number of methodological flaws make the results uninterpretable. The "visual imagery ability" measure used actually measured the relative dominance of imagery in the visual modality over imagery in other sensory modalities rather than the ability to experience vivid visual imagery on request. Also, the subjects were self-selected from a larger pool of Ss who had previously undergone SD and it is possible

use memory without imagery. In a second portion of this study Sheehan (1966a) investigated the possibility that differential demand characteristics confounded his findings and once again found that reproduction of geometric patterns by Ss who reported vivid images was more accurate than the performance of Ss who reproduced the pattern from memory without using imagery. Further research into the role of image vividness in this type of task and into the processes involved has supported the belief that images can be used to reproduce stimuli and that this use of imagery results in a significant change in performance (Marks, 1972).

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As is true of much psychological research, research on SD has generally relied on undergraduate college students as Ss because of their availability and convenience. Unfortunately, it has been discovered that undergraduates with fears of small animals, tests, and public speaking bear little resemblance to persons with clinical phobias (Olley & McAllister, 1975) and there is no evidence to

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Another methodological flaw which is present in many studies but which is rarely discussed is the unwitting use of control groups which may have therapeutic effects. An example of this appears in a study by McGlynn and McClaren (1975) where the treatment designed to control for non-specific effects consisted of visualization of pleasant imagery. It was assumed that, since the treatment included neither phobic imagery nor relaxation training, it was inert. However, research has demonstrated that visualization of pleasant images can be used to reduce pain, discomfort, and anxiety (Horan, Layling & Pursell, 1976; Horan, 1973). Thus though McGlynn and McClaren (1975) interpreted the lack of a significant difference in outcome between treatment groups as evidence that placebo effect were responsible for decreases in avoidance

behavior it is quite possible that all treatments had specific, though different, therapeutic effects. This type of flaw leads to misinterpretation of results primarily when there is no significant difference between control and treatment groups.

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The reciprocal inhibition theory of SD postulates that muscle relaxation or some other inhibitory response is essential for SD to be effective and early studies supported this view (Yates, 1970, 1974). More recently, SD has been found to be effective with or without relaxation training with both undergraduate subjects (Crowder & Thornton, 1970; Water, McDonald, & Koresko, 1972; Waters & McDonald, 1973; Henkel & Bastine, 1972) and clinical phobics (Agras, et al., 1971; Craighead, 1973). Some studies with undergraduate Ss have found that muscle tension is an effective as muscle relaxation (Proctor, 1969; Sue, 1972) but other studies have suggested that, while muscle relaxation is not essential, it facilitates SD (Nawas, Welsh, & Fishman, 1970; Matthews, 1971).

Muscle relaxation, as used in SD, resembles the conditions of reduced sensory stimulation which have been found to increase the vividness of imagery in other situations (Singer, 1973) and it has been suggested that relaxation functions in this way in SD.

Wolpe and Flood (1970), Van Egeren, Feather, Hein (1971), Van Egeren (1970), and Chapman and Feather (1971) found that relaxed Ss had stronger physiological responses to phobic imagery than non-relaxed Ss and this may indicate that the images were more vivid or realistic for relaxed Ss. Wolpin and Kirsh (1974) found that relaxation affected the quality of the imagery by making the images more benevolent and increasing the Ss' feeling of involvement but a previous study (Henkel & Bastine, 1972) found that relaxation did not affect image quality.

The role assigned to construction of a hierarchy of phobic scenes was central in Wolpe's original formulation of SD because it was theoretically important that the client not experience anxiety intense enough to overcome the inhibitory effect of relaxation. The research in this area clearly implies that the construction of a hierarchy is unnecessary (Yates, 1975) but the research is inconclusive because all of the studies reviewed by Yates (1975) used undergraduate Ss rather than clinical phobics. The research shows that hierarchies are unnecessary with undergraduates with subclinical fears but generalization to clinical populations is of doubtful validity. Clinically, proceeding through a graduated hierarchy of phobic scenes minimizes clients' negative emotional reactions to treatment and decreases the probability of their terminating therapy prematurely (Bandura, 1969).

With the mounting evidence that the theory of reciprocal inhibition could not adequately explain SD and that none of the components of SD were necessary or sufficient, it has been

increasingly suggested that behavior change following SD is due to non-specific (placebo) effects, specifically the client's expectancy of change. Much research has been conducted in this area but Kazdin and Wilcoxon (1976) found that almost all of the studies used control procedures which are less credible than SD and/or used undergraduate Ss who may be more susceptible to placebo effects than clinical Ss. The conclusion they reached after an extensive review was:

> The most parsimonious explanation of the results would seem to be that systematic desensitization includes a specific therapeutic ingredient which accounts for change. . . . However, when the different investigations of desensitization are examined, it appears that the results still do not unambiguously rule out non-specific treatment effects as a rival hypothesis (Kazdin & Wilcoxon, 1976).

Of the various components, procedural variations, and theoretical explanations of SD which have been investigated, none have been found to be consistently related to the outcome of SD. Indeed, the at least occasional successes of implosive therapy and flooding procedures which resemble SD only in their use of phobic imagery argue that the effective component of SD is imagery, a conclusion reached by Wilkins (1971, 1972) and supported by Singer (1973).

All of the theories concerning specific treatment effects of SD treat phobic imagery as interchangeable with real stimuli. The ability to experience vivid images of phobic stimuli on request is considered necessary for SD to be successful (Lazarus, 1964; Paul, 1966). Clients who report that they are unable to

visualize hierarchy scenes do not respond to SD (Lazarus, 1964), and difficulty experiencing vivid imagery has been considered a major cause of failure of SD (Darwin & McBreaty, 1969; Richardson, 1972; Wolpe and Lazarus, 1966). In his discussion of the treatment of phobias Marks (1969) suggests that inability to obtain images, dissociation of anxiety from phobic imagery, or dilution or intensification of the phobic value of imagery will result in failure of SD. Clinical reports that some clients who are unable to experience phobic imagery and thus do not respond to SD respond well to "in vivo" desensitization (Bonem, 1976) suggest that imagery does serve a functional role in SD. However, many of the studies which have directly investigated the role of imagery (Davis, McLemore, & London, 1970; McLemore, 1971; Beere, 1971; Hyman, 1973) have not supported this hypothesis.

In the first reported empirical research on this topic Davis, McLemore, and London (1970) investigated the relationship between a measure of "visual imagery ability" and outcome of SD. This study found a non-significant relationship between "visual imagery ability" and a behavior change score with pre-therapy performance controlled; however, a number of methodological flaws make the results uninterpretable. The "visual imagery ability" measure used actually measured the relative dominance of imagery in the visual modality over imagery in other sensory modalities rather than the ability to experience vivid visual imagery on request. Also, the subjects were self-selected from a larger pool of Ss who had previously undergone SD and it is possible

that the sample was biased in unknown ways. Finally, even if the findings were valid, since the Ss were undergraduates with sub-clinical fears, the findings may not generalize to clinical SD.

In an effort to overcome the problems caused by the use of an unvalidated measure of imagery and a possibly biased sample of Ss, McLemore (1971) conducted another study with undergraduate Ss in which he used four subscales from Sheehan's (1967) short form of Betts' Questionnaire Upon Mental Imagery (QMI) and Gordon's Control of Visual Imagery Questionnaire (CVIQ) (Richardson, 1969) as measures of imagery. Though he did not find a significant relationship between imagery measures and outcome of SD it is extremely doubtful that these findings can be generalized to any population because the Ss' fears were so mild that they responded well to two "therapy" sessions totaling 60 minutes of taped SD. Also, the "trait" scores obtained from the QMI and CVIQ are not good predictors of imagery experienced during SD (Beere, 1971). Thus the lack of a significant relationship between the "trait" measures and outcome of SD does not imply lack of a relationship between imagery experienced during SD and outcome.

In a test of London's hypothesis that the crucial variable in both SD and implosive therapy is the elicitation of vivid imagery, Beere (1971) examined the relationship between image vividness and controlability and outcome of SD. In this well controlled study he found no significant relationship between either QMI and CVIQ scores or the reported vividness of imagery during SD and the outcome of SD.

Beere found that QMI scores predicted vividness of neutral images during SD but did not predict vividness of phobic images. He hypothesized that reported vividness of imagery was a function of ability to image vividly and the anxiety-potential of the images requested, that Ss capable of imaging vividly avoided anxiety by producing less vivid images of phobic scenes. While this could explain some of Beere's findings it is puzzling that reported image vividness was significantly related to reports of anxiety but not significantly related to outcome of SD. It is possible that, since this was an analog study, non-specific treatment effects masked specific treatment effects, but it is also possible to interpret Beere's findings as indicating that imagery is not functionally related to the outcome of SD.

Gaupp (1972) conducted a study which was virtually a replication of Beere's (1971) but found that pretest QMI scores did predict outcome of SD. In an analog study with Ss with an intense fear of crawling insects he found that Ss with high image vividness scores showed more behavioral, physiological, and cognitive change than Ss with low image vividness scores following SD. Vivid imagers found it more difficult to visualize phobic imagery than neutral images but consistently experienced less difficulty visualizing and controlling stimuli than weak imagers. It is not at all clear why Gaupp's (1972) findings were positive while Beere's (1971) were negative. The procedures used were not identical and the Ss differed in type of fear so a direct comparison between the two studies is not possible.

In a comparison of the relative effectiveness of SD and SD plus focusing instructions on math anxiety in high-school students Hyman (1973) administered an image vividness rating scale following each treatment session. She reports a near-significant correlation between reported image vividness and outcome of SD. She also found that SD Ss reported visualization of extraneous images and reports a non-significant trend for the occurrence of extraneous images to interfere with treatment.

In a direct test of the hypothesis that image vividness is directly related to the outcome of SD but is not related to the outcome of "in vivo" desensitization, McSweeney (1975) used five pretest measures of image vividness and controlability with volunteer Ss with public speaking anxiety. No significant relationship was found between any one imagery measure and outcome, but a significant cannonical correlation was found between all five imagery measures and outcome measures. This suggests that while no one measure was a good predictor of outcome of SD a linear combination of several measures is a good predictor. This may possibly indicate that neither image vividness nor image controlability alone is the crucial variable in SD but that the two, in combination, are crucial.

Imagery also serves as a stimulus in the covert conditioning techniques--covert reinforcement (COR) (Cautela, 1970b), covert sensitization (Cautela, 1967), covert extinction (Cautela, 1971), covert negative reinforcement (Cautela, 1970a), covert modeling (Cautela, 1976) and covert response cost (Cautela, 1976).

These techniques are based theoretically on principles of operant conditioning which have been demonstrated in the laboratory and rest on the assumption that appropriate imagery is an adequate substitute for overt stimuli, behavior, and consequences (Cautela, 1973). The assumption that imaging of appropriate stimuli is necessary and sufficient for behavior change has been tested in research with COR.

The procedure of COR involves selection of the response to be increased, selection of appropriate reinforcers, and imaginal presentation of the response to be increased followed by imaginal presentation of a reinforcer (Cautela, 1970b). It is assumed that the parameters which are important in positive reinforcement such as the temporal relationship between response and reinforcement, magnitude of reinforcer and schedule of reinforcement play the same role in COR as in operant reinforcement. Reinforcement is made immediately contingent upon imaging of the response, several of the most powerful available reinforcers are used to avoid satiation, and a continuous reinforcement schedule is used.

Research on the role of imagery in COR can be divided into three general types: analog studies in which imagery is used to reinforce overt behavior, analog studies in which imagery is used to reinforce covert behavior, and clinical analog studies in which imagery is used to reinforce covert behavior, and clinical analog studies in which imagery is used to reinforce approach towards phobic stimuli or relaxation in phobic situations. Since all of these studies are analog studies using either analog tasks

or sub-clinical behavior problems the generalizability of the results can be questioned.

Cautela, Steffan, and Wish (cited in Scott and Rosensteil, 1976) used COR to reinforce overestimates or underestimates in a circle size estimation task. COR resulted in the predicted changes in size estimates while there was no change without reinforcing images or with non-contingent covert reinforcement. However, the word "reinforcement" alone also resulted in significant behavior change. Tondo and Cautela (1974) used COR with the same circle estimation task and found that pretest scores on the Imagery Survey Schedule predicted both ratings of imagery during COR and differential outcome of COR.

Steffan (1971) used COR to investigate the Greenspoon effect in hospitalized patients diagnosed as schizophrenics. In this well controlled study he found that COR of plural nouns resulted in a significant increase in the number of plural nouns. Neither non-contingent covert reinforcement or contingent presentation of "scene," the cue for reinforcement, without reinforcement resulted in an increase in significant change. In a similar study Ascher (1973) found that COR produced a significant increase in the probability of use of a reinforced pronoun which varied directly with the number of times each pronoun was reinforced. Asher (1973) also found that, during an extinction period, the probability of reinforced pronouns decreased but did not return to baseline.

Krop, Messinger, and Reiner (cited in Scott and Rosensteil, 1976) used COR to increase eye contact during an anxiety arousing interview by having Ss image a pleasant scene following five or more seconds of eye contact. The COR group differed significantly from non-contingent reinforcement and no reinforcement control groups immediately post-treatment but did not differ from the other two groups on a one-week follow up.

Baron (1975) investigated the importance of quality and duration of imagery in COR using a two-choice key pressing task where signals for reinforcement were presented on a VI-10 schedule for each key. The results indicated that higher quality images produced significantly higher response rates and that longer image durations produced significantly higher response rates. Overt reinforcement and overt plus covert reinforcement were equally effective and both were significantly more effective than the signals for reinforcement alone.

In the studies which have investigated the effect of COR on covert responses the experimenters have attempted to modify attitudes towards the mentally retarded and to modify self-concept in institutionalized Ss. Cautela, Walsh, and Wish (1971) had Ss imagine a "mentally retarded" person and then imagine a pleasant scene. They found a significant positive change in experimental Ss' attitudes towards the mentally retarded in comparison with Ss who imagined a mentally retarded person without any pleasant imagery. It is difficult to explain these results in terms of operant conditioning (Scott and Rosensteil, 1976) because Ss were

reinforced simply for imaging a retarded person, not for expression of positive attitudes. An alternative explanation is that classical conditioning occurred due to the pairing of the image of a retarded person with a pleasant scene and resulted in the attitude change. It is also quite possible that the objective of the experimental manipulation was apparent to Ss and that this biased the results.

Krop, Calhoon, and Verrier (1971) and Krop, Perez, and Beaudoin (1973) have used COR to modify the "self-concepts" of institutionalized Ss. Krop et al. (1971) used children with behavior disorders as Ss and compared COR with overt reinforcement and no reinforcement while Krop et al. (1973) used male psychiatric patients as Ss and compared COR with overt reinforcement and non-contingent pleasant imagery. In both studies the COR and overt reinforcement Ss were reinforced following "positive self-concept" responses to items from a self-concept scale. Though positive results were obtained in both studies it is apparent that overt responses to self-concept scale items were reinforced and that any link between these behaviors and the covert responses which constitute self-concept is purely hypothetical.

The majority of COR clinical analog studies have simply been outcome studies or have tested theoretical conceptualizations of COR and do not bear directly on the role of imagery in COR. A number of studies have been reported which question the effects of COR and challenge the simple operant conditioning paradigm of COR (Bajtelsmit and Gershman, 1976). However,

those studies which have investigated the role of imagery in COR have supported the assumption that imagery serves a functional role in COR.

The other therapy techniques which rely on the stimulus properties of imagery have been supported by clinical case studies and some outcome research (Cautela, 1976, 1970a, 1971, 1976). However, the role of imagery in these techniques has not been investigated directly. The assumption that imagery can substitute for stimuli in psychotherapy techniques receives mixed support in research on SD and COR and has not been tested with other therapy techniques.

Of the eight studies which have investigated the role of imagery, four have found a significant relationship between image quality and treatment outcome (Gaupp, 1972; Tondo & Cautela, 1974; McSweeney, 1975; Baron, 1975) and four studies have failed to find such a relationship (Davis, McLemore, & London, 1970; McLemore, 1971; Beere, 1971; Hyman, 1973). Two of the studies with negative findings (Davis, McLemore, & London, 1970; McLemore, 1971) suffer from methodological flaws which may invalidate their results. However, the failure of Beere (1971) and Hyman (1973) to find a significant relationship suggests that the relationship between image quality and behavior change is not robust.

The Determinants of the Stimulus-Value of Mental Imagery

The variables which have been most commonly seen as determinants of the stimulus-value of imagery are the stimulus-value of the stimulus being imaged and the vividness and controlability of the image experienced.

The stimulus-value of the stimulus being imaged is an obvious determinant of the stimulus-value of the image. A number of studies reported earlier (Matthews, 1971; Wolpe & Flood, 1970; Van Egeren, 1970; Van Egeren, Feather, & Hein, 1971; Chapman & Feather, 1971; Marks & Huson, 1973; Haney & Euse, 1976; May, 1977; Craig, 1968) have found that Ss' subjective and physiological responses to images are qualitatively similar to Ss' responses to the actual stimuli. However, in all of the studies investigating the role of imagery as a stimulus in psychotherapy, the stimuli imaged have been standardized and S differences in response to the stimuli being imaged have not been investigated.

Of the variables which may influence the stimulus-value of imagery, the most thoroughly investigated has been individual differences (IDs) in the ability to experience imagery.

IDs occur both in the type of imagery experienced and in the characteristics of the images experienced. The types of imagery used in psychotherapy are commonly classified as memory images and imagination images and, of the many dimensions along which images may vary, the dimensions which have been most

thoroughly researched are sensory modality, vividness, and controlability.

During the long search for a suitable typology for classifying persons according to their experiences of imagery, IDs in the sensory modality in which imagery was experienced were long considered important. IDs in the predominant modality in which imagery is experienced have been reported consistently and a typology of habitual visualizers versus habitual verbalizers has been proposed and supported by some research (Richardson, 1969). However, Sheehan's finding (1967) that ratings of image vividness in various sensory modalities were highly correlated within subjects has cast doubt on the value of this categorization. Lindauer's conclusion that reports of predominant modality are based on preference rather than ability and that such a typology is irrelevant to tasks such as SD where a specific image is requested (Sheehan, 1972) is widely accepted.

The most heavily researched area of IDs in imagery has been IDs in image vividness, the degree to which the intensity of an image matches the intensity of the stimulus imaged. IDs in reports of image vividness have been related to performance on a number of cognitive and perceptual tasks, sometimes with mixed results.

For example, Fusella (1973) found that "inner-acceptant" Ss who reported high image vividness and scored high on two cognitive variables were significantly more susceptible to the Perky effect than Ss who scored low on all three variables but

that ratings of the vividness of individual images did not correlate significantly with accuracy of signal detection. This contradicts the findings of a number of studies of the use of imagery to increase accuracy of reconstruction of geometric patterns (Sheehan, 1966, 1972; Sheehan & Neisser, 1969; Neisser, 1972; Marks, 1972). These studies found significant correlations between ratings of image vividness and accuracy within Ss but not between Ss. Neisser (1972) has suggested that, in many tasks, the image may serve as a discriminative stimulus and that, in these cases, the vividness of the imagery is irrelevant as long as the image is perceptible. Marks (1973), on the other hand, suggests that Neisser's conclusions are based on studies which produce atypical results because the task used was low in meaningfulness, interest, and affect and because a score for image vividness across modalities was used with a purely visual task. In his research using a picture recall task somewhat higher in meaningfulness, interest, and affect than the geometric figures used previously, he found that persons scoring high in vivid visual imagery performed consistently better than Ss scoring low on vividness.

In an investigation of physiological responses to phobic imagery, Lang, Melamed, and Hart (1970) found significant correlations between reported image vividness and physiological responses to phobic imagery. These correlations, ranging from .52 to .88, not only were significant but also accounted for a sizeable portion, 1/4 to 1/2, of the variance of the physiological

responses. This suggests that vivid images function more effectively as phobic stimuli than dim images.

The investigation of IDs in image controlability, the degree to which a stimulus can be imaged at will, maintained in consciousness, and purposely modified, was begun by Gordon (1949). Her research on the relationship between image controlability and ethnic stereotypes and her investigation of the relationship between imagery control and perceptual control (Gordon, 1950) demonstrated the importance of IDs in image controlability. A series of studies has shown that Ss who report voluntary control over mental imagery report greater control over the rate of reversal of a Necker cube and some studies have found that controlled imagers performed significantly better on the Stroop-Color Word Test (Richardson, 1972).

Many researchers investigating mental practice have suggested that IDs in image vividness and controlability play a part in explaining IDs in improvement under mental practice conditions. In a study designed to investigate this hypothesis Richardson and Start (1964) had male Ss practice a gymnastic movement mentally using visual and kinesthetic imagery and measured actual performance after a week of mental practice. It was found that Ss with vivid, controlled imagery performed significantly better than Ss with vivid, uncontrolled imagery and that the relationship obtained could not be explained in terms of gymnastic ability. Unfortunately, the possibility of differential motivation between groups was not ruled out completely so that while this research supports

the relevance of IDs in imagery control to uses of imagery, it is not conclusive (Richardson, 1972).

Though image vividness and image controlability are theoretically distinct dimensions of ID's in imagery experience they are not empirically distinct (Lane, 1974). Reports of image vividness and image controlability tend to correlate significantly in normal Ss (Sheehan, 1972) and pretest measures of ability to experience vivid imagery and ability to experience controlled imagery correlate significantly both because of this relationship and because of test characteristics (Lane, 1974). For this reason pretest measures of image vividness and image controlability were considered as joint predictors of image quality in this study and S ratings of the vividness and controlability were combined into a composite report of image quality.

In seven of the eight studies investigating the stimulus-value of imagery in psychotherapy, questionnaires which assess the Ss' ability to experience vivid or controlled imagery have been used as a predictor of image quality (Davis, McLemore, & London, 1970; McLemore, 1970; Beere, 1971; Gaupp, 1972; Hyman, 1973; Tondo & Cautela, 1974; McSweeny, 1975). Both Beere (1971) and Hyman (1973) found that these "trait" measures were good predictors of the quality of neutral or pleasant imagery but were not good predictors of the quality of aversive imagery.

Several authors (Beere, 1971; Wilkins, 1971; Reyher, 1976) have suggested that variables other than ability to experience vivid, controlled imagery also determine the image quality.

The following variables may be determinants of the image quality and thus be determinants of the stimulus-value of imagery: tendency to avoid aversive stimulation, level of relaxation or anxiety, sex of S, complexity of the stimulus being imaged, amount of imagery practice, trait anxiety, neuroticism, introversion, and openness to imagery and related phenomena. Of these variables the two which have been suggested most often as important determinants of image quality are tendency to avoid aversive stimulation and degree of relaxation or anxiety.

Beere (1971) has suggested that Ss image aversive stimuli less vividly to avoid aversive stimulation, and Reyher (1976) has suggested that Ss' defense mechanisms may block imagery, decrease image vividness, transform imagery, or disassociate imagery from affect. Both views suggest that S differences in response to aversive stimulation may influence image quality.

On a clinical level it is obvious that individuals respond differently to aversive situations. Some persons avoid them strenuously, some tolerate them but experience great subjective discomfort, and some persons seek out aversive situations in "counterphobic" behavior.

On an empirical level Rona et al. (1976) and Lazarus and Alfert (1969) have found that pretest measures of Ss' tendency to respond to aversive stimulation by cognitively approaching or avoiding the stimulation predicted subjective and physiological responses to a stressor. Other research has shown that this measure, Byrne's Repression-Sensitization Scale (Byrne, 1961),

predicts differences in magnitude of subjective estimates of the magnitude of aversive stimulation (Lazarus & Alfert, 1969), and Ss position on the repressor-sensitizer dimension predicts differences in recall of stimuli associated with aversive stimulation (Lazarus & Longo, 1953). The hypothesis that Ss respond to aversive imagery in the same way as they respond to aversive stimuli leads to the conclusion that S differences in response to aversive imagery should correspond to S differences in response to aversive stimuli. This conclusion is supported by a study of physiological responses to positive, negative, and neural imagery by Haney and Euse (1976). The authors interpret their finding that Ss reported positive and neutral imagery to be clearer than negative imagery as supporting the hypothesis that anxiety is a mediator of image clarity (Haney & Euse, 1976; Euse & Haney, 1975).

If, as Wolpe (1970) hypothesizes, relaxation inhibits subjective and autonomic responses to aversive images it is possible that relaxation moderates the hypothesized tendency to avoid aversive images. While this possibility has not been investigated empirically, the common finding that relaxed Ss experience stronger responses to aversive stimuli than non-relaxed Ss (Wolpe & Flood, 1970; Van Egeren, 1970; Van Egeren, Feather, & Hein, 1971; Chapman & Feather, 1971) is compatible with the hypothesis that relaxation suppresses avoidance of imagery.

Bandura (1977) suggests a model of the relationship between level of arousal and response to arousing stimuli which combines the hypothesis that relaxation inhibits arousal with the hypothesis

that relaxation inhibits avoidance of the arousing stimulus. He predicts a curvilinear relationship where a high level of arousal leads to behavioral and/or cognitive avoidance of an arousing stimulus and thus to little additional arousal, where a moderate level of arousal leads to little avoidance and a large increase in arousal, and where a low level of arousal also leads to little avoidance of the stimulus but leads to a smaller increase in arousal. This suggests that it may be possible to maximize or minimize response to arousing stimuli by manipulating the Ss level of arousal.

It has been hypothesized that relaxation influences the vividness and controlability of imagery directly. Singer (1973) reports that muscle relaxation produces conditions similar to the conditions of reduced sensory stimulation which have been found to increase image vividness. The previously reported finding (Wolpe & Floor, 1970; Van Egeren, 1970; Van Egeren, Feather, & Hein, 1971; Chapman & Feather, 1971) that relaxed Ss experience stronger physiological responses to aversive imagery could also be explained by the hypothesis that relaxation resulted in more vivid, controlled images. While some form of relaxation is commonly used with many imagery techniques, the effects of S differences in depth of relaxation have not been investigated directly.

Three variables clearly should influence the level of relaxation or anxiety experienced by Ss during therapeutic procedures using mental imagery: Ss' ability to relax, relaxation instructions, and the stimulus-value of the stimulus being imaged.

Relaxation is commonly conceptualized as a skill which can be learned through guided practice (Bernstein & Borkovec, 1973). Wide individual differences in the depth of relaxation both before and after training have been noted (Bernstein & Borkovec, 1973) but have not been fully investigated. These ID's will directly influence the level of relaxation or anxiety experienced by each S during imagery techniques.

Since relaxation is conceptualized as a behavior under Ss' voluntary control, the instructions Ss receive concerning relaxation should directly influence the level of relaxation or anxiety. The effects of relaxation instructions within Ss has not been clearly investigated but the assumption that Ss relax, insofar as possible, when instructed to relax is commonly made.

The assumption is commonly made that relaxation and anxiety are mutually inhibitory. It has been clearly shown that relaxation decreases anxiety and autonomic arousal (Bernstein & Borkovec, 1973) and clinical experience suggests that intense anxiety or autonomic arousal inhibit relaxation. Since phobic imagery has been found to result in physiological and psychological arousal it is possible that this arousal inhibits Ss' relaxation.

Summary

Research into the stimulus properties of mental imagery has supported the hypothesis that mental images can function as stimuli in a variety of tasks and settings. Physiological and

subjective responses to mental images are qualitatively similar to responses to the stimuli imaged, responses to mental images reliably discriminate between images of phobic stimuli and images of neutral stimuli, and images of complex patterns of stimuli can be used to facilitate reconstruction of the stimulus pattern.

However, studies directly investigating the role of imagery in psychotherapy techniques based on the stimulus properties of mental imagery have not produced clear support for the hypothesis that mental images are a functional component of these therapy techniques. Theoretically the vividness and controlability of imagery should be directly related to the stimulus-value of the images and thus to treatment outcome yet tests of this hypothesized relationship have produced mixed results.

It has been suggested that the lack of clear support for the importance of imagery is a result of the stimulus-value of mental imagery being multiply determined, that the pretest measures of image vividness and controlability which have commonly been used are not good predictors of the stimulus-value of mental imagery. Investigation of determinants of the stimulus-value of mental imagery is needed to clarify the role of mental imagery in these psychotherapy techniques.

HYPOTHESES

This study investigates the hypothesis that the stimulus-value of mental imagery is multiply determined. More specifically it is hypothesized that:

1. The stimulus-value of a mental image is determined by the stimulus-value of the stimulus imaged, the quality of the experienced image, and the level of relaxation or anxiety.

2. The quality of the experienced image is determined by imagery ability, level of relaxation or anxiety, tendency to avoid aversive stimuli, and the stimulus-value of the experienced image.

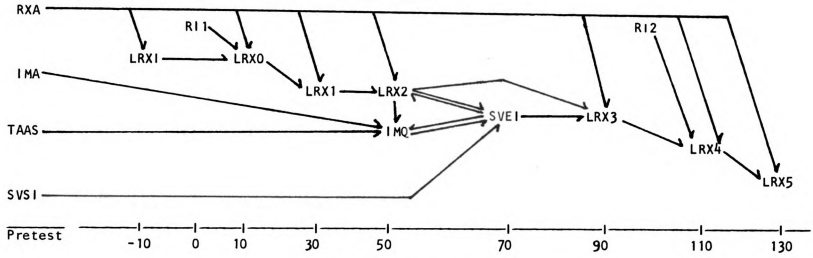
3. The level of relaxation or anxiety while imaging a stimulus is determined by the initial level of relaxation, relaxation ability, and the stimulus-value of the experienced image.

4. In the absence of stimulation the experienced level of relaxation is determined by the initial level of relaxation, relaxation ability, and relaxation instruction.

In this study Relaxation Ability, Imagery Ability, the Stimulus-Value of the Stimulus Imaged, and Tendency to Avoid Aversive Stimuli were measured before imagery trials. The level of relaxation was measured three times before imaging a stimulus, twice while imaging a stimulus, and twice after imaging a stimulus. Image Quality and the Stimulus Value of the Experienced Image were measured while imaging the stimulus and Relaxation Instructions before and after imaging the stimulus were varied from trial to

trial. The hypothesized pattern of relationships between these variables in shown in Figure 1. The operationalization and measurement of these variables is discussed in the subsequent Measures section.

These hypotheses predict a specific pattern of causal relationships which implies a pattern of correlations between variables. The hypothesized pattern of causal relationships is shown in Figure 2 and the implied pattern of correlations are shown in Figure 3.



Exogenous Variables:

RXA - Relaxation Ability
IMA - Imagery Ability
TAAS - Tendency to Avoid Aversive Stimuli
SVSI - Stimulus-Value of Stimulus Imaged
RI1 - Relaxation Instructions #1
RI2 - Relaxation Instructions #2

Endogenous Variables:

LRXI - Initial Level of Relaxation
LRX0 - Level of Relaxation following RI1
LRX1 - Level of Relaxation before imaging stimulus
LRX2 - Level of Relaxation following onset of image
IMQ - Image Quality
SVEI - Stimulus-Value of Experienced Image
LRX3 - Level of Relaxation before termination of image
LRX4 - Level of Relaxation following RI2
LRX5 - Level of Relaxation at end of trial

Figure 1. Hypothesized Causal Model.

From / To	RXA	IMA	TAAS	TVSI	RI1	RI2	LRXI	LRXO	LRX1	LRX2	SVEI	IMQ	LRX3	LRX4	LRX5
RXA															
IMA															
TAAS															
SVSI															
RI1															
RI2															
LRXI	1														
RLXO	1				1		1								
LRX1	1							1							
LRX2	1								1		1				
SVEI				1						1		1			
IMQ		1	1							1	1				
LRX3	1									1	1				
LRX4	1					1							1		
LRX5	1													1	

Figure 2. Hypothesized Direct Effects.

To \ From	RXA	IMA	TAAS	SVSI	RI1	RI2	LRXI	LRXO	LRX1	LRX3	SVEI	IMQ	LRX3	LRX4	LRX5
RXA	1						+	+	+	+			+	+	+
IMA		1										+			
TAAS			1									+			
SVSI				1							+				
RI1					1			+							
RI2						1								+	
LRXI	+						1	+							
LRXO	+				+		+	1	+						
LRX1	+							+	1	+					
LRX2	+								+	1	+	+	+		
SVEI				+						+	1	+	+		
IMQ		+	+							+	+	1			
LRX3	+									+	+		1	+	
LRX4	+					+							+	1	+
LRX5	+													+	1

Figure 3. Correlations Predicted on the Basis of Direct Effects.

METHOD

Overview of the Procedure

The hypotheses predict a pattern of relationships among fifteen variables. In order to test the hypotheses volunteer Ss were recruited, variables conceptualized as consistent traits or response tendencies were assessed by paper-and-pencil tests and inventories, and variables specific to the setting or to the experienced image were measured in experimental sessions which resembled, in some ways, the procedures commonly used with imagery-based psychotherapy techniques. Some procedural variables were varied systematically while other variables were randomized to eliminate systematic biases.

The discussion of the experimental procedure is divided into four sections: subject selection, setting and apparatus, measures, and experimental procedure.

Subject Selection

All Ss were undergraduate volunteers who were enrolled in introductory psychology courses and who received course credit for participation in the study. Ss were recruited through a short presentation of the study which was conducted at the close of their introductory psychology class. The study was described as an investigation of the relationships between imagination and

personality, the experimental procedure was outlined briefly, the possibility of Ss improving relaxation skills through training and practice was presented, and interested Ss were asked to write their name, phone number, and sex on a sign-up sheet after class. For an outline of the presentation see Appendix A.

Subjects were selected randomly from the list and were contacted by telephone. Five male Ss and five female Ss were assigned to each of six experimental groups on the basis of the convenience of group meeting times for them. Subjects who could not attend any of the group meeting times were excluded from the study. During this initial contact Ss were asked whether they were left-handed or right-handed, and this information was used in setting up experimental apparatus and arranging chair assignments.

Setting and Apparatus

Experimental sessions were conducted in two settings: Ss completed paper-and-pencil measures in a university classroom and Ss participated in relaxation training and collection of process data in a specially equipped group therapy room. The university classroom was not exceptional in any way, the only facilities used were individual desks for Ss and the room was selected on the basis of availability and proximity to the group therapy room.

The setting in the group therapy room is illustrated in Figure 4. Subjects were assigned to seats randomly with the restriction that left-handed Ss were seated to E's right because of limitations imposed by the equipment being used and were

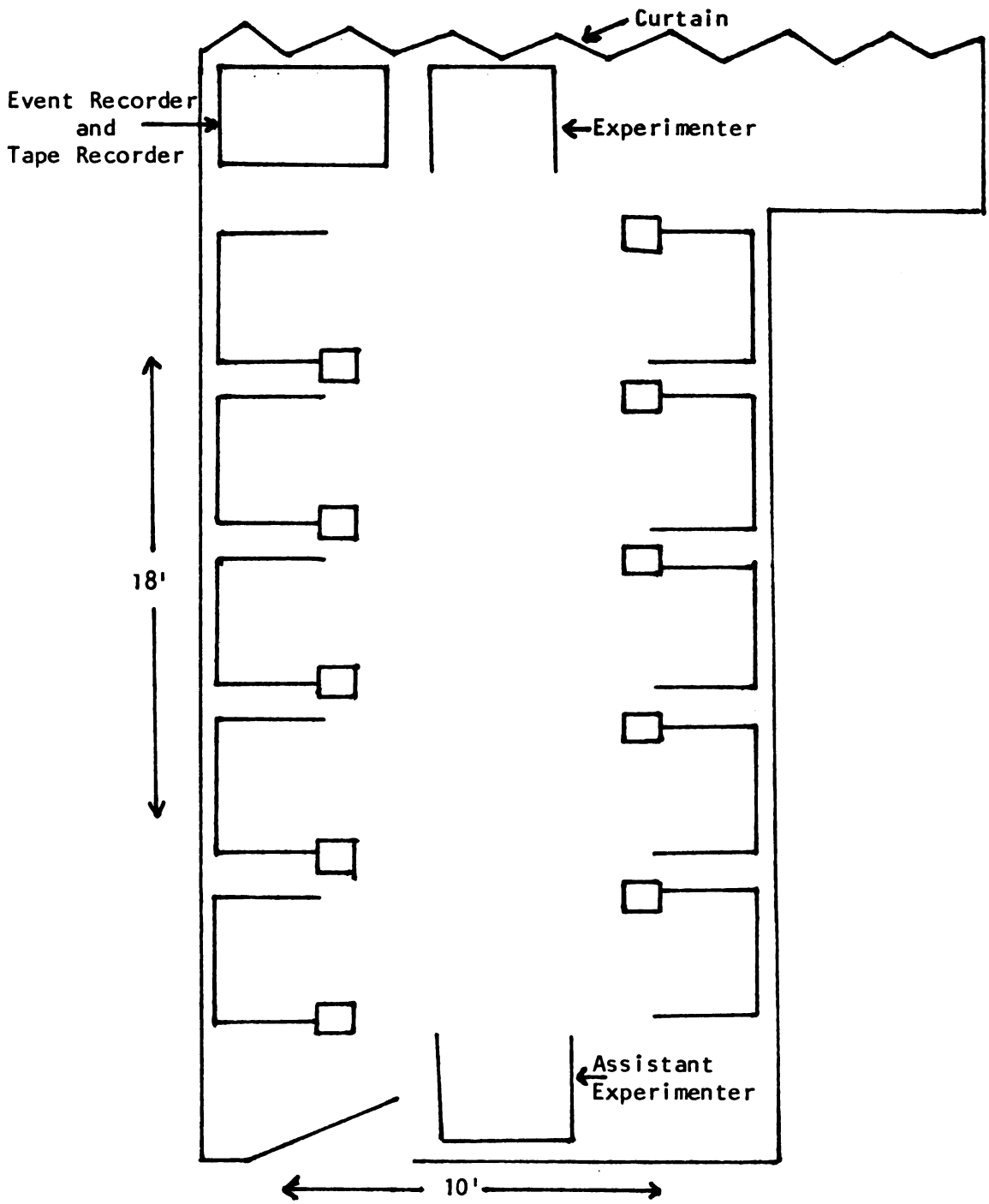


Figure 4. Setting for Relaxation Training and Imagery Trials.

seated in comfortable chairs along opposite sides of the room with their heads supported by a pillow resting against the wall. Each Ss' dominant hand rested on a keyboard attached to the arm of the chair. The experimenter (E) was seated at one end of the room between the rows of Ss with a cart containing two event recorders attached to the keyboards, and a cassette tape recorder used for administering standardized imagery instructions on his right. An assistant experimenter (AE) was seated at the opposite end of the room with a clipboard. A curtain behind E concealed unused equipment.

The keyboard attached to each S's chair was used to record S ratings of level of relaxation or anxiety, image vividness, imagery controlability, and stimulus-value of the image. The keyboard, illustrated in Figure 5, consisted of ten rectangular, doorbell-type push buttons arranged in two rows of five each on a plywood base. Each button on the top row was marked with a small dot of a silicone sealant to make it possible for Ss to discriminate between the two rows of buttons by touch.

The keyboards were wired so that each key activated four channels of two twenty-pen Esterline-Angus event recorders, singly or in combination. The responses were recorded on paper tape and were later transcribed directly to opscan data sheets for optical scanning and decoding and scoring by computer. When an S recorded more than one response per response period the last response coded during the response period was treated as the S's intended response.

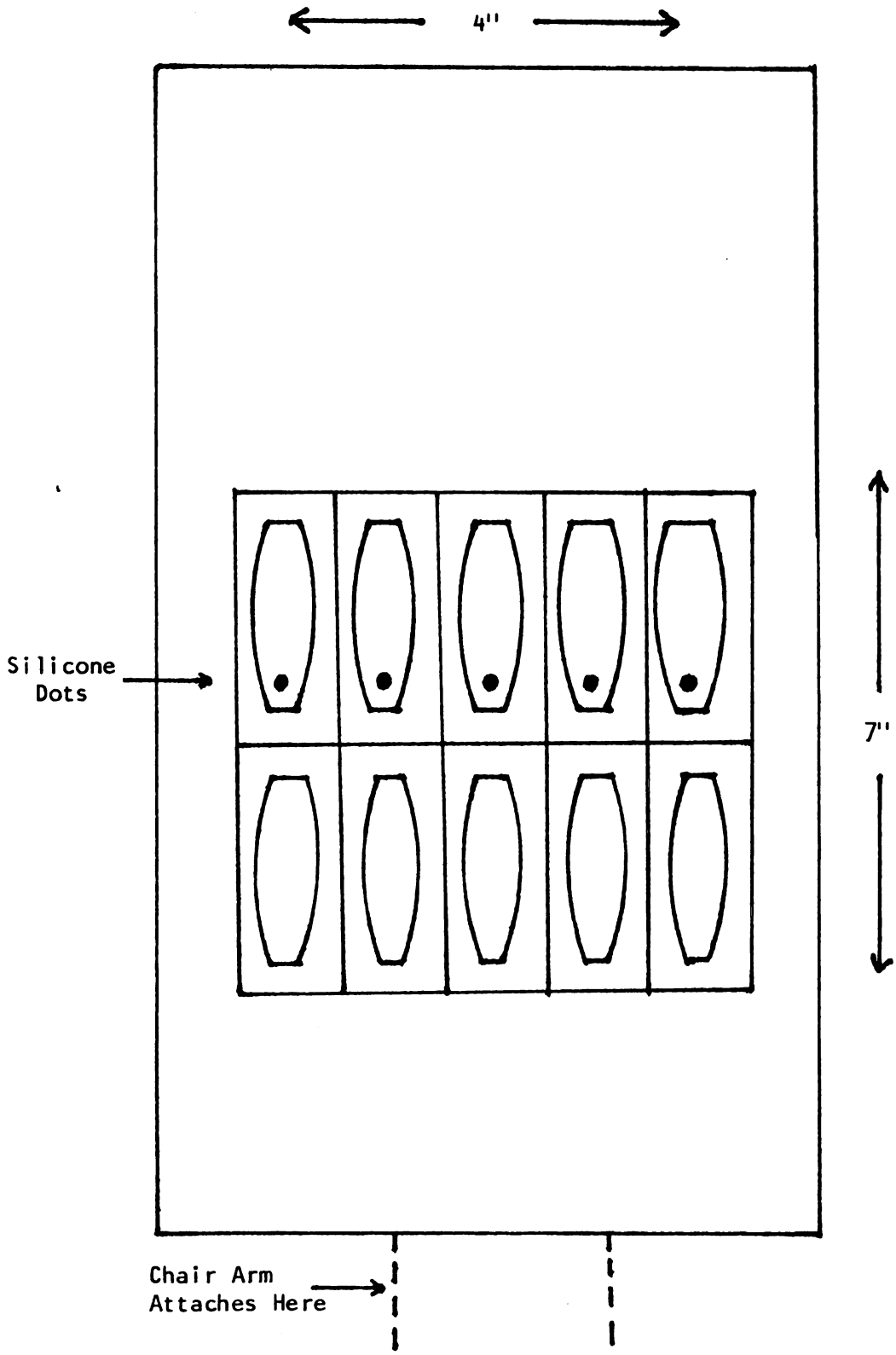


Figure 5. Subject Response Keyboard.

Ss were informed of this procedure which allowed them to correct errors in responding simply by pressing the correct key.

Measures

Variables conceptualized as consistent traits or response tendencies relatively independent of the experimental situation were measured by paper-and-pencil tests and self-report inventories. These variables included tendency to avoid aversive stimuli (TAAS), imagery ability (IMA), stimulus-value of the stimulus imaged (SVSI), and demographic information. In addition, information concerning Ss' perception of the study and their experiences during the study was collected and personality data was collected in order to disguise the variables being investigated in this study.

Variables specific to the experimental setting or specific to the image being experienced were measured during the experimental sessions, primarily by S self-reports. These variables included the initial level of relaxation or anxiety (LRXI), the level of relaxation or anxiety at six points during each imagery trial (LRX0 through LRX5), relaxation ability (RXA), relaxation instructions (RI1, RI2), image quality (IMQ), and stimulus-value of the experienced image (SVEI).

Tendency to Avoid Aversive Stimuli

Three measures of TAAS were tested in this study: Byrne's Repression-Sensitization Scale (RS), the Stress Reaction Scale (SR) of the Differential Personality Questionnaire (DPQ), and the Danger-Seeking (DS) scale of the DPQ.

The RS Scale (Byrne, 1961) is a forced-choice self-report scale which has been used repeatedly to predict individual differences in response to phobic stimuli (Rona, et al., 1975). Though the RS scale was designed to detect differences in types of defense mechanisms used by Ss, the use of this scale does not require the assumption that defense machanisms exist as entities distinct from other cognitive processes. Ss scoring high on the RS scale show heightened behavioral responses to stressors and reduced autonomic responses to stressors while Ss scoring low on the scale show the opposite pattern (Rona, et al., 1975).

The SR scale is a subscale of the DPQ, a forced-choice self-report personality inventory (Tillegen, 1977). The SR scale assesses Ss' tendency to respond to stressful stimuli or situations with anxiety, worry, or "being upset." This scale is closely related to Eysenck's Neuroticism scale but is more independent of introversion-extraversion scores.

The DS scale is another subscale of the DPQ which assesses both Ss' willingness to invest time and energy in avoiding situations commonly seen as dangerous and Ss' thrill-seeking behavior.

It was hypothesized that these three measures assessed different aspects of TAAS, however, when a cluster analysis was conducted on the measures used in this study these three measures did not form a reliable cluster. The RS and SR scales did form a reliable cluster (an alpha coefficient reliability of .88) so TAAS was measured by the sum of Ss standardized scores on the RS and SR scales.

Imagery Ability

Three measures of IMA were tested in this study, Sheehan's short-form of Bett's Questionnaire on Mental Imagery (QMI), Lane's Questionnaire on Imagery Control (QIC), and the Absorption (AB) scale of the DPQ.

The QMI (Richardson, 1969) is a measure of the ability to experience vivid imagery in seven sensory modalities. It asks Ss to image thirty-five images in seven sensory modalities and to rate the vividness of the image on a seven-point scale. It is the most widely used measure of image vividness and, while there is some debate over its factorial composition (White, Ashton, & Law, 1976), it has been found to be reliable (Richardson, 1969) and to be useful as a predictor of the vividness of images of affectively neutral stimuli (Beere, 1971).

The QIC (Lane, 1975) is a measure of Ss' ability to control mental imagery which was designed to parallel the QMI. Subjects are asked to image thirty-five specific stimuli, modify each of them in a specified way, and report their success in transforming the image and the ease with which the transformation was accomplished. QIC scores have been found to be reliable and to reflect a single imagery control factor (Lane, 1975).

The AB scale is a subscale of the DPQ which assesses capacity for episodes of absorbed and "self-altering" attention that are sustained by imaginative and "enactive" representations. This scale measures a variable which has been linked conceptually

with IMA (Beere, 1971; Sheehan, 1972) but which has received little empirical investigation (Tellegen, 1976).

It was hypothesized that QMI, QIC, and AB scores measured different aspects of IMA, however, when the cluster analysis of measures used in this study was conducted the three measures did not form a reliable cluster. QMI and AB scores did form a reliable cluster (coefficient alpha reliability .74) so IMA was measured by the sum of standard scores on the QMI and AB scale.

Stimulus-Value of the Stimulus Imaged

SVSI was measured by the Stimulus-Value Survey Schedule (SVSS), a measure developed specifically for use in this study. The SVSS was based on a pool of items adapted from Spiegler and Liebert's (1970) augmented form of the Fear Survey Schedule, the Reinforcement Survey Schedule (Cautela & Kastenbaum, 1967), the Negative Reinforcement Survey Schedule (Cautela, 1970), and the Covert Response Cost Survey Schedule (Cautela, 1976). This pool of items was assembled into a single, four-part form with each stimulus, stimulus-complex, or situation to be rated on a ten-point scale from Very Unpleasant to Very Pleasant.

Fifty undergraduate volunteer Ss were recruited from introductory psychology classes to participate in a three-week study called "Personality and Preferences." Testing was conducted with two groups of twenty to thirty Ss in a university classroom. In the first session the study was presented as an investigation

of how persons feel about various persons, things, and situations and how this relates to personality and then the item pool was administered with the four parts administered in counterbalanced orders. In the second session, one week later, the DPQ was administered and in the third session, one week after the second session, the newly developed SVSS was administered.

The distribution of S ratings of each item in the item pool were analyzed for mean rating, range of ratings, and the normality of the distribution of ratings. Thirty-two of the items were selected on the basis of having a relatively normal distribution of S ratings, having a wide range of S ratings, and providing a wide range of mean S ratings among the items. These thirty-two items were ordered randomly to form the SVSS (Appendix B). The correlation between SVSS item ratings and DPQ Content Balanced Desirability, Unlikely Virtues, and Inconsistency Scales was computed. No significant correlations between the ratings and the three validity scales were found. Two sets of ten SVSS items were selected randomly to be used as stimuli in the imagery sessions. The mean ratings of these items by the pilot study Ss were used to sequence these items so that aversive stimuli were interspersed with more neutral or pleasant stimuli.

Demographic Information

Ss recorded demographic information on a Personal Data Sheet (PDS). Information requested included student number, age, sex, marital status, place of birth, urban vs. rural rearing,

religious information, academic information, and information concerning Ss' experiences with mediation and relaxation training. The entire PDS is presented in Appendix C.

Subject's Perception of the Study

Following completion of the study Ss completed the Participant's Evaluation Form (PEF), a measure developed for this study to evaluate the credibility of the rationale presented for the study, the extent to which Ss were able to guess the specific hypotheses being tested, Ss evaluation of the group progressive relaxation used in the study, and to provide Ss with an opportunity to submit complaints, comments, and suggestions (Appendix D).

Personality Data

The entire DPQ (Tellegen, 1976) was admininstered to Ss, the SR Scale was used as one measure of TAAS, the AB scale was used as a measure of IMA, and the remaining nine personality scales and six validity scales were used to lend credibility to the study's cover identity and were used in auxiliary analyses.

The DPQ is a new personality inventory which possesses a clearly discriminant multi-dimensional structure and consists of three hundred items from which scores can be obtained on eleven substantive scales and six "validity moderator" scales. The DPQ was designed to represent a number of distinct personality dimensions which personality psychologists have considered important and which have been a focus of theory and research.

The eleven substantive scales of the DPQ are Well-Being, Stress Reaction, Unfriendly World, Aggression, Social Closeness, Social Potency, Hard Work, Impulsiveness, Danger Seeking, Authoritarianism, and Absorption. The Stress Reaction scale is strongly related to Eysenck's Neuroticism but is more independent of introversion markers and samples a wider range of items related to the stress reaction syndrome. The Social Potency, Social Closeness, and Impulsiveness scales represent the most important components of Eysenck's Extraversion dimension. Since these components have been found to be independent, Tellegen (1976) feels they should be measured separately. The Absorption scale represents a variable which has often been related theoretically to imagery ability (Beere, 1971; Sheehan, 1972). Tellegen (1976) proposes that it involves primarily a capacity for episodes of absorbed and "self-altering" attention that are sustained by imaginative and "enactive" representation.

The six "validity moderator" scales are Associative Slips, Unlikely Virtues, Content Balanced Desirability, Content Balanced Acquiescence, Content Balanced Endorsement, and Inconsistency. The Content Balanced Desirability, Acquiescence, and Endorsement scales were constructed so that their items are balanced in respect to the eleven substantive scales and thus these validity scales are not confounded with the substantive scales. The Unlikely Virtues scale is similar to the MMPI Lie scale.

The eleven substantive scales have internal consistencies of between .80 and .92 with a median alpha of .86. Test-retest

reliabilities have been determined at a one week interval for six of the scales and all were at least .90. All of the currently available reliability data and normative data are based on research with undergraduate Ss at the University of Minnesota.

Initial Level of Relaxation or Anxiety and Level of Relaxation or Anxiety

LRXI and LRX were measured in the same way, the only difference between the two was the point in time at which the measurement was conducted. LRXI was measured at the beginning of an imagery trial and LRX was measured at six points during the imagery trial (LRX0, LRX1, LRX2, LRX3, LRX4, LRX5).

LRXI and LRX were measured by S self-reports. At various points in the experimental procedure Ss were asked to rate their level of relaxation or anxiety on a ten-point scale (Figure 6). This scale ranged from Extremely Anxious to Just Barely Anxious and from Just Barely Relaxed to Completely Relaxed. During the training period at the close of the first session the meaning of the various points on the scale were clarified and Ss were taught how to record their ratings by pressing the appropriate key. The abbreviated rating instructions used during imagery sessions and during relaxation training were "Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right." Responses were coded from -1.0 to +1.0 in 0.222 increments with Extremely Anxious as -1.0 and Completely Relaxed as +1.0. Figure 7 illustrates the points during the imagery trial

Rating	Coded Value	Meaning
0	-1.0	Extremely anxious
1	- .777	Very anxious
2	- .555	Moderately anxious
3	- .333	Mildly anxious
4	- .111	Just barely anxious
5	.111	Just barely relaxed
6	.333	Mildly relaxed
7	.555	Moderately relaxed
8	.777	Very relaxed
9	1.0	Completely relaxed

Figure 6. Rating Scale Used for ILRX and LRX.

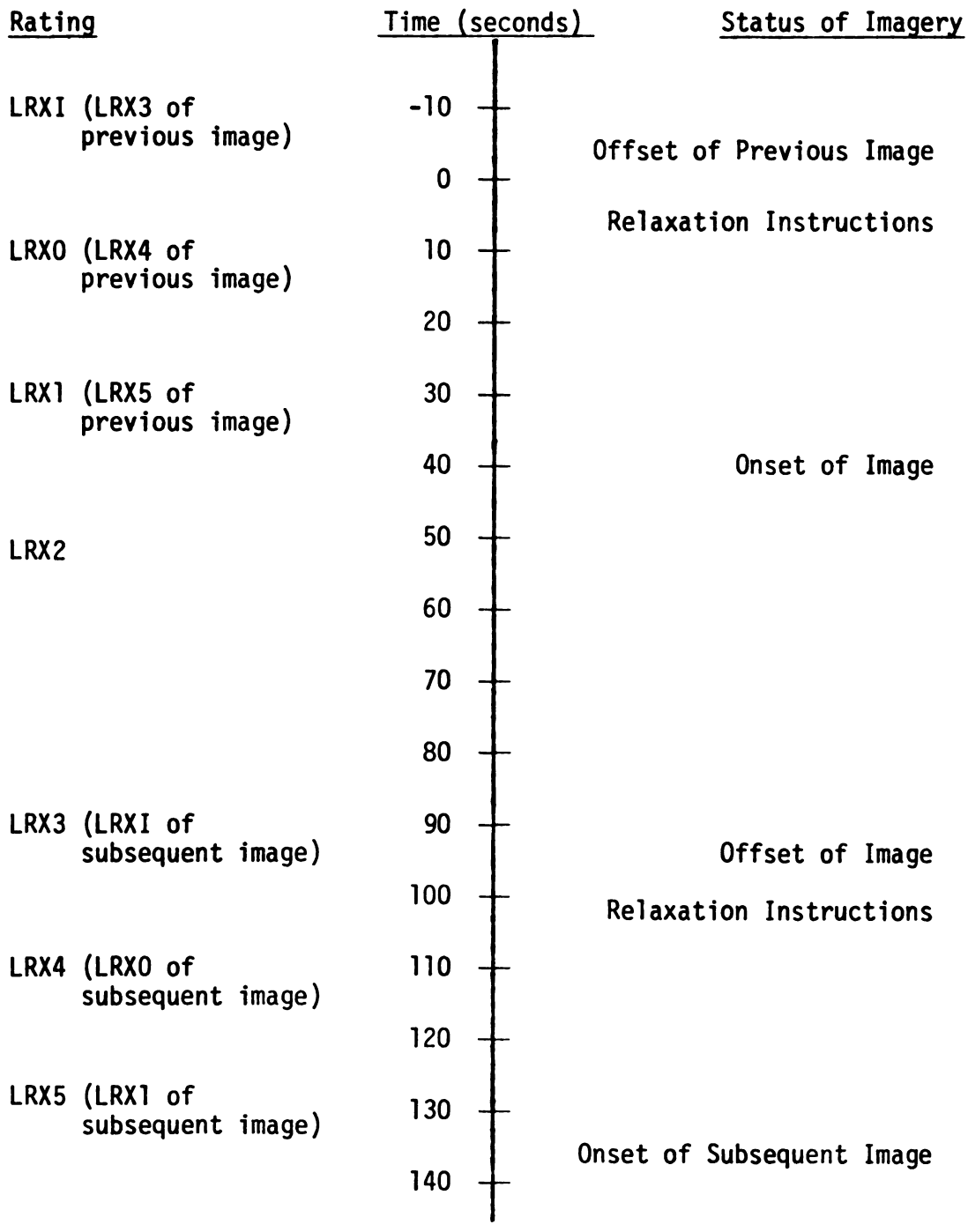


Figure 7. Timing of Ratings of LRX.

during which Ss reported LRX. It should be noted that, due to the serial nature of the imagery trials, a rating of the level of relaxation following one image is the level of relaxation preceding the next image and thus the data points overlap, LRX4 for the first image is also LRX0 for the second image. This timing of the images is similar to the inter-image intervals used in SD (cf. Deffenbacher, 1976).

Relaxation Ability

Two measures of RXA were tested in this study: Ss' LRX at the beginning of the experimental session and Ss' average LRX between images.

It was hypothesized that Ss' LRX when asked to relax at the beginning of the session would primarily reflect the Ss' RXA in the experimental session. The Ss' LRX immediately before the first image in the session was measured by the rating of LRX1 for the first image in the session.

It was also hypothesized that when Ss' LRX between images was averaged, the image specific influences (such as SVEI) would tend to cancel and this would provide a measure of RXA, the determinant of LRX which was not image specific. The average LRX between images was computed simply by averaging Ss' ratings of LRX4 and LRX5 for the first nine of the ten imagery trials in the session.

These two measures of RXA formed a reliable cluster (alpha coefficient reliability = .79) so RXA scores were computed by adding Ss' standard scores on each measure. It should be noted

that Ss' RXA scores were specific to the experimental session and could vary between sessions.

The Relaxation Rating Checklist (RXRC) was used as an auxiliary measure of RXA. The primary function of the RXRC was to convince Ss that E was using an objective measure LRX and thus to encourage them to take the progressive relaxation training seriously, practice the relaxation training regularly, and rate LRX honestly. The RXRC consisted of ratings of the frequency of four gross indicators of anxiety or lack of relaxation. E and AE observed each S for fifteen seconds and completed the RXRC during a period of relaxation following Ss' rating of RXA. The mean of the two RXRC scores was used as a secondary measure of RXA. Possible scores ranged from 0 to 14 where 0 indicated no indications of anxiety and 14 indicated many signs of anxiety (Appendix E).

Image Quality

Two separate S ratings were combined to provide a measure of IMQ. Ss rated image vividness on a five-point scale (Figure 8) ranging from "As vivid as real life" to "Extremely vague and dim" and recorded their responses on the bottom row of the keyboard. Ss also rated image controlability on a five-point scale (Figure 9) from "Experienced the instructed image without changing or fading" to "Did not experience the instructed image at all." The meanings of the various points on the rating scales were clarified during the training period and Ss were taught how to record their responses. The abbreviated instructions used during imagery sessions were

Rating	Coded Value	Meaning
0	0.0	Extremely vague and dim
1	0.25	Vague and dim
2	0.5	Clear but not vivid
3	0.75	Moderately vivid
4	1.0	As vivid as real life

Figure 8. Rating Scale for Image Vividness.

Rating	Coded Value	Meaning
0	0.0	Did not experience the instructed image at all
1	.25	Experienced the instructed image and it changed or faded immediately
2	.50	Experienced the instructed image and it changed or faded quickly
3	.75	Experienced the instructed image and it changed or faded slowly
4	1.0	Experienced the instructed image without changing or fading

Figure 9. Rating Scale for Image Controlability.

"Rate image vividness. Extremely vague and dim is bottom left, as vivid as real life is bottom right" and "Rate the stability of the image. Not experiencing the instructed image is bottom left, experiencing the instructed image without changing is bottom right."

Ratings on both dimensions were coded from 0.0 to +1.0 in 0.25 increments with "As vivid as real life" and "Experiencing the instructed image without it changing" coded as +1.0. The composite IMQ score was computed by taking the product of the image vividness and image control scores when image control was greater than 0.0, and by reversing the sign of the image vividness score when the image control score was equal to 0.0 (Figure 10). Thus IMQ scores could range from -1.0 to +1.0 with scores less than 0.0 indicating that the S experienced an image other than the requested image, a score of 0.0 indicating that the S experienced no image, or an extremely weak image, and a score greater than 0.0 indicating that the S experienced the requested image.

Stimulus-Value of the Experienced Image

SVEI was measured by S ratings of how pleasant or unpleasant it was to image the stimulus on a ten-point scale (Figure 11) from Extremely Unpleasant to Extremely Pleasant. The meaning of the various points on the rating scale were clarified during the training and Ss were taught how to record their ratings. The abbreviated rating instructions used during the imagery sessions were "Rate how pleasant or unpleasant it is to image this. Extremely unpleasant is top left, Extremely Pleasant is bottom right." Ratings were

IMQ Value	Meaning
1.00	The experienced image was as vivid as life and was experienced without changing or fading
.75	The image was moderately vivid and unchanging or was as vivid as life and changed or faded slowly
.56	The image was moderately vivid and changed or faded slowly
.50	The image was vivid as life and changed or faded quickly or was clear but not vivid and was unchanging
.375	The image was clear but not vivid and changed or faded slowly or was moderately vivid and changed or faded quickly
.25	The image was vivid as life and changed or faded immediately or was vague and dim but unchanging or was clear but not vivid and changed or faded slowly
.1875	The image was moderately vivid and changed or faded immediately or was vague and dim and changed or faded quickly
.125	The image was clear but not vivid and changed or faded immediately or was vague and dim and changed or faded quickly
.0625	The image was vague and dim and changed or faded immediately
0.0	No image was experienced or an extremely vague and dim extraneous image was experienced
-.25	A vague, dim extraneous image was experienced
-.50	A clear but not vivid extraneous image was experienced
-.75	A moderately vivid extraneous image was experienced
-1.00	An extraneous image as vivid as life was experienced

Figure 10. The Range of Values for IMQ.

Rating	Coded Value	Meaning
0	-1.0	Extremely unpleasant
1	- .777	
2	- .555	Moderately unpleasant
3	- .333	
4	- .111	Just barely unpleasant
5	.111	Just barely pleasant
6	.333	
7	.555	Moderately pleasant
8	.777	
9	1.0	Extremely pleasant

Figure 11. Rating Scale for SVEI.

coded from -1.0 to +1.0 in 0.222 increments with -1.0 indicating a rating of extremely unpleasant and +1.0 indicating a rating of extremely pleasant.

Relaxation Instructions

RI1 and RI2 were procedural variables, before and after each of the images Ss were instructed to relax or not to relax. When Ss were instructed to relax RI1 or RI2 was coded at +1.0 and when Ss were instructed to make no special effort to relax RI1 or RI2 was coded as 0.0.

Experimental Procedure

The experimental procedure was conducted in six groups of ten Ss each. The only difference in treatment between the groups was the order in which the procedures were conducted. Ss' assignment to groups was completely independent of all S variables other than sex. Groups met on weekday evenings at times convenient to E.

The experimenter (E) was assisted by three advanced undergraduate assistant experimenters (AEs) who received academic credit for participation in the study in conjunction with independent study of related topics. AEs were blind to the hypotheses being tested until the completion of data collection and were blind to Ss scores on all measures except the RXRC and insofar as they observed Ss pressing keys to record ratings. An AE assisted E during each session; the primary function of AEs was completion of the RXRC, however, AEs also assisted with other aspects of the study whenever needed.

An outline of the procedure is presented in Figure 12. The procedure consisted of five weekly sessions which were approximately one hour in length. The content and setting of the sessions varied from week to week but included explanation of the rationale and procedure for the study, administration of paper-and-pencil measures, training in rating and recording process variables, relaxation training, and imaging stimuli from the SVSS while rating and recording process variables.

Session One

For Groups 1 and 2 the first portion of the initial session was conducted in a university classroom where the rationale for the study used in S recruitment was explained in greater detail, the procedures to be used in the initial session were explained, and Ss' questions were answered. Next, one of the three sets of paper-and-pencil tests was administered. Group 1 completed the DPQ and Group 2 completed the RS and SVSS.

Following completion of the questionnaire Ss moved to the group therapy room and were seated in their randomly assigned seats. The function of the keyboards for recording ratings was explained and the rating scales were explained in detail. Ss then practiced using the keyboards to record ratings while listening to pre-recorded practice instructions which asked Ss to make a specific rating, for example, "Report feeling moderately relaxed," and repeated the brief rating instructions, i.e., "Extreme anxiety is top left, complete relaxation is bottom right." The recorded

	Session 1	Session 2	Session 3	Session 4	Session 5
GROUP 1	DPQ Keyboard training	Keyboard practice First set of images Relaxation training 1	Keyboard practice Relaxation training 2 RS, SVSS	Relaxation training 3 Keyboard practice PDS,QMI,QIC	Keyboard practice Relaxation training 4 Second set of images PEF
GROUP 2	RS, SVSS Keyboard training	Keyboard practice Second set of images Relaxation training 1	Keyboard practice Relaxation training 2 DPQ	Relaxation training 3 Keyboard practice PDS,QMI,QIC	Keyboard practice Relaxation training 4 First set of images PEF
GROUP 3	Keyboard training PDS,QMI,QIC	Keyboard practice First set of images Relaxation training 1	Keyboard practice Relaxation training 2 DPQ	Relaxation training 3 Keyboard practice RS, SVSS	Keyboard practice Relaxation training 4 Second set of images PEF
GROUP 4	Keyboard training DPQ	Keyboard practice Second set of images Relaxation training 1	Keyboard practice Relaxation training 2 PDS,QMI,QIC	Relaxation training 3 Keyboard practice RS, SVSS	Keyboard practice Relaxation training 4 First set of images PEF
GROUP 5	Keyboard training RS, SVSS	Keyboard practice First set of images Relaxation training 1	Keyboard practice Relaxation training 2 PDS,QMI,QIC	Relaxation training 3 Keyboard practice DPQ	Keyboard practice Relaxation training 4 Second set of images PEF
GROUP 6	Keyboard training PDS,QMI,QIC	Keyboard practice Second set of images Relaxation training 1	Keyboard practice Relaxation training 2 RS, SVSS	Relaxation training 3 Keyboard practice DPQ	Keyboard practice Relaxation training 4 First set of images PEF

Figure 12.--Outline of the Procedure.

instructions asked Ss to make a rating every fifteen seconds then accelerated to a rating every ten seconds. Following the keyboard practice Ss were dismissed.

A problem was encountered with this procedure in that some Ss completed the paper-and-pencil measures more quickly than other Ss and became bored while waiting for the others to finish. In order to avoid this problem subsequent groups practiced using the keyboards to record ratings before they completed the questionnaires and were allowed to leave when they completed the questionnaires. Group 4 completed the DPQ, Group 5 completed the RS and SVSS, and Groups 3 and 6 completed the PDS, QMI, and QIC.

Session Two

The second session was conducted completely in the group therapy room. The procedure for the session was outlined briefly and a keyboard practice similar to the one used in Session One was conducted using recorded instructions which asked Ss to make specific ratings every ten seconds. Ss were instructed to relax as completely as possible and, thirty seconds later, were instructed to rate their level of relaxation or anxiety. Next tape recorded instructions were played which asked Ss to image stimuli randomly selected from the SVSS and report level of relaxation, image quality, and subjective response to the image. Groups 1, 3, and 5 imaged the first ten items selected from the SVSS. The timing of instructions for imaging specific stimuli and reporting ratings is shown in Figure 13. Ss were instructed to relax on one half of

Time (seconds)	Instructions
0	Stop imaging and relax. Let yourself relax completely.* Stop imaging. Make no special effort to relax.
10	Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.
20	
30	Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.
40	Imagine . . . (SVSS item)
0**	
10	Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.
20	Rate the vividness of the image. Extremely vague and dim is bottom left, as vivid as life is bottom right.
30	Rate how pleasant or unpleasant it is to imagine this. Extremely unpleasant is top left, extremely pleasant is bottom right.
40	Rate the stability of the image. Not experiencing the instructed image is bottom left, experiencing it without changing is bottom right.
50	Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.
60	

*Alternate forms for trials with and without relaxation. On the initial trial of each session the first phrase of this instruction is omitted.

**Timing is from the end of the instruction to image a stimulus.

Figure 13. Timing of Instructions During Imagery Trials.

the trials and not to relax on one half of the trials in random order; the sequence of instructions is shown in Figure 14. The transcript of the complete instructions used in this Session and Session Five is contained in Appendix F.

Following completion of the imaging of the SVSS items Ss began progressive relaxation training. The progressive relaxation training was based on the procedure described by Bernstein and Borkovec (1972). First E explained the rationale of progressive relaxation emphasizing the view that relaxation is a skill which can be acquired through guided practice. The procedure to be used for progressive relaxation training was described and Ss' questions were answered in the manner suggested by Bernstein and Borkovec (1972). Ss were then instructed to assume a comfortable position with their heads supported by pillows and their dominant hands resting on the keyboard. As E guided Ss through the repeated tensing and relaxation of sixteen major muscle groups they were asked to rate their LRXI and to rate their LRX after relaxation of each muscle group.

Following completion of the relaxation procedure Ss were instructed to relax as completely as possible and, thirty seconds later, were asked to rate their LRX and then were instructed to continue relaxing as E and AE completed the RXRC. Ss were reminded of the importance of practicing relaxation in order to master the skill. Ss were asked to practice relaxation daily and were provided with cards on which they were asked to record the time of

Image Number	RI1*	RI2*
1	1**	0
2	0	1
3	1	1
4	1	0
5	0	0
6	0	1
7	1	1
8	1	1
9	1	0
10	0	0

*RI1 - The relaxation instructions before imaging the stimulus.
RI2 - The relaxation instructions after imaging the stimulus.

**1 - "Stop imaging and relax. Let yourself relax completely."
0 - "Stop imaging. Make no special effort to relax."

Figure 14. Sequence of Relaxation Instructions.

each practice and their level of relaxation or anxiety before and after each practice (see Appendix G).

Session Three

Ss assembled in the group therapy room and first practiced recording ratings on the keyboards using the same tape recorded instructions as in Session Two, then repeated the progressive relaxation training procedure used in Session Two. Ss then moved to the classroom and there completed more of the paper-and-pencil measures. Groups 1 and 6 completed the RS and SVSS, Groups 2 and 3 completed the DPQ, and Groups 4 and 5 completed the PDS, QMI, and QIC.

Session Four

The fourth session was identical to the third session except that Ss completed the final set of paper-and-pencil measures and the relaxation training procedure was abbreviated. Groups 1 and 2 completed the PDS, QMI, and QIC, Groups 3 and 4 completed the RS and SVSS, and Groups 5 and 6 completed the DPQ. The progressive relaxation training was conducted using an abbreviated procedure involving tensing and relaxing seven muscle groups (Bernstein & Borkovec, 1972), and the RXA rating procedure used in previous sessions was repeated.

Session Five

The final session was similar to the second session. The session was conducted entirely in the group therapy room and began

with an opportunity for Ss to ask questions about any difficulties encountered in relaxation practice. Progression relaxation was conducted using an abgreviated procedure involving tensing and relaxing four muscle groups (Bernstein & Borkovec, 1972). Ss rated their ILRX and rated their LRX after relaxation of each muscle group. While Ss continued their relaxation they repeated the brief keyboard practice used in Sessions Two through Four. Following this, Ss imaged and rated the items from the SVSS they had not imaged in Session Two. Thus Groups 1, 3, and 5 imaged the second sixteen items from the SVSS and Groups 2, 4, and 6 imaged the first sixteen items from the SVSS. The instructions and timing were pre-recorded and were identical with the instructions and timing used in the second session (Figures 13 and 14).

Following completion of the image rating, Ss were instructed in the completion of the progression relaxation training, were provided with an instruction sheet outlining the rest of the relaxation training program, and were informed of times when E would be available for consultation on the relaxation training. Finally Ss were administered the PEF which assessed the credibility of the procedure, the extent to which Ss practiced the progressive relaxation procedure, and Ss' perception of the exact hypotheses being investigated. Ss were also provided with the opportunity to report comments, complaints, and criticisms anonomously. Finally, the purpose of the study was explained briefly and S questions were answered.

RESULTS

Effects of Subject Attrition

Of the sixty Ss who agreed to participate in the study fifty-one attended the initial session, forty Ss attended the second session, and twenty-five Ss completed the study. In order to determine whether this high drop-out rate biased the study, T-tests were used to test for differences between Ss who attended only one of the imagery sessions (Session Two) and Ss who attended both imagery sessions and thus completed the study. The results of tests for differences between these groups on experimental conditions, sex of S, DPQ subscales, QMI, QIC, and RSS are displayed in Tables 1 and 2.

No significant differences were found between Ss who completed the study and Ss who withdrew from the study after the second session on any of these variables. No similar analysis of the effect of S drop-outs before the second session was conducted because the available data was insufficient for statistical comparison. On the basis of this analysis it was concluded that S withdrawal from the study did not bias the sample and all available data was used in the analyses reported here. Thus data collected from Ss who later withdrew from the study was not excluded from analysis. Because of this the number of cases on which comparisons and correlations are based varies with each pair of variables.

TABLE 1

T-Tests for the Effects of Subject Attrition

Variable		N of Cases	Mean	S.D.	T	d.f.	2-tailed probability
Experimental Condition	G1*	15	1.467	.516	-0.08	38	.937
	G2	25	1.480	.510			
Sex of S	G1	9	.444	.527	-0.51	27	.614
	G2	20	.550	.510			
DPQ01 Well-Being	G1	13	18.539	3.688	1.55	32	.132
	G2	21	16.095	4.888			
DPQ02 Stress Reaction	G1	13	13.000	4.865	-0.49	32	.626
	G2	21	14.095	7.035			
DPQ03 Unfriendly World	G1	13	4.615	2.293	0.30	32	.767
	G2	21	4.286	3.538			
DPQ04 Aggression	G1	13	7.308	3.924	1.00	32	.326
	G2	21	5.857	4.234			
DPQ05 Social Closeness	G1	13	15.692	4.234	1.19	32	.241
	G2	21	13,524	5.095			
DPQ06 Social Potency	G1	13	12.308	5.618	0.26	32	.799
	G2	21	11.762	6.252			
DPQ07 Hard Work	G1	13	13.231	3.609	0.60	32	.552
	G2	21	12.318	4.225			
DPQ08 Impulsiveness	G1	13	9.846	3.484	0.33	32	.742
	G2	21	9.286	5.405			
DPQ09 Danger Seeking	G1	13	14.000	5.447	0.63	32	.532
	G2	21	12.672	5.621			

*G1 - Ss who dropped out after the second session.
G2 - Ss who completed the study.

Table 2

T-Tests for the Effects of Subject Attrition (contd.)

Variable		N of Cases	Mean	S.D.	T	d.f.	2-tailed probability
DPQ10	G1	13	16.615	4.646	1.62	32	.114
Authoritarianism	G2	21	13.619	5.554			
DPQ11	G1	13	21.692	7.674	-0.82	32	.412
Absorption	G2	21	23.810	7.160			
DPQ12	G1	13	1.462	1.391	-0.96	32	.347
Associative Slips	G2	21	2.090	2.119			
DPQ13	G1	13	2.077	2.019	-1.23	32	.228
Unlikely Virtues	G2	21	2.095	1.841			
DPQ14	G1	13	10.385	1.895	-0.16	32	.873
Desirability	G2	21	10.524	2.732			
DPQ15	G1	13	14.846	2.577	1.20	32	.241
Acquiescence	G2	21	13.762	2.567			
DPQ16	G1	13	28.462	2.727	1.52	32	.138
Endorsement	G2	21	26.714	3.538			
DPQ17	G1	13	13.615	4.114	0.62	32	.540
Inconsistency	G2	21	12.667	4.476			
Questionnaire on	G1	7	174.00	32.76	-0.17	26	.869
Mental Imagery	G2	21	176.71	38.70			
Questionnaire on	G1	8	121.50	14.83	-1.52	26	.141
Imagery Control	G2	20	133.25	19.65			
Repression-	G1	11	61.546	8.802	-1.42	26	.167
Sensitization	G2	17	66.118	7.999			

*G1 - Ss who dropped out after the second session.
G2 - Ss who completed teh study.

While this means that comparisons and correlations are based on somewhat different samples, the lack of significant differences between Ss who completed the study and Ss who withdrew after the second session suggests that these somewhat different samples are comparable.

Equivalence of Groups

One way ANOVAs were used to test for differences in S characteristics between the six experimental groups on DPQ subscale scores and QMI, QIC, and RSS scores and Scheffe tests were used to test for differences between pairs of gruops when a significant main effect for groups was found. Significant main effects were found for two of the twenty ANOVAs which were computed, the results of these two ANOVAs are shown in Tables 3 and 4.

A significant main effect was found for group assignment with the DPQ Unfriendly World Subscale score as the dependent variable but no significant differences between groups was found using the Scheffe test. A significant main effect ($\alpha = .05$) was also found with DPQ Inconsistency scale scores as the dependent variable and the mean score for Group 6 was significantly lower than the mean scores for Groups 3 and 5 (Scheffe test, $\alpha = .05$). Neither of these variables is clearly related to the hypotheses being tested so it was concluded that the groups were equivalent in terms of Ss' characteristics and the data from the six groups was pooled for subsequent analysis.

Table 3

One Way ANOVA for Differences Between Groups on DPQ Unfriendly World Scores

Source	Sum of squares	d.f.	Mean squares	F	p
Between Groups	108.61	5	21.72	2.86	.03
Within Groups	205.27	27	7.06		
TOTAL	313.87	32			

Group	N	Mean
1	4	3.75
2	4	3.75
3	7	6.14
4	7	2.57
5	6	7.00
6	5	2.40

Critical difference for Scheffe Test (α = .05) = 5.07

There are no significant differences between pairs of groups.

Table 4

One Way ANOVA for Differences Between Groups on DPQ Inconsistency Scores

Source	Sum of squares	d.f.	Mean squares	F	p
Between Groups	236.44	5	47.29	3.42	.016
Within Groups	373.44	27	13.83		
TOTAL	609.88	32			

Group	N	Mean
1	4	12.50
2	4	11.50
3	7	15.29
4	7	12.57
5	6	16.50
6	5	8.20

Critical difference for Scheffe Test (α = .05) = 5.07.

Group 6 is significantly different from groups 3 and 5.

Equivalence of Assignment to Experimental Conditions

One way ANOVAs were also used to test for differences in subject characteristics between the two experimental conditions. Significant differences ($\alpha = .05$) between conditions were found with DPQ Unfriendly World scores ($p = .003$), DPQ Absorption scores ($p = .027$), DPQ Inconsistency scores ($p = .005$), and Questionnaire on Imagery Control scores ($p = .028$). While two of these variables, DPQ Absorption scores and QIC scores, are clearly related to the hypotheses being tested it was concluded that, since the analyses being conducted test for a pattern of relationships within and between Ss rather than differences between conditions or groups, these differences would not confound the analyses.

Reliability of Keyboard Ratings

The reliability of Ss' keyboard responses was measured by computing the Pearson correlation coefficient of the ratings which were requested during keyboard practices and the ratings each S recorded by pressing keys on the keyboard. Ratings which were missing either because the S failed to record a response or due to equipment failure were not considered in the computation of the reliabilities. Thus Ss differed in the number of recorded rating-requested rating pairs used in calculating the reliability of their keyboard responses.

The results of these reliability computations are displayed in Table 5. The majority of Ss were able to record their responses using the keyboards accurately with little practice. In

Table 5

Reliability of Subjects' Keyboard Responses

Reliability**	Session 1		Session 2		Session 5		Overall	
.90 - 1.0	33***	(75%)	24	(59%)	16	(66%)	31	(66%)
.80 - .89	5	(11%)	5	(12%)	3	(12.5%)	5	(10%)
.70 - .79	0		5	(12%)	2	(8%)	5	(10%)
.50 - .69	4	(9%)	2	(5%)	0		2	(4%)
.30 - .49	2	(4.5%)	2	(5%)	0		1	(2%)
.30	0		3	(7%)	3	(12.5%)	3	(6%)

*The overall reliability was based on the responses recorded during the keyboard practices in sessions 1, 2, and 5 and for some Ss is based on data from only one or two sessions.

**Pearson correlation between Ss responses and correct responses.

***Number of Ss attaining this level of reliability.

each session more than 80% of the Ss attained a reliability of more than 0.70 and two-thirds of the Ss attained an overall reliability of more than 0.90. A cut-off score of 0.70 was chosen and all Ss who did not attain an overall reliability greater than 0.70 were deleted from subsequent analyses.

Reliability of the Relaxation Rating Checklist

The reliability of the RXRC scores was assessed by computing inter-rater reliabilities between E and each AE across the sessions during which both E and AE completed ratings (Table 6). These reliabilities, ranging between approximately 0.4 and 0.6 were unsatisfactorily low, therefore RXRC scores were not used in data analysis.

Correlations Between Variables

The correlations obtained between the fifteen experimental variables are shown in Table 7. Sixty-nine of the one hundred and five correlations were statistically significant ($\alpha = .05$), and nineteen of the twenty-two correlations predicted on the basis of the hypothesized direct effects were significant. Fifty correlations not predicted on the basis of hypothesized direct effects were significant.

Two of the three predicted correlations which did not attain significance involve the correlation between relaxation instructions and the subsequent level of relaxation (RI1-LRX0, RI2-LRX4). Both of these correlations are essentially zero and

Table 6

Inter-rater Reliabilities for the Relaxation Rating Checklist

	Assistant Experimenter #1	Assistant Experimenter #2	Assistant Experimenter #3
	R* = .4895	R = .3875	R = .6441
Experimenter	n = 57	n = 56	n = 63
	p = .001	p = .002	p = .001

*Pearson correlation coefficient.

Table 7

Correlations Between Variables**

RXA	100	40*	14	07	00	00	49*	76*	74*	40*	15*	01	46*	75*	72*
IMA		100	19	09	-00	-00	07	40*	43*	08	21*	34*	09	40*	44*
TAAS			100	-06	00	00	13*	14*	15*	07	-01	17*	13*	13*	15*
SVSI				100	30*	-13*	-01	10	07	27*	56*	06	24*	07	09*
RI1					100	00	-09	04	-00	-00	09*	03	-02	-04	06
RI2						100	02	02	-06	-17*	-16*	-05	-08*	04	-01
LRXI							100	60*	45*	30*	07	-11*	37*	44*	38*
LRX0								100	81*	26*	09*	04	32*	70*	66*
LRX1									100	32*	11*	11*	32*	71*	74*
LRX2										100	50*	-06	65*	45*	33*
SVEI											100	17*	46*	32*	21*
IMQ												100	-07	10*	13*
LRX3													100	61*	43*
LRX4														100	80*
LRX5															100

*p .05

**Correlation coefficients are shown with decimals omitted, underscoring indicates correlations predicted by the hypotheses.

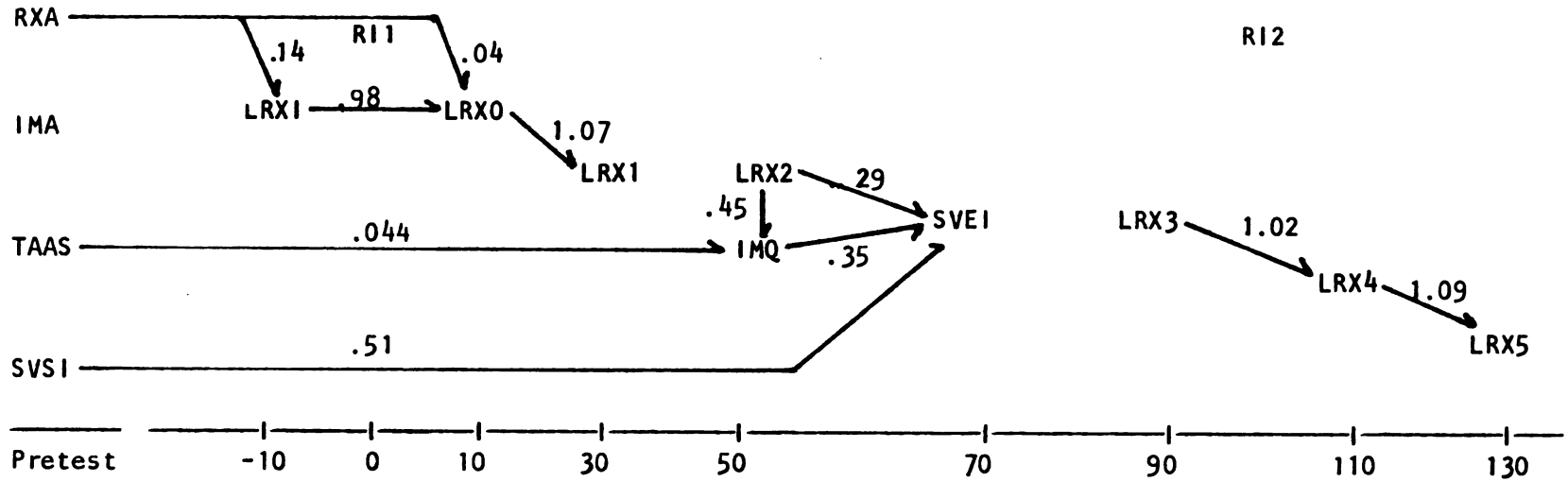
provide no support for the hypothesis that instructing Ss to relax or not relax alters their level of relaxation. The third of these predicted correlations is the correlation between the level of relaxation or anxiety while imaging the stimulus (LRX2) and the quality of the image (IMQ). This lack of significant correlation is not inconsistent with the hypothesized model because LRX2, IMQ, and SVEI are involved in touching feedback loops. When variables are involved in a loop or loops, the correlation is determined by the relative strengths of their reciprocal effects on each other. The lack of a significant correlation does not necessarily imply a lack of relationships between the two variables (Heise, 1975).

Causal Analysis

The computer program used in conducting the causal analysis on this data, the generalized three-stage least squares (G3SLS) program of the Statistical Package for the Social Sciences (SPSS) (Kaikow, Reagan, & Chouinard, 1977), deleted from the analysis all cases where data was missing on any variable used in the analysis. Thus Ss who failed to complete sessions one through four were deleted from this analysis and, in addition, if any of the Ss' ratings on an imagery trial were missing due to S failure to record the rating properly or due to equipment failure, the Ss responses on that imagery trial were deleted. T-tests were used to test for differences between data used in the causal analysis and data not used in the causal analysis on sex of S, DPQ sub-scale scores, and on all of the variables used in the causal

analysis. Of the variables used in the causal analysis, average scores on the SR scale of the DPQ (one of two measures of TAAS), TAAS, RXA, LRX2, LRX3, and LRX5 were significantly higher for the data used in the analysis than for the data excluded from analysis. There was a significant sex difference and average scores were lower on DPQ Well-Being, lower on DPQ Social Closeness, higher on DPQ Unlikely Virtues, lower on DPQ Content Balanced Desirability, and lower on DPQ Content Balanced Endorsement for data included in the analysis. This indicates that Ss whose data were included in the analysis were more likely to be female (55% vs. 41%), were more likely to avoid aversive stimuli, were better able to relax, and were more relaxed at three of the six points where Ss rated their level of relaxation. These differences raise questions over whether the results of this analysis can be generalized to other samples of college students. The results of the causal analysis are displayed in Figures 15 and 16.

It can be seen that the causal analysis (regression coefficients computed on unstandardized variables, Figure 15) and the path analysis (regression coefficients computed on standardized variables, Figure 16) produced somewhat discrepant results. The most important disagreements are over the presence or absence of a significant effect of SVEI on IMQ, and over whether the effect of LRX2 on IMQ is positive or negative. The two analyses also differ on the presence or absence of an effect of RXA on LRX2, an effect of LRX2 on LRX3, an effect of SVEI on LRX3, an effect of RXA on LRX4, an effect of LRX3 on LRX4, and on the sign of



Exogenous Variables:

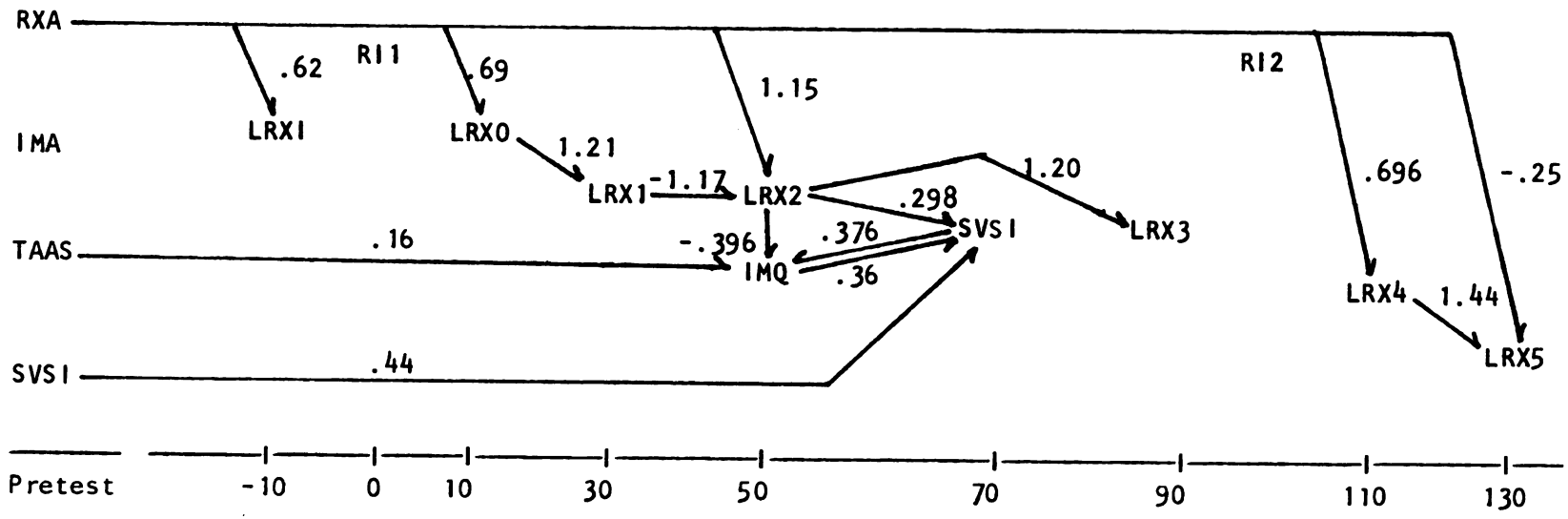
RXA - Relaxation Ability
IMA - Imagery Ability
TAAS - Tendency to Avoid Aversive Stimuli
SVSI - Stimulus-Value of Stimulus Imaged
RI1 - Relaxation Instructions #1
RI2 - Relaxation Instructions #2

Endogenous Variables:

LRXI - Initial Level of Relaxation
LRX0 - Level of Relaxation following RI1
LRX1 - Level of Relaxation before imaging stimulus
LRX2 - Level of Relaxation following onset of image
IMQ - Image Quality
SVEI - Stimulus-Value of Experienced Image
LRX3 - Level of Relaxation before termination of image
LRX4 - Level of Relaxation following RI2
LRX5 - Level of Relaxation at end of trial

*Generalized three-stage least squares estimates computed on unstandardized variables. Only statistically significant regression coefficients are shown ($\alpha = .05$).

Figure 15. Causal Analysis.*



Exogenous Variables:

RXA - Relaxation Ability
IMA - Imagery Ability
TAAS - Tendency to Avoid Aversive Stimuli
SVSI - Stimulus-Value of Stimulus Imaged
RI1 - Relaxation Instructions #1
RI2 - Relaxation Instructions #2

Endogenous Variables:

LRXI - Initial Level of Relaxation
LRX0 - Level of Relaxation following RI1
LRX1 - Level of Relaxation before imaging stimulus
LRX2 - Level of Relaxation following onset of image
IMQ - Image Quality
SVEI - Stimulus-Value of Experienced Image
LRX3 - Level of Relaxation before termination of image
LRX4 - Level of Relaxation following RI2
LRX5 - Level of Relaxation at end of trial

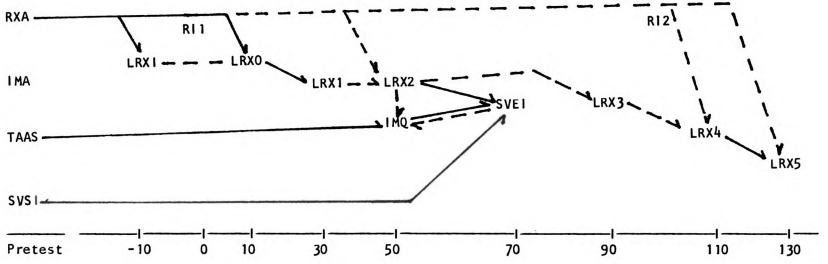
*Generalized three-stage least squares estimates computed on standardized variables. Only statistically significant path coefficients are shown ($\alpha = .05$).

Figure 16. Path Analysis.*

the effect of LRX1 on LRX2. In theory the two analyses should produce results which are analogous, the magnitudes of the coefficients would differ but the pattern of significant causal relationships should be the same. The discrepancies between the two analyses in this case should be due to the amount of error in the data and should disappear when the accuracy of measurements were improved or more data were available.

Figure 17 summarizes the points on which the path analysis and the causal analysis agree and disagree. Hypothesis 1 stated that SVEI was determined by SVSI, IMQ, and LRX2 and was supported by both analyses. Hypothesis 2 stated that IMQ was determined by IMA, LRX2, TAAS, and SVEI. Both analyses failed to support IMA as a determinant, both supported TAAS as a determinant, and the two analyses disagreed over LRX2 and SVEI. Hypotheses 3 and 4 concerned the determinants of LRX before, during, and after each image. The two analyses both failed to support the hypothesized effects of SVEI, RI1, and RI2 on LRX and produced very mixed results on the effect of RXA and the previous LRX on LRX.

Where the two analyses disagree there is no justification for treating one analysis as more believable than the other. Because of the discrepancies between the two analyses no further data analysis was conducted.



Exogenous Variables:

RXA - Relaxation Ability
IMA - Imagery Ability
TAAS - Tendency to Avoid Aversive Stimuli
SVSI - Stimulus-Value of Stimulus Imaged
RI1 - Relaxation Instructions #1
RI2 - Relaxation Instructions #2

Endogenous Variables:

LRXI - Initial Level of Relaxation
LRXO - Level of Relaxation following RI1
LRX1 - Level of Relaxation before imaging stimulus
LRX2 - Level of Relaxation following onset of image
IMQ - Image Quality
SVEI - Stimulus-Value of Experienced Image
LRX3 - Level of Relaxation before termination of image
LRX4 - Level of Relaxation following RI2
LRX5 - Level of Relaxation at end of trial

*Solid lines represent hypothesized causal relationships supported by both analyses.
Dotted lines represent relationships supported by one analysis or relationships where the analyses disagree over whether the relationship is positive or negative.

Figure 17. Combined Results of Path Analysis and Causal Analysis.*

DISCUSSION

Psychotherapy techniques which rely on the stimulus properties of mental imagery show potential for increasing the effectiveness and efficiency of psychotherapy. Research into the stimulus properties of mental imagery has provided support for the assertion that mental imagery is potentially useful in psychotherapy and has demonstrated that in some situations mental imagery can be superior to verbal description (Gaupp, 1969). However, studies which have investigated psychotherapy techniques which rely on the stimulus properties of mental imagery have not provided consistent support for the hypothesis that imagery is a crucial component of these techniques (Beere, 1971).

It has been suggested (Beere, 1971) that both the characteristics of imagery experienced during psychotherapy and the stimulus-value of the imagery are multiply determined and that an understanding of the determinants of the stimulus-value of mental imagery would resolve the discrepancy between the imagery research which supports the use of imagery techniques and the psychotherapy research which fails to support the importance of imagery.

It was hypothesized that:

1. The stimulus-value of a mental image is determined by the stimulus-value of the stimulus imaged, the quality of the experienced image, and the level of relaxation or anxiety.

2. The quality of the experienced image is determined by imagery ability, level of relaxation or anxiety, tendency to avoid aversive stimuli, and the stimulus-value of the experienced image.

3. The level of relaxation or anxiety while imaging a stimulus is determined by the initial level of relaxation or anxiety, relaxation ability, and the stimulus-value of the experienced image.

4. In the absence of stimulation the level of relaxation or anxiety is determined by the initial level of relaxation or anxiety, relaxation ability, and relaxation instructions.

This hypothetical model was tested by computing a causal analysis and a path analysis on data collected from a sample of sixty undergraduate volunteers. Both analyses supported Hypothesis 1, but Hypothesis 2 was only partially supported, Hypothesis 3 was not clearly supported, and Hypothesis 4 was partially supported at some points in the imagery trials and not supported at other points in the imagery trials.

In supporting Hypothesis 1 this study has provided empirical support for procedures common to many of the psychotherapy techniques which use the stimulus properties of imagery. This finding supports using images in the place of the actual stimuli by showing a correspondence between the stimulus-value of the stimulus and the stimulus-value of the image. It supports treating image quality as an important variable in these psychotherapy techniques by showing that image quality is a major determinant of the stimulus-value

of the experienced image. Finally, it shows that the level of relaxation while imaging a stimulus can moderate the stimulus-value of the image. However, the lack of support for Hypothesis 3 prevents this from providing clear support for the use of relaxation training with imagery procedures.

The mixed support for Hypothesis 2 highlights the lack of theoretical understanding of the processes involved in imagery procedures. While previous imagery research has supported both imagery ability and level of relaxation as determinants of image quality, neither analysis found imagery ability to be a significant determinant and the two analyses disagreed over whether level of relaxation was positively or negatively related to image quality. It is quite possible that the method used to measure IMA in this study did not provide a reliable, valid measure of imagery ability and that this produced the negative results. Otherwise it is difficult to explain why individual differences in imagery ability would not produce differences in image quality. The conflicting results concerning the effect of the level of relaxation or anxiety on image quality should be a product of measurement error throughout the model.

The finding that tendency to avoid aversive stimuli had a significant effect on image quality provides some support for the more global hypothesis that somehow the quality of aversive images is limited in order to limit aversive stimulation. However, only one analysis supported the hypothesis that the stimulus-value of the experienced image had a direct effect on image quality and

neither analysis supported the hypothesized indirect effect of the stimulus-value of the experienced image on image quality through its impact on the level of relaxation or anxiety. These findings do not provide clear support for the global hypothesis that the image quality of an aversive image decreases in order to limit the stimulus-value of the image and certainly does not provide support for hypotheses concerning the specific processes responsible for this hypothesized phenomenon.

Hypotheses 3 and 4 concerned the determinants of the level of relaxation or anxiety at each of the points when LRX was rated. Both analysis found that relaxation instructions and the stimulus-value of the experienced image had no significant effect on the level of relaxation or anxiety while producing very mixed results concerning the effect of relaxation ability and the previous level of relaxation. In this study the importance of following relaxation instructions was not emphasized and Ss were not provided with any motivation for following the instructions. It is difficult to justify generalizing from this situation to the use of imagery in psychotherapy where the clients are motivated to comply with the procedure in order to obtain beneficial results. Also, two theories of affective response to stimulation, Solomon's Opponent Process Theory (Solomon & Corbit, 1973) and Denny's Elicitation Theory (Denny, 1976) predict that affective responses to stimuli vary across time in a curvilinear pattern. The current hypothetical model did not take either the time lag or the curvilinearity of the relationship into account and thus ignored a potentially

important determinant of the level of relaxation or anxiety. It is possible that this inadequacy of the model is responsible for the mixed results concerning the determinants of the level of relaxation or anxiety, certainly the model did not adequately describe these determinants.

The data on which this analysis was based differed from the larger pool of data on many of the variables included in the analysis. This raises questions concerning the validity of generalizing these results to other samples of college students, let alone to clinical populations.

While it is clear that further research is needed to develop a better theoretical model of the determinants of the stimulus-value of mental imagery and to test the generalizability of that model, this study shows that there is considerable potential for the development of such a model. This model successfully predicted 19 of 22 correlations and successfully accounted for the immediate determinants of the stimulus-value of mental imagery. Further research may produce a model which describes the functioning of the stimulus-value of imagery in psychotherapy more completely and which possesses greater explanatory and predictive power.

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APPENDICES

APPENDIX A

OUTLINE OF PRESENTATION USED IN SUBJECT RECRUITMENT

APPENDIX A

OUTLINE OF PRESENTATION USED IN SUBJECT RECRUITMENT

Hello, I'm _____. I'm working with Jim Pretzer, a grad student in Clinical Psychology.

I'd like to tell you about a research project you may want to take part in, what it will involve, and what you can get out of it.

It's a study of imagination and personality, both how imagination influences personality and how personality influences imagination.

In the study you will:
- take paper-and-pencil tests
- imagine a variety of scenes
- report what you imagined and how you felt
- participate in progressive relaxation training

Progressive relaxation training is:
- a technique for learning to relax deeply at will
- it has been used widely
- most people who learn it find it useful for controlling anxiety, tension (like before a test), and insomnia caused by tension
- it teaches relaxation as a skill through guided practice

It will involve meeting once a week for 5 weeks on Monday, Tuesday or Wednesday evenings, times to be arranged.

Interested persons should sign up on the sheets at the back of the room.

Any questions?

Answers to questions:

About credits - 10

About what's being investigated--that will be explained at the end of the study, explaing it now might influence the results.

About times--Jan. 30 to March 1, 7-8 p.m. or 8:30-9:30 p.m. Sessions will last 1 to 1½ hours, they should plan on attending all sessions but can quit at any time without penalty.

About relaxation--a skill learned through practice, not magic, not hypnosis, more like meditation.

About imaginary scenes--common scenes like riding a rollercoaster or sitting in class.

APPENDIX B

STIMULUS-VALUE SURVEY SCHEDULE (SHORT FORM)

APPENDIX B

STIMULUS-VALUE SURVEY SCHEDULE (SHORT FORM)

The items on this questionnaire refer to things, situations, and experiences which may give pleasant or unpleasant feelings. Mark the space on the answer sheet which describes how much pleasure or discomfort the item gives you nowadays.

Rating scale:

1 = Very Unpleasant

2 = Unpleasant

3 = Moderately Unpleasant

4 = A Little Unpleasant

5 = Just Barely Unpleasant

6 = Just Barely Pleasant

7 = A Little Pleasant

8 = Moderately Pleasant

9 = Pleasant

10 = Very Pleasant

Before you start, mark your student number in the space provided on the answer sheet and mark from "3C" in the box labeled FORM on the answer sheet.

PLEASE DO NOT WRITE IN THIS BOOKLET!

1. Listening to classical music.
2. Reading a medical text.
3. Seeing a group of tough-looking people in the hall.
4. Reading a comic book.
5. Being very hot.
6. A dream.
7. Reading a religious book.
8. Listening to rhythm and blues music.
9. Birds in the trees around you.
10. Seeing a nude woman through a window.
11. Reading a book about politics and history.
12. Shopping for appliances.
13. Blushing.
14. Shopping for auto parts.
15. Hearing loud voices.
16. Listening to country and western music.
17. Watching people playing pool.
18. Square dancing.
19. Watching a football game.
20. Being in a large crowd.
21. Talking to a judge.
22. Solving a crossword puzzle.
23. Shopping for a new car.
24. Seeing a pool of animal blood on the ground.
25. Watching a track meet.

26. Listening to folk music.

27. Saying prayers.

28. Being watched while you work.

29. Being in a strange place.

30. Seeing human blood.

31. Reading a science book.

32. Listening to show tunes.

APPENDIX C

PERSONAL DATA SHEET

APPENDIX C

PERSONAL DATA SHEET

This sheet will ask you for some basic background information. Answer each question by marking the appropriate space on the answer sheet. Before you begin mark your student number in the space provided on the answer sheet.

1. How old are you?
   A. Less than 18
   B. 18 to 21
   C. 22 to 30
   D. 21 to 50
   E. Over 50

2. What is your sex?
   A. Female
   B. Male

3. What is your marital status?
   A. Single
   B. Married
   C. Separated
   D. Divorced
   E. Living with someone

4. What is your class level?
   A. Freshman
   B. Sophomore
   C. Junior
   D. Senior
   E. Graduate or other

5. What is your overall GPA?
   A. 1.9 or less
   B. 2.0 to 2.2
   C. 2.3 to 2.7
   D. 2.8 to 3.3
   E. 3.4 to 4.0

6. What is your major? (If you're undecided, which are are your most interested in?
   A. Psychology
   B. Other Social Sciences
   C. Physical Sciences, Medicine, Agriculture
   D. Business
   E. Humanities

7. How interested are you in psychology?
   A. Very interested
   B. Moderately interested
   C. About average compared to other fields
   D. Not very interested
   E. I don't enjoy it at all

8. Where were you born?
   A. Northeastern U.S.A.
   B. Southern or Southeastern U.S.A.
   C. Midwest U.S.A.
   D. Western or Northwestern U.S.A.
   E. Outside of the U.S.A.

9. Where did you live as a child?
   A. Northeastern U.S.A.
   B. Southern or Southeastern U.S.A.
   C. Midwest U.S.A.
   D. Western or Northwestern U.S.A.
   E. Outside of the U.S.A.

10. What type of area did you live in as a child?
   A. Inner city or urban
   B. Suburban
   C. Small town
   D. Rural

11. Do you feel like you are good at relaxing when you feel anxious?
   A. I generally can relax deeply without much effort.
   B. I generally can relax but I have to work at it.
   C. Sometimes I can relax and sometimes I can't.
   D. I generally can become less anxious but not relaxed.
   E. I generally can't change my level of anxiety at all.

12. Have you had any experience with meditation techniques (TM, yoga, etc.)?
   A. No.
   B. Yes, I've tried meditation once or twice.
   C. Yes, I used to meditate but don't do it anymore.
   D. Yes, I meditate occasionally but not very regularly.
   E. Yes, I meditate regularly.

13. Have you had any experience with relaxation training or autogenic training?
   A. No.
   B. Yes, I've tried the training once or twice.
   C. Yes, I had some training but I don't use if anymore.
   D. Yes, I had training and I use it occasionally.
   E. Yes, I had training and I use it regularly.

APPENDIX D

PARTICIPANT'S EVALUATION FORM

APPENDIX D

PARTICIPANT'S EVALUATION FORM

Your evaluation of this study is important both so that we can determine if the study worked the way we expected it to and so that we can design future studies to eliminate any problems you've become aware of. Please answer the following questions, for most of the questions you will mark a space on the answer sheet but a few questions will ask you to write out answers on the back of the answer sheet. Be sure to number the answers you write on the back of the answer sheet and to skip the space on the front of the answer sheet for that question.

Be sure to mark your student number on the answer sheet before you begin.

PLEASE DO NOT WRITE IN THIS BOOKLET!

1. How clear and understandable was the explanation of the purpose of the study?
   A. Very clear and understandable.
   B. Clear and understandable.
   C. A bit hard to understand.
   D. Hard to understand.
   E. Impossible to understand.

2. How clear and understandable were the explanations of the procedure for each session.
   A. Very clear and understandable.
   B. Clear and understandable.
   C. A bit hard to understand.
   D. Hard to understand.
   E. Impossible to understand.

3. How clear and understandable was the explanation of how progressive relaxation training works.
   A. Very clear and understandable.
   B. Clear and understandable.
   C. A bit hard to understand.
   D. Hard to understand.
   E. Impossible to understand.

4. How reasonable did the explanation of the purposes of the study seem?
   A. Quite reasonable and convincing.
   B. Reasonable enough.
   C. I had a few doubts about it.
   D. I found it hard to accept.

5. How reasonable did the explanation of how progressive relaxation training works seem?
   A. Quite reasonable and convincing.
   B. Reasonable enough.
   C. I had a few doubts about it.
   D. I found it hard to accept.

6. Did you feel like you needed more information about any part of the study? If so, what? (Answer this on the back of the answer sheet and skip space 6 on the front of the answer sheet.)

7. Was the timing of images too fast or too slow?
   A. Much too fast.
   B. A bit too fast.
   C. About right.
   D. A bit slow.
   E. Much too slow.

8. Was it distracting to rate the images?
   A. Yes, very distracting.
   B. Yes, moderately distracting.
   C. A bit distracting.
   D. No, it wasn't distracting.

9. Did rating the iamges seem to change the images? If so, how? (Answer on the back of the answer sheet and skip space 9.)

10. Did rating your level of relaxation seem to change your level of relaxation? If so, how? (Answer on the back of the answer sheet and skip space 10.)

11. Were the keyboards hard to use?
   A. Really hard to use.
   B. Somewhat hard to use.
   C. Not very hard to use.
   D. Easy to use.
   E. Quite easy to use.

12. Did you like the progressive relaxation training?
   A. I really liked it.
   B. I like it moderately,
   C. I didn't really like or dislike it.
   D. I disliked it a bit.
   E. I really disliked it.

13. Did you find the progressive relaxation training useful outside of the experiment?
   A. I found it very useful.
   B. I found it useful sometimes.
   C. I didn't find it very useful.
   D. I didn't find it useful at all.

14. If a friend told you that he/she was trying to find a good way to relax would you recommend progressive relaxation training?
   A. I definitely would.
   B. I probably would.
   C. I might.
   D. I probably wouldn't.
   E. I definitely wouldn't.

15. How often did you practice the progressiv relaxation training at home (on the average)?
   A. Twice a day.
   B. Once a day.
   C. About two days out of three.
   D. About every other day.
   E. About one day out of three or less.

16. Did your relaxation practice at home work as well as the practice during experimental sessions (on the average)?
    A. Practice at home worked better.
    B. Both worked about the same.
    C. Practice at home didn't work quite as well.
    D. Practice at home didn't work nearly as well.
    E. Practice at home didn't work at all.

17. Was it ever hard to stop imaging a scene when you were asked to?
    A. Yes, with both pleasant and unpleasant scenes.
    B. Yes, only with pleasant scenes.
    C. Yes, only wiht unpleasant scenes.
    D. Yes, but I can't remember if the scences were pleasant or unpleasant.
    E. No.

Did you ever experience images other than the requested ones when you were asked to image a scene? If so, answer the next 4 questions, if not skip to question 23.

18. Were these extra images more pleasant or less pleasant than the requested images?
    A. Always more pleasant.
    B. Usually more pleasant.
    C. Usually less pleasant.
    D. Always less pleasant.
    E. I can't remember.

19. Were these extra images similar to your dreams?
    A. Usually very similar.
    B. Usually somewhat similar.
    C. Usually not similar.
    D. Usually completely different.
    E. I can't remember.

20. Where these extra images similar to your daydreams?
    A. Usually very similar.
    B. Usually some what similar.
    C. Usually not similar.
    D. Usually completely different.
    E. I can't remember.

21. Did these images seem connected to your past?
    A. They usually seemed clearly connected to my past.
    B. They sometimes seemed connected to my past.
    C. They usually didn't seem connected to my daily life.

22. Did these images seem connected to your daily life?
    A. They usually seemed clearly connected to my daily life.
    B. They sometimes seemed connected to my daily life.
    C. They usually didn't seem connected to my daily life.

23. The general purpose of the study was explained but the exact theories being tested weren't explained, exactly what do you think was being tested? (Answer on the back of the answer sheet, skip space 23.)

24. Do you think the experimenter found what he was looking for?
    A. Yes, I'm sure he did.
    B. I think he did.
    C. I really don't know.
    D. I doubt if he did.
    E. I'm certain he didn't.

APPENDIX E

RELAXATION RATING CHECKLIST

Session # _____ Rater # _____

Chair # _____ Set # _____

APPENDIX E

RELAXATION RATING CHECKLIST

Check the appropriate ratings:

A. Posture (position of head and neck, arms and hands, back and shoulders):
   _____0. Limp (completely relaxed posture)
   _____1. Loose (moderately relaxed posture)
   _____2. Neither tense nor relaxed (normal day-to-day muscle tension)
   _____3. Tense (moderate muscle tension)
   _____4. Rigid (extreme muscle tension)

B. Eyeblinks:
   _____0. No eyeblinks or eyelid twitches.
   _____1. Eyelids twitching occasionally (1-2 times).
   _____2. Eyelids twitching frequently (3+ times).
   _____3. Eyes blinking open occasionally (1-2 times).
   _____4. Eyes blinking open frequently (3+ times).

C. Movement of entire body, arm, leg, or head:
   _____0. No movements.
   _____2. Occasional movements (1-2).
   _____4. Frequent movements (3+).

D. Movements of fingers, feet, or facial movements:
   _____0. No movements.
   _____2. Occasional movements (1-2).
   _____4. Frequent movements (3+).

APPENDIX F

EXPERIMENTAL INSTRUCTIONS USED IN SESSIONS TWO AND FIVE

APPENDIX F

EXPERIMENTAL INSTRUCTIONS USED IN

SESSIONS TWO AND FIVE

First Set of Images:

Relax and get in a comfortable position with your hand on the keyboard.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Imagine listening to classical music.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate the vividness of the image. Extremely vague and dim is bottom left, as vivid as life is bottom right.

Rate how pleasant or unpleasant it is to imagine this. Extremely unpleasant is top left, extremely pleasant is bottom right.

Rate the stability of the image. Not experiencing the requested image is bottom left, experiencing it without changing is bottom right.

Rate your level of relaxation or anxiety. Extremely anxious is top left, completely relaxed is bottom right.

Stop imaging. Make no special effort to relax.

Rate you level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Imagine reading a religious book.

Rate your level of relaxation or anxiety. Extreme anxiety is bottom left, as vivid as life is bottom right.

Rate how pleasant or unpleasant it is to imagine this. Extremely unpleasant is top left, extremely pleasant is bottom right.

Rate the stability of the image. Not experiencing the requested image is bottom left, experiencing it without changing is bottom right.

Rate your level of relaxation or anxiety. Extremely anxious is top left, completely relaxed is bottom right.

Stop imaging and relax. Let yourself relax completely.

Rate your level of relaxation of anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Imagine seeing a group of tough-looking people in the hall.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate the vividness of the image. Extremely vague and dim is bottom left, as vivid as life is bottom right.

Rate how pleasant or unpleasant it is to imagine this. Extremely unpleasant is top left, extremely pleasant is bottom right.

Rate the stability of the image. Not experiencing the requested image is bottom left, experiencing it without changing is bottom right.

Rate your level of relaxation of anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Stop imaging and relax. Let yourself relax completely.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate your level of relaxation or anxeity. Extreme anxiety is top left, complere relaxation is bottom right.

Imagine reading a comic book.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate the vividness of the image. Extremely vague and dim is bottom left, as vivid as life is bottom right.

Rate how pleasant or unpleasant it is to imagine this. Extremely unpleasant is top left, extremely pleasant is bottom right.

Rate the stability of the image. Not experiencing the requested image is bottom left, experiencing it without changing is bottom right.

Rate your level of relaxation or anxiety. Extremely anxiuos is top left, completely relaxed is bottom right.

Stop imaging. Make no special effort to relax.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate your level of relaxation of anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Imagine talking to a judge.

Rate your level of relaxation or anxiety. Extreme anxiety is tope left, complete relaxation is bottom right.

Rate the vividness of the image. Extremely vague and dim is bottom left, as vivid as life is bottom right.

Rate how pleasant or unpleasant it is to imagine this. Extremely unpleasant is top left, extremely pleasant is bottom right.

Rate the stability of the image. Not experiencing the requested image is bottom left, experiencing it without changing is bottom right.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, compelte relaxation is bottom right.

Stop imaging. Make no special effort to relax.

Rate your level of relaxation of anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Imagine being in a large crowd.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate the vividness of the image. Extremely vague and dim is bottom left, as vivid as life is bottom right.

Rate how pleasant or unpleasant it is to imagine this. Extremely unpleasant is top left, extremely pleasant is bottom right.

Rate the stability of the image. Not experiencing the requested image is bottom left, experiencing it without changing is bottom right.

Rate your level of relaxation or anxiety. Extremely anxious is top left, completely relaxed is bottom right.

Stop imaging and relax. Let yourself relax completely.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate your level of relaxation of anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Imagine a dream.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate the vividness of the image. Extremely vague and dim is bottom left, as vivid as life is bottom right.

Rate how pleasant or unpleasant it is to imagine this. Extremely unpleasant is top left, extremely pleasant is bottom right.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Stop imaging and relax. Let yourself relax completely.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Imagine listening to rhythm and blues music.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate the vividness of the image. Extremely vague and dim is bottom left, as vivid as life is bottom right.

Rate how pleasant or unpleasant it is to imagine this. Extremely unpleasant is top left, extremely pleasant is bottom right.

Rate the stability of the image. Not experiencing the requested image is bottom left, experiencing it without changing is bottom right.

Rate your level of relaxation or anxiety. Extremely anxious is top left, completely relaxed is bottom right.

Stop imaging and relax. Let yourself relax completely.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate your level of relaxation of anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Imagine seeing a nude woman through a window.

Rate your level of relaxation or anxiety. Extreme anxeity is top left, complete relaxation is bottom right.

Rate the vividness of the image. Extremely vague and dim is bottom left, as vivid as life is bottom right.

Rate how pleasant or unpleasant it is to imagine this. Extremely unpleasant is top left, extremely pleasant is bottom right.

Rate the stability of the iamge. Not experiencing the requested image is bottom left, experiencing it without changing is bottom right.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Stop imaging. Make no speical effort to relax.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Imagine being very hot.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate the vividness of the image. Extremely vague and dim is bottom left, as vivid as life is bottom right.

Rate how pleasant or unpleasant it is to imagine this. Extremely unpleasant is top left, extremely pleasant is bottom right.

Rate the stability of the image. Not experiencing the requested image is bottom left, experiencing it without changing is bottom right.

Rate your level of relaxation or anxiety. Extremely anxious is top left, completely relaxed is bottom right.

Stop imaging. Make no special effort to relax.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate your level of relaxation of anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

EXPERIMENTAL INSTRUCTIONS USED IN

SESSIONS TWO AND FIVE

Second Set of Images:

Relax and get in a comfortable position with your hand on the keyboard.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Imagine shopping for applicances.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate the vividness of the image. Extremely vague and dim is bottom left, as vivid as life is bottom right.

Rate how pleasant or unpleasant it is to imagine this. Extremely unpleasant is top left, extremely pleasant is bottom right.

Rate the stability of the image. Not experiencing the requested image is bottom left, experiencing it without changing is bottom right.

Rate your level of relaxation or anxiety. Extremely anxious is top left, completely relaxed is bottom right.

Stop imaging. Make no special effort to relax.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Imagine being watched while you work.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate the vividness of the image. Extremely vague and dim is bottom left, as vivid as life is bottom right.

Rate how pleasant or unpleasant it is to imagine this. Extremely unpleasant is top left, extremely pleasant is bottom right.

Rate the stability of the image. Not experiencing the requested image is bottom left, experiencing it witbout changing is bottom right.

Rate your levelof relaxation or anxiety. Extremely anxious is top left, completely relaxed is bottom right.

Stop imaging and relax. Let yourself relax completely.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate your level of relaxation of anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Imagine watching a track meet.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate the vividness of the iamge. Extremely vague and dim is bottom left, as vivid as life is bottom right.

Rate how pleasant or unpleasant it is to imagine this. Extremely unpleasant is top left, extremely pleasant is bottom right.

Rate the stability of the image. Not experiencing the requested image is bottom left, experiencing it without changing is bottom right.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Stop imaging and relax. Let yourself relax completely.

Rate you level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Imagine seeing a pool of animal blood on the ground.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate the vividness of the image. Extremely vague and dim is bottom left, as vivid as life is bottom right.

Rate how pleasant or unpleasant it is to imagine this. Extremely unpleasant is top left, extremely pleasant is bottom right.

Rate the stability of the image. Not experiencing the requested image is bottom left, experiencing it without changing is bottom right.

Rate your level of relaxation or anxiety. Extremely anxious is top left, completely relaxed is bottom right.

Stop imaging. Make no special effort to relax.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate your level of relaxation of anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Imagine saying prayers.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate the vividness of the image. Extremely vague and dim is bottom left, as vivid as life is bottom right.

Rate how pleasant or unpleasant it is to imagine this. Extremely unpleasant is top left, extremely pleasant is bottom right.

Rate the stability of the image. Not experiencing the requested image is bottom left, experiencing it without changing is bottom right.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Stop imaging. Make no special effort to relax.

Rate your level of relaxation or anxiety. Extremely anxiety is top left, complete relaxation is bottom right.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Imagine being in a strange place.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate the vividness of the image. Extremely vague and dim is bottom left, as vivid as life is bottom right.

Rate how pleasant or unpleasant it is to imagine this. Extremely unpleasant is top left, extremely pleasant is bottom right.

Rate the stability of the image. Not experiencing the requested image is bottom left, experiencing it without changing is bottom right.

Rate your level of relaxation or anxiety. Extremely anxious is top left, completely relaxed is bottom right.

Stop imaging and relax. Let yourself relax completely.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate your level of relaxation of anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Imagine hearing loud voices.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate the vividness of the image. Extremely vague and dim is bottom left, as vivid as life is bottom right.

Rate how pleasant or unpleasant it is to imagine this. Extremely unpleasant is top left, extremely pleasant is bottom right.

Rate the stability of the image. Not experiencing the requested image is bottom left, experiencing it without changing is bottom right.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Stop imagining and relax. Let yourself relax completely.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Imagine seeing human blood.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate the vividness of the image. Extremely vague and dim is bottom left, as vivid as life is bottom right.

Rate how pleasant or unpleasant it is to imagine this. Extremely unpleasant is top left, extremely pleasant is bottom right.

Rate the stability of the image. Not experiencing the requested image is bottom left, experiencing it without changing is bottom right.

Rate your level of relaxation or anxiety. Extremely anxious is top left, completely relaxed is bottom right.

Stop imaging and relax. Let yourself relax completely.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Imagine shopping for a new car.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate the vividness of the image. Extremely vague and dim is bottom left, as vivid as life is bottom right.

Rate how unpleasant or unpleasant it is to imagine this. Extremely unpleasant is top left, extremely pleasant is bottom right.

Rate the stability of the image. Not experiencing the requested image is bottom left, experiencing it without changing is bottom right.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Stop imaging. Make no special effort to relax.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Imagine solving a crossword puzzle.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate the vividness of the image. Extremely vague and dim is bottom left, as vivid as life is bottom right.

Rate how pleasant or unpleasant it is to imagine this. Extremely unpleasant is top left, extremely pleasant is bottom right.

Rate the stability of the image. Not experiencing the requested image is bottom left, experiencing it without changing is bottom right.

Rate your level of relaxation or anxiety. Extremely anxious is top left, complete relaxation is bottom right.

Stop imaging. Make no special effort to relax.

Rate your level of relaxation or anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

Rate your level of relaxation of anxiety. Extreme anxiety is top left, complete relaxation is bottom right.

APPENDIX G

RELAXATION MONITORING CARD

APPENDIX G

RELAXATION MONITORING CARD

Front:

INSTRUCTIONS

As you know it is important to practice relaxation in order to master it.

Place this card somewhere obvious (such as on your mirror) to serve as a reminder and, each time you practice, record the date, time, and your level of tension or relaxation before and after practice.

Rating Scale for Tension or Relaxation:

1. Extremely Tense
2. Tense
3. Moderately Tense
4. Mildly Tense
5. Just Barely Tense
6. Just Barely Relaxed
7. Mildly Relaxed
8. Moderately Relaxed
9. Relaxed
10. Completely Relaxed

Back:

DATE	TIME	BEFORE	AFTER	
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.