IMAGERY/MENTAL PRACTICE: A COGNITIVE TECHNIQUE
FOR TEACHING ADAPTIVE MOVEMENT TO
POSTOPERATIVE SPINAL PATIENTS

DISSertation

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Postoperative spinal patients were randomly assigned to one of three treatment conditions and were taught five adaptive movements by occupational therapists. The Control group received routine hospital occupational therapy; the Placebo group participated in an imagery relaxation task unrelated to the mental practice task of the Imagery group, which was shown line drawings of the adaptive movements under study, provided movement instructions, and asked to mentally practice each movement in a familiar, daily living situation. Thirty-five patients returned for follow-up, and a measure of outcome was obtained through the use of a quantified movement assessment instrument. Subjective ratings for anxiety, rumination, and imagery were made by the occupational therapists. An occupational motoric-symbolic rating scale was developed to assess the symbolic portion of the patient's job experience.

Statistical procedures including chi square, analysis of variance, and Pearson correlation were performed. Results were in the predicted direction although statistical
significance was not achieved. Possible explanations for the obtained results were discussed.
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CHAPTER I

IMAGERY/MENTAL PRACTICE: A COGNITIVE TECHNIQUE FOR TEACHING ADAPTIVE MOVEMENT TO POSTOPERATIVE SPINAL PATIENTS

Back problems have become a major health concern (Bigos, Spengler, Martin, Zeh, Fisher, Nachemson, & Wang, 1986). Eight out of 10 Americans have been affected (Anastas, 1986) or will be affected to some degree during their lifetimes with back problems (Spengler et al., 1986). The incidence of low-back pain and injury has become a formidable problem in the Western world (Bigos, Spengler, Martin, Zeh, Fisher, & Nachemson, 1986). Seven million new victims have been identified each year (Bete, 1985). Approximately 600,000 occupational back injuries have occurred annually (Bete, 1986), and 200,000 people have had surgery for back problems during this same time period (Bete, 1985). Back pain has accounted for one-third of all workers' compensation claim costs (Anastas, 1986). Pain, loss of income, medical expenses, inconvenience, and disability have often been the result of back difficulties as billions of dollars have been spent on legal costs, sick pay, and medical/surgical benefits (Anastas, 1986; Bete, 1985).
Back problems have proven costly for everyone concerned—sufferers, their families, their employers, and the economy. The victims of back problems have suffered personal pain, loss of individual productivity, and sometimes, income. Often inpatient hospitalization and surgery have been necessary to obtain relief. Unfortunately for the victims of back injuries, the cost of health care has risen steadily for a number of years. In 1977, then President Jimmy Carter proposed the Health Costs Containment Act as part of his health care initiatives (Carter, 1978). The ever accelerating cost of health care has been a major reason for the rising Consumer Price Index in the United States. Currently, more than one tenth (10.8%) of the gross national product (GNP) of the United States is spent on health care (Cohen, 1985). In 1981, the increase in the cost of health care was 15.7 per cent, which represented the largest one-year increase. In 1985, total health care spending in the United States rose 8.9 per cent and was the smallest rate of increase in two decades (Anderson & Baldwin, 1986).

It has become increasingly important to consider ways of controlling health care costs (Editorials, 1986). One way to reduce overall health care cost for consumers and third-party payers has been to shorten the stay in the hospital whenever possible. This has been occurring with increasing frequency. The average daily census for small or rural
hospitals has fallen 13 per cent between 1980 and 1984. This was compared with a drop of six per cent nationally for all hospitals (News Briefs, 1986). Changes in medical practice have helped to bring this about through advances in the knowledge and skills necessary to provide hospital care. Another way to reduce medical costs has been the use of more outpatient services, especially for diagnostic procedures, and same-day-surgery services. Certain diagnostic and surgical procedures have been identified by some health insurance companies as entirely reimbursable if performed on an outpatient basis and only partially reimbursable if inpatient care was provided when not medically necessary (Anastas, 1986).

The Prospective Payment System (PPS) and Diagnostic Related Groups (DRGs) recently introduced into the health care delivery system by Medicare have become an incentive for inpatient facilities to control hospital lengths of stay and thereby keep bed days within the limits specified by the DRGs. The DRGs were established to set reimbursements for each hospital admission depending on the patient's diagnosis. Under the PPS, hospitals were paid the average cost for treating each episode. The average cost was adjusted for such variables as patient age and type of treatment received (Washington, 1986). Revenue has been lost by hospitals who were unable to collect from patients
who required additional days beyond those paid for by Medicare, insurance, or personal resources.

The resulting reduction in length of stay has caused hospitals to treat a generally more acutely ill patient population (Dolkart, 1986). However, the reduction in amount of time spent in the hospital must not affect the quality of care. This must remain the same for the shorter hospital stays as it was for the longer intervals.

The attempt to reduce hospital stays has created problems in certain situations, especially spinal surgery patients. Two major tasks faced by postoperative spinal patients have traditionally resulted in longer hospital stays for these patients. First has been the physical recovery from the surgery with the concomitant decrease in the use of associated analgesics. Second, postoperative spinal patients must learn correct body mechanics to improve adaptive movements and lessen the likelihood of re-injury. The restriction of movement brought about by surgery has affected every aspect of a patient's life style (Spencer, 1978). Learning and using adaptive movements, in large measure, have determined how successfully a post-surgical patient has accommodated to the routine activities of daily living (Physicians Art Service, 1977). However, in many cases patients have been ready for discharge from the acute care phase of their treatment before they were ready to actually practice the physical movements.
In the hospital setting, several treatment disciplines have been applied to assist patients in obtaining maximum possible recovery. A discipline frequently used to assist post-surgical patients in re-learning skills for self-help, work, and play or, in other words, functional rehabilitation, has been occupational therapy (Hopkins & Tiffany, 1978). The occupational therapist's understanding of the integration of basic mechanical concepts, the effects of exercise on the body, muscle function, and the relationship of gravity and resistance to movement has been important in functional restoration (Smith, 1978). Occupational therapists have been key caregivers in providing restorative services to postoperative back patients. Therefore, if occupational therapists could be equipped with techniques shown to improve the acquisition of skilled/adaptive movements, then the occupational therapists' contribution to the recovery of function following surgery would be enhanced, and the possibility of shortening hospital stays without sacrificing quality could be approached. If imagery/mental practice could be shown to improve the adaptive motor skills necessary to reduce the probability of re-injury, and if the imagery practice could be administered by occupational therapists themselves, this would be a significant contribution to the repertoire of a professional group central to the treatment of back problems.
Three recent developments have paved the way for research that could assist in finding acceptable solutions to this problem. First, advances in the area of behavioral medicine/health psychology have resulted in the application of psychological methods and technologies to the understanding and treatment of physical disorders (Agras, 1982; Matarazzo, 1980; Melamed, 1984; Schwartz & Weiss, 1978). Second, the use of mental imagery has re-emerged as a potentially useful technique when used adjunctively with medical procedures to aid in the treatment of patients under a variety of conditions (Achterberg & Lawlis, 1980). Third, the literature of sport psychology has contained numerous examples of the use of imagery/mental practice to improve motor skills or physical performance (Corbin, 1972; Suinn, 1976b; Weinberg, 1982).

Review of the Literature

The purpose of the present study was to explore the potential for using imagery/mental practice as a cognitive mediation strategy to teach body mechanics to postoperative spinal patients. In other words, could the technique of imagery, which has a long history of use in various mental and physical settings, and more recently in sport psychology to improve athletic performance, have efficacy in an acute care/rehabilitation setting to teach adaptive movements? The literature review was concerned with the definitions of adaptive movement, imagery, and mental practice; the
historical and theoretical development of imagery and mental practice; and lastly, the use of imagery/mental practice in the literature of sport psychology and rehabilitation.

**Definitions.** Corbin (1972) urged consideration of the physical principles that apply to movement and postulated that a prerequisite for effective use of mental practice would be the use of established biomechanical principles. Occupational therapy has used the mechanical principles of physics to conceptualize the bones of the body as levers, the muscles as force, and the joints as the axis or fulcrum (Smith, 1978). This "machine analogy" has been used by occupational therapy as a method of increasing patient understanding of the adaptations necessary to improve/restore movement. Thus, clarity of understanding of correct or corrective body mechanics would be an essential element of post-surgical rehabilitation.

Imagery, visualization, or fantasy has been explained as the internal experience of a perceptual event in the absence of the actual external stimulus. Images were not to be confused with a percept which was evoked by an actual physical stimulus. Images might involve any sensory modality although the visual sense has been most often associated with imagery. Technically, imagery has been distinguished from the retrieval of stored memory because stored memory conformed more to reality than imagery. Imagery did not need to follow closely any previously
encountered stimulus (Achterberg & Lawlis, 1980). "During the imagery process, loyalty to external reality is suspended and inhibitions on the creative process are released" (p. 28). Recently, Achterberg (1985) suggested that an image was a hypothetical construct or intervening variable and has found "itself in the quite respectable company of other great issues studied: learning, motivation, memory, and perception" (p. 144).

Holt (1972) further elaborated that the subjective phenomenon of image "may have any combination of external and internal influences" (p.13). When the weight was clearly on the side of sensory input, the common terms percept or perceptual image served him interchangeably. On the other hand, when the weight was on the side of inner, central inputs, he spoke of mental images or of subtypes such as hypnagogic images or drug images.

For Gordon (1972) the image was "the perception of forms, or colors, or sounds, or smells, or movements, or tastes in the absence of an actual external stimulus which could have caused such perception" (p. 63). The external stimuli might have presented themselves in the past, but at the time of the image, the stimulus was not present.

Mental practice which has been defined by Richardson as "the symbolic rehearsal of a physical activity in the absence of any gross muscular movements" (1967a, p. 95) has been considered a specific practice technique (Corbin,
1972). R. N. Singer's (1980) definition was very similar to Richardson's. "Mental or image practice or conceptualization refers to task rehearsal in which there are no observable movements" (p. 426). Mental practice, has been the most frequently used term (Richardson, 1967a), although it has also been referred to as imaginary practice (Perry, 1939), covert rehearsal (Corbin, 1967), symbolic rehearsal (Sackett, 1934), imagery rehearsal or Visuo-Motor Behavioral Rehearsal (VMBR) (Suinn, 1976a; 1976b; 1979), conceptualizing practice (Egstrom, 1964), and visualization (Samuels & Samuels, 1975).

Although the literature has tended to use the terms "imagery" when referring to the phenomenon or mentalistic concept or artistic and clinical work and "mental practice" for activities related to movement or sport, the words have been used interchangeably in this paper. It was supposed that the use of the term "mental practice" for areas of movement and sport has been a natural result of the latter terminology being closely related to the term "physical practice," so often used in the areas of sport and movement.

Two types of visualizations or mental practice—process and final-state—were identified by Samuels and Samuels (1975). In process visualization, the person imagined the sequence of actions which would bring a situation to a successful conclusion. Maltz (1966) wrote a popular book which cited examples of how mental practice could be used to
improve daily living. Job interviews were rehearsed; salesmen practiced successful closings, and students used mental practice to relieve test anxiety. The use of final-state visualization relied on imagining the final outcome without practicing the step by step process of arriving at the desired outcome. Thus, a salesman might visualize his commission check as the result of a sale. Final state visualization has been particularly useful when dealing with material objects because of the concreteness of the imaged objects. In process visualization the possible variables which could and would affect any situation were much more difficult to define and predict.

"Imagery is a common human characteristic—almost everyone has the ability to image" (Shorr, 1983, p. 15). Shorr earlier stated, "Imagination lies at the central kernel of our consciousness . . . ." (Shorr, 1972, p. 11) and emphasized the ubiquitous nature of daydreaming. This characteristic of daydreaming was used to demonstrate to patients their own capacities for imagery.

**Historical/theoretical development.** The use of imagery has a recorded history of over 3,000 years. The Egyptians thought that disease, as well as everything else, came from mentalistic phenomena. Therefore, good health could be achieved by visualizing the body in a perfect state or by imagining a healing god. Later, temples were erected where patients found relief from ill health through dreams induced
during sleep. The practice, later called "incubation sleep" was incorporated into Greek medicine at temples built in Greece and Italy. The Greek physician Galen used imagery as a diagnostic tool for humoral imbalance. The extent and type of imbalance was determined by the type of images reported as contents of the dream (Achterberg, 1985; Achterberg & Lawlis, 1980; Samuels & Samuels, 1975).

Interest in imagery has waxed and waned throughout history. "The putative role of imagery has varied historically from being an absolutely essential element of thought to being incidental and of little importance" (Kosslyn, 1980, p. 1). Schultz (Schultz & Luthe, 1959) pioneered the development of imagery early in this century through the use of self-control and muscular relaxation techniques. Carefully controlled generation of imagery under the direction of a therapist was known as fixed imagery. However, for almost 50 years in this century, psychologists who ascribed to behaviorism largely ignored the study of human imagery and mental representation in general (Holt, 1964; Kosslyn, 1980; Sommer, 1980). The behaviorists in the twenties and thirties denied the existence of imagery (Hilgard, 1981) and replaced it with the concept of subvocal speech (Shorr, 1983). J. L. Singer (1974) pointed out "that despite the focus of the behaviorists upon objective responses, the most widely used and most thoroughly studied method depends upon a private
image" (p. 126). Many behavior modification techniques have relied on the imagery generated by the client. This state of affairs forced the behaviorists to again include inner experience in the realm of science.

Although psychiatrists and psychoanalysts still attended to the study of imagery and fantasies, these disciplines made little contribution to the formal understanding of the nature of imagery processes. Rarely were even anecdotal accounts indicating the systematic exploration of the imagery capacity of patients published by Freudian and neo-Freudian therapists in spite of their great reliance on dreams, associations, and daydreams (J. L. Singer, 1974).

Modern medicine has viewed imagery as the placebo effect of treatment. The placebo was the "product of the imagination" (Achterberg & Lawlis, 1980, p. 37), and imagery has been the "golden thread" that ran through the history of healing from ancient to modern times. The quality and degree of the placebo response, which was fashioned by the patient's expectancies, hopes, fears, prior learning, and past and present belief systems, has been documented experimentally and historically (Achterberg & Lawlis, 1980).

During the late 1950s and early 1960s, a set of practical problems, new lines of research, and a shift in the definition of the task of scientific psychology have caused a resurgence of interest in imagery. There were
three sets of practical problems. First, there were the questions raised by the emergence into consciousness of vivid imagery from victims of "highway hypnosis." The most frequent reporters of this phenomenon were radar operators, long-distance truck drivers, operators of snowcats on polar explorations, and jet aircraft pilots. The second problem set was the sensory and perceptual deprivation of prisoners in concentration camps. The imagery resulting from isolation, sleep deprivation, and indoctrination was available for study through first-hand accounts. The third set of problems was associated with the wide-spread interest in hallucinogenic drugs and the images reported by users (Holt, 1964).

New avenues of research into brain function have also raised the question of imagery as not only a psychological phenomenon, but a physiological one as well. Direct stimulation of exposed cortex produced vivid records of memory and brought a "mentalistic" concept into the realm of physiology. The discovery that the reticular activating system regulated sleep and wakefulness caused another mentalistic concept, that of consciousness, to again have relevance for psychology. The objective physiological indicator of dreaming, rapid eye movements, caused a renewed interest in dreams and dream-related research which heightened interest in imagery (Holt, 1964). Based on the accumulation of information from brain research and the
biological sciences, Achterberg (1985) noted that "images, indeed all thoughts, are electrochemical events, which are intricately woven into the fabric of the brain and body" (p. 9).

As scientific psychology emerged, the task of psychology was re-defined. The introspectionists deemed the task of psychology "to describe and explain the mind, the facts of perception, memory, imagination, thinking, emotion, etc., as immediately given to the psychologist, who could and did study them on an N of 1--herself" (Holt, 1964, p. 259). When that task was reformulated by behaviorism, it became "to describe and explain the objectively observable behavior of other organisms (other than oneself)" (p. 259). Now, according to Holt, the task was "to construct a detailed working model of the behaving organism" (p. 260). Models have become increasingly more complex, but "with the advent of the concept of mediated generalization," even, "behavioristic models have had a place for cognitive processes" (p. 260).

Sheehan (1979) noted that the study of fantasy or imagery phenomena increased as psychology admitted to the "genuineness of imagery and the meaningfulness of investigating it" (p. 89). As a less behavioristic view was accepted, individuals were seen as having been shaped and in turn having modified their environment in a purposeful, active, cognitive manner. This "interactionism"
viewed "the individual as an intentional, active agent who interprets situations and assigns cognitive meaning to them" (p. 89). Such an expanded view would now permit the study of imagery.

Kosslyn (1980) suggested that recent studies of imagery have taken four fundamental forms. First, there has been the study of the effects of the use of images upon a person's ability to perform certain tasks. It was within this area that the present study was conducted. The other areas considered the nature of perceptual and imaginal processing, spontaneous use of imagery, and the structure of imagery per se.

Tenable theoretical explanations for the use of mental practice in performing tasks related to movement and sport psychology were identified by Corbin (1972). The "gross framework" notion theorized that mental practice has value in helping a learner conceptualize the "gestalt" of a task. The suggestion that prior experience with a skill was necessary for effective use to be made of mental practice has agreed with this theoretical assumption. Another position, that of selective attention, has claimed that mental practice was effective because it focused on the "key" components of the skill to be learned and because of this, lesser components of the skill were ignored. Two other notions related to attention from a different perspective. Mental practice prior to performance created a
level of motivation in the performer to try out the skills practiced. Therefore, mental practice groups surpassed control groups because of increased motivation. The other position has been that mental practice groups performed better because motivation was increased due to the "Hawthorne effect." The "something", whatever it was, received by the experimental group was better than the "nothing" received by the control subjects. The feedback theory maintained that identified errors permitted adjustment prior to additional trials. A controlled image of the skill to be learned produced a slight, but real, muscular contraction, and the resultant kinesthetic feedback provided information for adjustments in future attempts. Consistent with Gestalt theory, mental practice provided the opportunity for behavioral changes which resulted from insight as a new perceptual organization developed. The connectionist theory also relied on the slight specific muscle responses that occurred during mental imagery. These formed a "connection" with the mental practice stimulus. The more mental practice, the stronger the connection became and improved overt performance was the result.

Zecker (1982) reviewed the literature related to the theoretical basis for mental practice and concluded that "the theoretical accounts differ and no single dominant theoretical position has emerged" (p. 52). He categorized the main lines of theoretical thinking as
psychoneuromuscular, symbolic-perceptual, and motor learning. Many of the theoretical positions identified by Corbin (1972) could be classified within Zecker's three groups of theories. Richardson (1967b) noted that improvement in performance as a result of mental practice could be due to motivational factors, symbolic learning, or the psychoneuromuscular explanation.

Regarding the motor learning theories, R. N. Singer (1980) has called for "assuming the basis and validity of laws or principles of learning" (p. 23) and using them in the psychomotor domain where applicable. According to him, although the research findings are not of sufficient quality and quantity to be a "principle", the trend that has emerged has been sufficient to constitute support for action. Of course, this action was not as easy as it sounded primarily for three reasons. First, the accepted learning principles have been broad and generalized. In the second place, it has been difficult to develop practical application of specific learning principles which arose as a result of the more controlled environment of a laboratory. The third reason, and perhaps the one which has produced the most frustration, was the diversity that research had taken in the areas concerned with motor skill acquisition. Thus, the development of theory was area-specific as opposed to a general-domain approach.
In keeping with the currently emerging Zeitgeist of model building in psychology, three researchers (Bandura, 1977; Lang, 1979; R. N. Singer, 1980) have offered interactive, comprehensive theories. The theoretical model proposed by Lang was directed to emotional imagery as used in a clinical setting. Lang's bio-informational theory of emotional imagery was developed "to show the connection with other phenomena in psychophysiology and cognitive psychology" (p. 510). Hale stated that Lang's theory "generalizes to nonemotional mental practice and adequately explains Jacobson's specificity of muscular concomitants" (1982, p. 380). R. N. Singer's integrative model was postulated to incorporate the theoretical findings from information-processing, adaptive, and cybernetic models of motor behavior. His major premises were predicated on the assumptions that cognitive processes impact learning and performing of complex motor tasks, and that the various conceptual approaches needed to be integrated for a more comprehensive view of motor behavior. Bandura's self-efficacy theory of behavior change proposed that personal efficacy was derived by individuals from information obtained through performance, vicarious experience, verbal persuasion, and physiological states. In an empirical study by Woolfolk, Murphy, Gottesfeld, & Aitken (1985) self-efficacy was correlated with performance for the simple motor skill accuracy task of putting a golf ball.
The occupational therapy literature has also addressed itself to model development. Gliner (1985), an associate professor of occupational therapy, has presented an integrated theory of motor learning and occupational therapy as related to purposeful activity for the learning of new skills. Knowledge of results has been a key factor in the motor learning theories of Adams' (1971) closed-loop theory and Schmidt's (1975) schema theory. According to Gliner, "knowledge of results is not sufficient to explain how learning takes place in complex, realistic situations" (p. 29). Therefore, he has proposed a motor skill acquisition theory "that treats the actor as a flexible performer and uses different strategies depending on the specific act to be performed" (p. 29).

The use of mental practice as related to movement has been studied for almost a century. As early as 1899, researchers asked if gymnastic movements could be learned through mental practice in the absence of actual physical practice (R. N. Singer, 1980). It had been assumed that the acquisition of motor or physical skills was predominantly acquired through physical practice. The degree of learning was inferred from overt performance. Physical practice was the vehicle for initiating, developing, and refining motor tasks (Reading, 1979). Numerous studies since that time have considered the relationship between mental practice and skill learning or improvement.
Corbin's (1972) and Weinberg's (1982) historical reviews of the early ideas and research associated with mental practice indicated that in the early 1900's Washburn suggested "tentative movements" would occur during imagining. Freeman (1933) continued Washburn's speculation that implicit muscular activity would increase skilled performance of a motor task. It was Jacobson (1932) who thoroughly studied muscular activity through use of the electromyograph (EMG) determining that EMG responses occur during imagining. He also determined that those subjects with prior movement experience developed greater muscular activity during imagining.

The early classical studies of mental practice used co-ordinated muscular movements of simple motor tasks and ideational or symbolic tasks. Mirror and maze tracing, card sorting (Sackett, 1934; 1935), tapping, card sorting, peg board, mirror drawing, and digit substitution (Perry, 1939), ring-toss (Twining, 1949), and dart-throwing and free throw shooting (Vandell, Davis, and Clugston, 1943) were studied using mental practice.

Vandell et. al. (1943) contributed significantly to research on mental practice because later studies on mental practice were patterned after their study. Three precise experimental conditions were used. One group received no practice, one practiced overtly and physically for 20 days, and one group practiced mentally for 20 days. Although the
study lacked statistical analysis and had a small number of
subjects, it did provide an impetus for the continued
investigation of the facilitative effects of mental practice
on skilled performance (Corbin, 1972). Trussel (1952) found
that a combination of mental practice and physical practice
produced the best results for a juggling task. Mental
practice alone did not affect any improvement in
performance. He suggested that this outcome was due to a
lack of familiarity with the task prior to mental practice.
Corbin (1967) tested the effect of mental practice on skill
performance of a novel motor skill after physical practice
for one week. His results indicated that mental practice did
facilitate juggling performance in those subjects who had
experienced controlled actual practice.

Clark (1960) indicated that mental practice was nearly
as effective as physical practice for the motor skill of the
Pacific Coast one-hand foul shot. Subjects were categorized
by varsity, junior varsity, or novice experience levels.
They were also classified according to arm strength and
intelligence. Clark concluded that prior experience with
the task was necessary before mental practice would provide
the maximal effect. An unanticipated adverse experimental
condition, which resulted in a serendipitous finding,
developed during Clark's research. One of the coaches had
made facetious and deprecating remarks to the varsity groups
concerning the possibilities of mental practice. The
subjects admitted that the coach's remarks did lessen their enthusiasm for carrying out the instructions of the experiment. A re-analysis of the data, excluding the one school that had been subjected to the coach's remarks, produced greater increases in improvement for the mental practice groups.

Corbin (1972) identified length, duration, distribution, and type of mental practice as conditions that would influence the effectiveness of using mental practice. From his review of the research literature, he concluded "that relatively short practice sessions are probably optimal" (p. 106) with the range being from one to five minutes, and "some distribution of practice will lead to more effective learning than will massed practice" (p. 107).

By duration, Corbin meant the period of time that was optimal for mental practice whether it was several days, weeks, or months. The issue of duration of practice has not been sufficiently investigated to make a judgement. Various pre-mental practice instructions, such as oral/written instructions, films, and demonstrations, have been used. However, it appeared that the type of pre-mental practice instructions given might be as important as the type of mental practice used and further study was indicated. Additionally, another factor was the type of task to be mastered. This could depend on whether the task was predominantly ideational, motor, or muscular.
Vividness and controllability have been investigated by asking subjects to rate themselves. The ratings have been correlated with task performance. Usually obtained differences were small, and researchers have been disappointed with this line of inquiry (Kosslyn, 1985). Morgan and Bakan (1965) reported that the reclining position for subjects in a sensory-deprivation situation produced more vivid imagery than subjects who sat up. Berdach and Bakan (1967) found that earlier and more frequent memories occurred when subjects were in a reclining position. Segal and Glickman (1967) concluded that subjects in a reclining position produced such vivid imagery that an actual projected image was precluded from awareness. Hull and Render (1984) concluded that a single treatment session of relaxation, fantasy journey, or free imagery did not affect controllability and vividness of imagery in seven sense modalities as measured by an imagery survey instrument.

The gender variable has produced little research although studies have been conducted that use males, females and coeducational groups as subjects (Corbin, 1972). Perry (1939) found no significant differences between males and females for ability to benefit from mental practice.

Sport psychology and rehabilitation. The benefits of using imagery as a therapeutic technique were noted by clinicians. Psycho-imagination therapy was developed in 1965 by Joseph Shorr, a clinical psychologist. Harry Stack
Sullivan's (1953) interpersonal school of psychoanalysis was the theoretical foundation for the use of the technique for behavior change. In addition to applications for treatment of emotional maladjustment, marriage and family problems, and psychosomatic problems, anxiety, depression, and other neuroses responded favorably to imagery treatment techniques (Shorr, 1981).

Shorr (1983) identified several attributes of imagery that appeared to make it applicable for clinical situations. "Imagery exercises the imagination in two ways: first, by making us see things; second, by making us interpret what we see" (pp. 6-7). Imagery has served an adaptive function by assisting in the reorientation of old patterns of behavior to changed situations. Imagery could serve as a broader frame of reference within which a person could act or to which knowledge could be attached. Imagery has served as an organizer of facts and possibilities. A key concept in the nature of imagery was the influence of past experience as vital in the organization and production of visual imagery. Also, "the creative imagination is obviously a powerful means of reconstructing complex visual-kinetic, audiovisual, and other types of images" (p. 14). Imagery, according to J. L. Singer (1974), has been useful as a patient treatment because the symbolism involved in imagery made it easier for the patient to deal with the problem. Mental imagery provided the client with a greater sense of self-control.
In addition to its therapeutic uses, Shorr (1983) stated that imagery played an important role in daily living. Imagery provided a mechanism by which reality could be tested without undergoing all of the dangers involved.

Sport psychologists encountered several problems in dealing with skill acquisition, retention, and performance. Much of the operant reinforcement and assertive training techniques used to help patients learn adaptive skills was based on the ability of the patient to practice in real life situations. The availability of these real life situations was frequently limited. Additionally, the success of these techniques relied on the number of available reinforced trials based on the assumption that the more frequently a behavior was practiced, the more likely that learning would occur. In addition, temporal contiguity of reward was another consideration when using intervention techniques that required the presence of a therapist (Suinn, 1976a).

Noticing the extensive use of cognitive behavior modification techniques by clinical psychologists, the sport psychologists began to investigate and use mental preparation techniques (Silva III, 1982). Oxendine (1968) and R. N. Singer (1980) found that the evidence supported the notion that physical proficiency might be enhanced by inclusion of a variety of learning techniques such as mental rehearsal, imagery, or informally thinking about the task.
Weinberg (1982) critiqued the literature on mental preparation strategies and concluded that "although much of the research on the effectiveness of mental practice in enhancing performance is equivocal" (pp. 202-203), there have been some consistent patterns observed. It has been noted that mental practice has been more effective if combined with physical practice and not substituted for the actual physical practice. Mental practice has appeared to be more effective during the initial learning stage or during the later stage. However, performers must achieve a minimal level of expertise before mental practice would be productive. In an extensive review of the literature on mental rehearsal and motor and sport related skills, Corbin (1972) concluded that skilled motor performance was positively affected by mental practice although he cautioned that in several studies mental rehearsal was not effective in improving performance.

Suinn (1976a, 1976b, 1979) developed the treatment technique of "visuo-motor behavior rehearsal" (VMBR). After relaxation through standard deep muscle techniques (Jacobson, 1932), the patient was directed to image himself in a specific situation. This was followed by instructions to role-play certain adaptive behaviors. Suinn used VMBR to assist persons in overcoming such fears as public speaking, oral examination, musical performance, and athletic performance. As a self-modeling technique, the imager could
see himself acting effectively. In addition, the visualization technique could assist in the diagnosing of a performance problem, provide information on ways to correct the problem, and give the client practice in the adaptive behavior.

As noted by Suinn in developing VMBR, anxiety could be a barrier to learning and performance. An empirical study of karate performance sought to determine whether VMBR was more effective than imagery or relaxation alone in facilitating performance. Only partial support for the effectiveness of VMBR was obtained in enhancing karate performance, however, there was significantly less precompetitive state anxiety for the relaxation and VMBR groups when compared with the imagery and placebo control groups (Weinberg, Seabourne, Jackson, 1981).

Teaching movement in a different context, Fleshman (1984) reported that he has used imagery to teach theatrical movement and mime for 15 years. His approach was in contrast to the more traditional approach of teaching theatrical movement in which the teacher demonstrated the movement and then asked the student to imitate the action. In the traditional approach, corrections were made through physical contact and/or verbal instruction. Fleshman maintained that mental imagery for teaching specific movements produced a "physical communication between the
mental image and the body" because "tactile and kinesthetic elements of the image act directly upon the body" (p. 92).

While numerous studies were found on the effects of mental practice on performance of motor skills, no studies were found which studied the effects of the use of imagery or mental practice on the learning or re-learning of the adaptive motor skills required for daily living. Much of the work of physical therapists and occupational therapists has been related to enhancing the ability of patients to function independently. Physical therapists have assisted with physical restoration by producing greater strength, endurance, and flexibility. The occupational therapists expanded the horizons of the patient by assisting in the development of skills for the activities of daily living. Occupational therapists have helped patients build functional restoration upon the physical restoration through instruction and practice of activities that were necessary for everyday living. Some of these activities were grocery shopping, ironing, dishwashing, carrying, and lifting objects. For most people, these activities were simply taken for granted, until mobility and flexibility were limited by pain or surgery.

Korn (1983) asserted that imagery, as well as other mental techniques, have not usually been part of the treatment regimen of physical rehabilitation units. One of the goals for which imagery was felt to be appropriate was
maximizing return of function. Korn cited several case histories to this end and indicated that using imagery relevant to the patient’s previous real life situations and interests can be most productive. A totally aphasic male patient with an interest in electronics used a stereo component system analogy to facilitate speech. Initially crude speech was fine tuned to increase clarity and distinction. An adolescent female patient with closed head trauma relearned dressing skills by imagining she dressed herself as if she were a life-sized doll. Motor skills were relearned by remembering piano playing using visual, kinesthetic, and auditory imagery.

A factor, according to Johnson & Korn (1980), which has been often overlooked in the rehabilitation of patients was the time factor for the initiation of treatment with mental techniques. They have begun imagery therapy within five days post-injury while the patient was still clinically semi-comatose. The patient’s responses which they observed led them to the conclusion that the potential levels of awareness of comatose and semi-comatose patients should not be ignored and "that awareness is more than merely conforming to accepted modes of communication" (p. 38).

Farley (1985) reported on the use of a self-management technique that he developed and used with two vocational clients at a rehabilitation center. The comprehensive program was known as Systematic Behavioral Response
Rehearsal (SBRR), and while the report was anecdotal he felt that the procedure had sufficient promise for further investigation in a experimental setting. He called for investigators to analyze the benefits of imagery in the vocational rehabilitation field as already begun in the fields of sport, mental health, and medicine.

**Research Question**

By randomly assigning postoperative spinal patients to one of three treatment conditions while they were still in the hospital, imagery/mental practice could be used by the occupational therapists as part of the routinely provided instructions on body mechanics. In other words, could the technique of imagery or mental practice, which has been widely used for treating medical and psychological conditions in clinical and competitive sport situations be useful for teaching adaptive movements in a postoperative-rehabilitation setting? The procedure would be used after the sedation of surgery had lifted and would have the advantage of providing the information on adaptive movements in a more timely manner so that mental practice could occur while the patient was unable to physically perform the movements. Then, the goals of reduced bed days without compromising quality patient care could be realized.

**Hypothesis**

If this line of reasoning were correct, and patients were tested at a later date, it would be expected that the
patients who received the mental practice condition would have performed better. It was hypothesized, therefore, that the patients who received the imagery/mental practice intervention would obtain a significantly higher score than the Control or Placebo patients on a movement assessment instrument which was administered at a later time when physical movement was permitted.
CHAPTER II

METHOD

Subjects

Data were collected from 35 postoperative spinal patients who were joint patients of the North Texas Back Institute (NTBI), Plano, Texas (subsequently the name was changed to Texas Back Institute) and the Plano General Hospital (PGH) from June, 1985 through June, 1986. All patients at the time of participation in the study had been admitted to PGH according to hospital policy and were under the care of a physician for surgery and postoperative inpatient and outpatient care. NTBI has operated as a professional association to provide evaluation, rehabilitation, and postoperative care by the disciplines of medicine, psychology, occupational therapy, and physical therapy. Specifically, the occupational therapy staff of the Institute has provided continuing evaluation of patients' postoperative progress and conducted assessments of patients' ability to return to work and/or to be placed in the functional rehabilitation and back school programs conducted by NTBI.

The criteria for subject selection were developed jointly by the investigator and the staff occupational
therapists (OTs) who were employed by NTBI at the initiation of the study. All of the patients had had general anesthesia for one of the following invasive surgical procedures to the back or neck: laminectomy/diskectomy, posterior lumbar fusion, anterior lumbar fusion, spinal reconstruction, anterior cervical fusion, or Knodt rod removal. Additional criteria included an easy command of the English language and the patient's treatment regimen indicated an outpatient occupational therapy follow-up visit would be appropriate. One hundred patients (100) were treated with 35 returning for the follow-up assessment. There were 23 males and 12 females, ranging in age from 22 to 61 years. Ten (10) Control group subjects returned, 13 Placebo, and 12 Imagery group subjects came back.

Instruments

The instruments for this study consisted of line drawings of five basic body movements, four subjective rating scales, a movement assessment, and a follow-up letter. All of the instruments were designed for use in this study.

Movement drawings. Five basic body movements were selected by the staff of the occupational therapy department as the movements most often needed initially by postoperative spinal patients to assist in performing routine, daily activities. The nonsexist line drawings (Appendix A) were patterned after the "universal figure" and
were created by a graphics artist to meet the needs of the study. Each movement was drawn on a single page, labeled in solid, bold letters with the name of the movement, and placed in a page protector in a three ring loose-leaf notebook. The instructions (Appendix B) to be used to introduce each movement prior to asking the patient to image the movement were also included in the notebook.

Rating scales. Five-point subjective rating scales (Appendix C) for anxiety, rumination, imagery, and occupational motoric-symbolic ratio were developed by the investigator for this study. The anxiety and rumination scales were used by the occupational therapists to provide subjective ratings based on direct observation of the patient's behavior during the initial postoperative contact in the patient's hospital room. The mid-points of the scales were the perceived averages on those two variables of the behavior of the usual postoperative spinal patient. The imagery scale provided a subjective assessment of the patient's ability to image and, therefore, to participate in the experimental treatment group task. The occupational motoric-symbolic ratio was determined by the investigator after reviewing the present or previous job and employer information which was obtained by the occupational therapists on the 100 subjects in the first phase of the study. The subjective rating was determined by the perceived ratio of motor skill to symbolic skill required on
the job. Because all jobs require both motoric and symbolic skills to a greater or lesser degree, the concept of a ratio was used to facilitate measurement. The ratings for patients who were unemployed (usually as a result of an injury necessitating surgery) were based on the type of employment previously held.

**Movement assessment.** The movement assessment instrument (Appendix D) was developed for this study by an NTBI outpatient therapist as a scoring device to quantify the correct accomplishment of each movement. Each movement was broken down into points, so that it was possible to receive partial credit and not be entirely penalized for incorrectly performing the movement.

**Follow-up letter.** A follow-up letter (Appendix E) was prepared by the investigator with approval of the chief occupational therapist and the administration of NTBI. The letter was on NTBI letterhead stationery and signed by an initial contact therapist.

**Procedure**

Prior to beginning the research, the therapists who would be making the initial contact met with the investigator to become familiar with the research procedure and the rating scales. Clarification and agreement regarding some of the meanings of the rating scale anchors occurred. A research notebook was assembled and carried by the therapists. It contained the instructions for each
treatment condition (Appendix F), the movement drawings, the
movement narratives for the imagery treatment group, and
data collection sheets.

Two phases were required for the research. The first
phase was the initial contact by an inpatient occupational
therapist. The second was the follow-up assessment by an
outpatient OT. The total score on the movement assessment
instrument was the outcome measure and, therefore, the
dependent variable.

Responsibilities for occupational therapy at NTBI were
generally divided into outpatient and inpatient services.
Because of this naturally occurring division of
responsibilities, it was possible to use the inpatient
therapists for the initial contact and the outpatient
therapists for the follow-up assessment because the patients
would have then been released from the hospital. When the
research began, the outpatient therapists used the movement
assessment instrument for all outpatients because they were
unaware of which patients had met criteria for the research
study. In this manner, better control of experimenter bias
was achieved, and more experience with the instrument was
acquired.

The sequence of the treatment conditions to be
administered was randomly determined by the investigator
prior to the initiation of research. This information was
recorded in a research log which was kept in the office of
the Occupational Therapy Department. At the time that occupational therapy was indicated in the patient's treatment process, the therapist determined if the patient met the criteria for inclusion in the study based on information in the patient's treatment record. The therapist then obtained from the log the treatment condition which was the next one to be administered according to the randomized research protocol. The therapist went to the patient's room and began the appropriate treatment condition. After this initial contact had been made, the therapist entered the name of the patient, date, and therapist's initials in the log.

**Control treatment condition.** In this condition patients received the routine care that was regularly provided by the occupational therapists of NTBI. Routine occupational therapy consisted of a postoperative interview with the patient to obtain demographic and environmental information. This information was used as the basis for a discussion of the principles of body mechanics which the patients were likely to encounter or need in everyday living situations. During the discussion, correct body mechanics were demonstrated by the occupational therapist with occasional participation by the patient if physical condition permitted. In addition, any barriers in the patient's environment were identified, and suggestions were discussed for minimizing them. When the research study
began, the therapist made a judgement about the patient's level of anxiety and rumination at the end of this contact and recorded these on the data collection record. Patients in all treatment conditions were unaware that the therapist was making the ratings.

**Placebo treatment condition.** In addition to the procedure described above, the therapist asked the patient to imagine a pleasant, safe place before proceeding with the routine information on body mechanics. The patients were told that relaxing a few minutes before the instructions on body mechanics were given would help them concentrate better on the information. The patients were asked to tell the therapist about the place or event that was being imagined in order for the therapist to assess the patient's ability to image. Then the routine information about body mechanics was presented. At the close of the contact the therapist recorded the information about the patient's level of anxiety, rumination, and quality of imaging according to the anchor definitions provided for each scale.

**Imagery treatment condition.** After the routine information about body mechanics as described above for the Control group had been provided, the OT presented each of the movement drawings in the same order for each patient along with the movement instructions (Appendix B). Following the visual and verbal presentations of each movement, the patient was requested to imagine performing
each movement according to the instructions which had just been given. The order of presentation was logrolling, up/down from chair, counterbalancing, half-kneeling, and pivoting. At the conclusion of the presentation of the five movements, the patients were instructed to mentally practice the movements several times a day between now and the time of their first OT outpatient follow-up visit. The patients were additionally asked to mentally practice seeing themselves performing the movements correctly and with ease although for a few days in actual practice their movements may be slow and require thinking about the details of each movement. At the conclusion of the session, the therapist recorded a rating of anxiousness, rumination, and quality of imaging on a data sheet.

**Movement assessment.** The follow-up movement assessment was conducted by the outpatient therapist during the first postoperative occupational therapy contact. At the time of the follow-up movement assessment, the patient was given a task to perform which would require the use of one of the research movements. If the patient did not perform the correct movement for the task, the therapist prompted the patient by asking if he/she knew another way to perform the task, and if that prompt failed to elicit the correct response, the therapist prompted with the name of the movement as presented during the initial hospital contact. All required equipment for performing each movement was
readily available at the test site. Each movement was scored; a total score was obtained, and the entire assessment was sent to the investigator for analysis. In addition to scoring the movements, information on level of educational attainment, the spontaneous mention of the hospital imagery session, and practice of the movements using imagery was recorded. The information on imagery and practice was gathered because the outpatient therapists were "blind" as to which patients were research subjects. If this condition became compromised, the data would be available for statistical analysis of the obtained scores on the assessment instrument based on the mention or non-mention of those two items.

Follow-up. After several months, it became evident that the rate of return for the occupational therapy follow-up visit was not occurring as expected even though at the outset it was known that follow-up for many patients could not occur for several months after surgery. Beginning with patients seen in January, 1986, approximately six weeks after the initial contact, a follow-up letter was routinely sent. The letter encouraged them to contact NTBI for a follow-up appointment. Later, the follow-up letter was also sent to any of the patients who had already been treated prior to the initiation of sending the letter and had not returned for follow-up. This procedure had the additional benefit of providing the OTs with information about patients
who had been dismissed from treatment by their doctor, returned to work, or had been referred to another provider.
CHAPTER III

RESULTS

Thirty-five (35) North Texas Back Institute patients returned for the follow-up movement assessment and were included in the data set. All returning patients were in the same hospital at the time of the initial treatment contact by the occupational therapist. During the follow-up assessment session, no patient mentioned imagery or practice of the movements using imagery after leaving the hospital.

The Control group of 10 patients was composed of six (60.0%) males and four (40.0%) females, with a racial breakdown of seven (70.0%) white, one (10.0%) black, and two (10.0%) of other racial backgrounds. The mean age was 41.1 years with a range of 22 to 61 years. The average educational level was 11.6 years with a range of 10 years to 14 years of formal education. Two (20%) participants had more than a high school education. The occupations of 80 per cent of this group were rated on the occupational scale as requiring 50 per cent or more motoric activity.

Surgical procedures for the control group consisted of posterior lumbar fusion for six (60.0%) patients, anterior lumbar fusion for two (20.0%), spinal reconstruction for one (10.0%), and anterior cervical fusion for one (10.0%).
The mean of the days from the day of surgery to the initial contact in the hospital by the occupational therapist was 4.2 days with the extremes being 2 to 7 days. The median and mode were 4 days. The mean of the days from the day of initial contact to the day of the follow-up movement assessment was 124.7 days with a standard deviation of 67.39 and extremes of 34 to 258 and a range of 224 days. The mode was 34 days; the median 113.5 days. Five (14.3%) Control group members received a letter encouraging a return visit to the clinic for follow-up evaluation.

Two (20.0%) subjects had previously had Activities of Daily Living (ADL) training; eight (80.0%) had not had the training. All subjects in this group were seen in the hospital by the same occupational therapist for the initial postoperative contact. The follow-up assessments were evenly divided between two therapists. Nine (90.0%) of the Control group patients were rated at the mid-point (2) or lower on the anxiousness scale. All 10 patients were rated at the mid-point (2) or lower on rumination.

The Placebo group of 13 patients was composed of seven (53.8%) males and six (46.2%) females, with a racial makeup of 12 (93.3%) whites, and one (7.7%) black. The mean age was 37.7 years with a range of 28 to 53 years. The average educational level was 11.5 years with a range of eight to 15 years of schooling. Five (37.24%) subjects had more than a high school education. Ten (76.9%) of the group's
occupations require motoric performance of 50 per cent or more.

The surgical procedures performed on the Placebo group consisted of laminectomy/diskectomy for two (15.4%), posterior lumbar fusion for seven (53.8%) patients, anterior lumbar fusion for two (15.4%), spinal reconstruction for one (7.7%), and anterior cervical fusion for one (7.7%).

The mean of the days from the day of surgery to the initial contact in the hospital by the occupational therapist was 4.3 days with the extremes being 3 and 7 days. The median and mode were 4 days. The mean of the days from the day of initial contact to the day of the follow-up movement assessment was 115.5 days with a standard deviation of 52.47 and extremes of 22 and 180 and a range of 158 days. The mode was 22 days; the median 115 days. Four (30.8%) Placebo group members received a letter encouraging a return appointment for a follow-up evaluation.

Six (46.2%) Placebo subjects had previously participated in ADL training; seven (53.8%) had not participated. Three occupational therapists saw the subjects in this group for the initial session. One therapist assessed nine (69.2%); another three (23.1%), and the third saw one (7.7%) patient. Follow-up was accomplished by two therapists with eight (61.5%) patients being seen by one therapist and five (38.5%) seen by the other. Eleven (84.6%) patients were rated at the mid-point
(2) or lower on the anxiousness scale. All 13 patients were rated at the mid-point (2) or lower on rumination. Nine (69.2%) subjects were rated at the mid-point (2) or higher on the vividness of imagery scale.

The Imagery group of 12 patients included 10 (83.3%) white males and two (16.7%) white females. The mean age was 33.6 years with a range of 27 to 45 years. The mean educational level was 12.3 years with a range of 10 years to 15 years of education. Six (50.0%) had achieved more than a high school education. The occupations of all subjects in this group required 50 per cent or more motor skill as rated on the occupational scale.

One (8.3%) patient in the Imagery group had received a laminectomy/diskectomy. The surgical procedures for three (25.0%) patients were posterior lumbar fusions. Eight (66.7%) patients had anterior lumbar fusion procedures.

The mean of the days from the day of surgery to the initial contact in the hospital by the occupational therapist was 4.3 days with the extremes being 3 and 6 days. The median was 4.5 and the mode was 5 days. The mean of the days from the day of initial contact to the day of the follow-up movement assessment was 102.75 days with a standard deviation of 94.16 and extremes of 21 and 360 and a range of 339 days. The mode was 21 days; the median 81.5 days. One (8.3%) Imagery subject was sent a letter encouraging a return appointment for a follow-up evaluation.
Three (25.0%) Imagery subjects had previously received ADL training; nine (75.0%) had not participated. All patients in this group were seen initially by the same therapist. Two therapists performed the follow-up assessments with nine (75.0%) subjects seen by one therapist and three (25.0%) seen by the other. Eleven (91.7%) patients were rated at the mid-point (2) or lower on the anxiousness scale. Eleven (91.7%) patients were rated at the mid-point (2) or lower on rumination. Ten (83.3%) of the group were rated at the mid-point (2) or higher on the imagery scale.

Chi square failed to detect any differences across treatment groups for pre-treatment, therapist, or post-treatment variables. The chi square values for pre-treatment variables were found in Table 1, Appendix G. The pre-treatment variables were age, education, race, and sex of the subjects; surgical procedure; number of days from date of surgery to initial contact; prior ADL training; and ratings on anxiety, rumination, imagery, and the occupational motoric-symbolic ratio. The therapist (initial and follow-up) variable chi square values have been shown in Table 2, Appendix G; the post-treatment variables of follow-up letter and number of days between initial contact in the hospital and the follow-up assessment were presented in Table 3, Appendix G.
To test the research hypothesis, analysis of variance was utilized. The research hypothesis stated that subjects in the Imagery group would score higher on the movement assessment instrument. The maximum possible score by an individual on the instrument was 30. The means and standard deviations obtained by the groups were: Control, 21.8, 5.78; Placebo, 21.5, 3.40; and Imagery, 23.4, 2.93. No significant differences were found. Analysis of variance values for the total movement score and treatment groups were presented in Table 4, Appendix G.

Pearson Product Moment correlation coefficients were shown in Table 5, Appendix G, comparing the total movement assessment score with selected subject descriptive, programmatic, and rating scale variables. Obtained correlation coefficients were low. Rated rumination was the only co-variate measure to correlate significantly with the total movement assessment score ($r = .37, p = .028$). The occupational motoric-symbolic rating ($r = .321$) approached statistical significance ($p = .059$).
CHAPTER IV

DISCUSSION

The results obtained in this study did not support the research hypothesis that subjects who received the imagery condition would score significantly higher on an adaptive movement assessment instrument. However, scores obtained by the imagery group subjects did indicate a trend in support of imagery as a facilitator of adaptive movement learning. The data failed to show any difference between the groups in terms of pre-treatment, therapist, and post-treatment variables, minimizing the probability that pre-treatment differences in subject groups, occupational therapists, or post-intervention conditions influenced the obtained results. Such findings were not totally unexpected because much of the imagery/mental practice literature has been equivocal.

Results of a post hoc analysis of selected variables and the outcome measure using correlational techniques indicated that the rumination rating scale achieved statistical significance with the total movement score ($r = .37, p = .028$). Although the correlation was low, it did raise an interesting possibility that a certain amount of ruminating behavior could facilitate the acquisition of
sequential and repetitious information. The motoric-symbolic rating scale, while not achieving statistical significance ($r = .321, p = .059$), did suggest prior experience with symbolic activities aided understanding and using the information presented by the therapists.

The lack of statistically significant findings could result because the theoretical model did not fit, or because methodological or measurement artifacts masked the actual strength of the relationships under study. Because the results were in the predicted direction, even if not statistically significant, the long history of applying imagery/mental practice under varying conditions, and the recent demonstration by sport psychologists of the effectiveness of imagery/mental practice in improving athletic performance, the results of this study were probably insufficient to support serious question of the theoretical assumptions. More likely, failure to demonstrate significance was related to a possible reduced sensitivity of the outcome measure, the complexity of the context in which this research was done, and/or to weakened controls and limitations inherent in field research.

For example, the outcome instrument used in this study, even though devised by an experienced occupational therapist, was nevertheless restrictive in terms of the range of scores permitted for each movement that was assessed. The maximum score for any one movement was six
points, but the allocation of the six points for some of the movements could be refined based on a further analysis of more subtle movements that were made in order to accomplish the complete movement. In this manner, the obtained score could vary at every point for each movement.

Although care was taken in the design of this study to ensure that the occupational therapists who assessed patients on the outcome measure remained "blind" to the research status of their patients, those occupational therapists who conducted the initial contact sessions using the randomly assigned treatment conditions for that subject had to be familiar with all conditions. Pre- and post-study conversations with the occupational therapists suggested that the "face validity" of the imagery technique was quite high for all the occupational therapists administering the treatment conditions. Because of their enthusiasm for the technique, it was likely that elements of the imagery training began to become part of the occupational therapists' work with subjects in the other two treatment conditions, thereby blurring the effect of imagery as measured by the outcome score. This "blurring effect" could have had a significant confounding effect upon the results, and if so, could have been largely responsible for the failure to detect significance. With the limitations of the clinical setting in which this research was conducted, it was not possible to have different occupational therapists
for each treatment group and still have different occupational therapists available for the outcome assessment. However, future research could include greater separation of function so as to minimize the blurring effect. Another limitation of the setting was related to the amount of time available for patient care by an occupational therapist. Patients in this study had one postoperative contact with the inpatient occupational therapist while in the hospital. Many studies of mental practice have used more than one practice session. Another contact with the occupational therapist could have been beneficial in reminding the patient to continue the mental practice and in identifying any problems that the patient was experiencing with the technique.

It was noteworthy that the variables associated with imagery/mental practice existed in a complex relationship. The matrix of variables could be assembled in many ways, and would very quickly exceed the scope of this study. In considering just five major categories of variables associated with imagery/mental practice, it would be possible to identify 13 different sub-variables, each of which could provide the basis for legitimate questions about its relationship to the total picture of the efficacy of imagery/mental practice (see Figure 1).
Figure 1

Selected Variables Related to Mental Practice

<table>
<thead>
<tr>
<th>Expected Outcome</th>
<th>Task Type</th>
<th>Practice Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquisition</td>
<td>Motor</td>
<td>Length</td>
</tr>
<tr>
<td>Retention</td>
<td>Muscular</td>
<td>Duration</td>
</tr>
<tr>
<td>Performance</td>
<td>Symbolic</td>
<td>Instructions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Imaging Ability</th>
<th>Perspective</th>
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</thead>
<tbody>
<tr>
<td>Vividness</td>
<td>External</td>
</tr>
<tr>
<td>Control</td>
<td>Internal</td>
</tr>
</tbody>
</table>

For example, if the general category of "expected outcome" for a skilled movement were considered, there would be at least three readily identifiable subvariables—acquisition, retention, and performance—from which to choose to further narrow the scope of the study. If acquisition were studied, it would be appropriate to ask how manipulation of any of the variables within the other groups would impact outcome. The conditions necessary to demonstrate the efficacy of imagery in enhancing acquisition of a muscular task might well differ from the set of conditions (including such things as perspective, type of instructions, degree of imagery vividness and control, etc.)
necessary to demonstrate the outcomes related to acquisition of a motor skill or symbolic task.

The point of this discussion was to illustrate the complexity involved in attempting to understand imagery/mental practice, and to emphasize the importance of designing future research to account for this complexity. Such multivariate designs could not only provide better answers to specific questions as attempted here, but could also assist with clarification of the theoretical puzzle surrounding imagery and mental practice.

In summary, the results of this study did not support the hypothesized relationship between imagery/mental practice and improvement in adaptive movement among post-surgical spinal patients. It was suggested that these findings were attributable to a "blurring effect", possible reduced sensitivity of the outcome instrument, and the limitations on postoperative contact with occupational therapists. However, the study did provide a novel setting for the use of imagery/mental practice, and highlighted certain methodological considerations for future research.

Conclusions

1) The study of imagery/mental practice was multi-faceted and highly complex, and the importance of the contribution of many of the variables that could account for differences has not been adequately explored. 2) Movement assessment instruments need to be sensitive enough to allow
obtained scores to vary at each point within a component of the instrument. 3) When possible experimenters needed to be responsible for only one treatment protocol to reduce the "blurring effect" identified in this study. 4) Patients needed more than one postoperative therapeutic contact with the therapist to reinforce the mental practice method and encourage continuing usage of the technique.
Appendix A

Movement Drawings
LOG ROLLING

1.

2.

3.

4.
UP/DOWN FROM CHAIR

1.

2.

3.

4.
COUNTERBALANCING
HALF-KNEELING
PIVOTING
Appendix B

Movement Instructions
Instructions for Logrolling Movement

The first movement is logrolling. This is the term we use for getting in or out of bed. The therapist outlines the steps while pointing to the drawings.

"In order to get out of bed, if you are lying on your back, you should slightly bend your knees and roll onto your side keeping your hips and shoulders in a straight line. Once you are completely on your side, you should push yourself up with your arm and your elbow while at the same time, letting your legs swing off the edge of the bed. Then come to a standing position using your arms and legs to propel you up while keeping your back straight. In order to get in bed, the procedure is reversed. You should sit on the edge of the bed and go directly down onto your side lowering your body with your arms while at the same time the legs are bent and brought up. Once you are completely on your side, then you can roll like a log onto your back while keeping the hips and shoulders in a straight line.

"Now, lie back and relax, close your eyes and imagine your bedroom at home. Do you see your bed?" (Therapist waits for response.) "Tell me what you see near your bed?" (Therapist waits for response.) If it appears the patient is not visualizing the areas of their bed, other suggestions using visual, auditory and tactile stimuli will be offered, i.e., is there a night stand near your bed, what is on the stand, can you feel the sheets on the bed, do they feel cool, are there any sounds in the room, perhaps, the ticking of a clock, a radio playing?

After it is clear that the patient is visualizing the bedroom, the therapist will ask him/her to visualize getting in and out of bed according to the instructions which were just given.
Instructions for Up/Down from Chair Movement

In order to get up and down from a chair there are certain steps you should follow. When you are seated in a chair with your buttocks and back completely against the back of the chair the first step is to slide your buttocks to the front of the chair using your arms on the armrest of the chair to push you forward. Once you are at the edge of the chair, your feet should be placed in a wide base of support and you should propel yourself straight up from the chair using your legs and keeping your back straight. If your chair has armrests you may use your arms on the armrests of the chair to help push you up. In order to sit down into a chair the procedure is reversed. Back up against the chair with one leg touching the front of the chair. Reach for the armrest with your arms so that you can lower yourself onto the edge of the chair. Once you are onto the seat of the chair, slide your buttocks back toward the back of the chair so that your back and your buttocks will be against the back of the chair.

"Now, once again close your eyes and imagine a chair in your home. Try to imagine a firm chair with armrests. What kind of chair is it? What room is it located in?"

Again, therapist elicits response and if it appears the patient is not visualizing a chair in their home, auditory, tactile and visual suggestions will be offered to encourage visualization.

After it is clear that the patient is visualizing a chair in his home, the therapist will ask him/her to visualize getting up and down from the chair according to the instructions which were just given.
Instructions for Counterbalancing Movement

"'Counterbalancing' is a term used to describe a technique to reach items which are in front of you and which tempt you to bend forward at the waist. In order to avoid forward bending and to practice counterbalancing, you should follow these steps. Decide which of your legs is the stronger leg and support your body weight with that leg. As you go forward to reach something in front of you, kick your weaker leg back behind you so that your back remains straight and your movement will occur at your hip. It is a good idea to support yourself with one arm on something sturdy while you reach for the item with your other arm.

Now, close your eyes and imagine a situation in your home where you would have to reach forward in order to retrieve an item. Perhaps this activity would occur in your kitchen or your laundry room."

Therapist waits for response. If it appears the patient is not visualizing a situation in their home where they would have to reach forward, once again visual, tactile and auditory suggestions will be made to encourage visualization.

After it is clear the patient has visualized a situation which would incorporate counterbalancing, the therapist will ask the patient to visualize himself/herself performing counterbalancing according to the instructions which were just given.
Instructions for Half-kneeling Movement

"Half-kneeling" is a term used to describe a technique which will allow you to retrieve things from below your waist while again avoiding forward bending. The steps in half-kneeling are as follows. Determine which of your two legs is the stronger as you will use that leg to get up and down from a half-kneeling position. Put your weaker leg behind you and use your stronger leg to lower your weaker knee to the floor so that your weaker knee is on the floor and your stronger leg is in a 90 degree position with your thigh out in front of you. If the object you are retrieving is lower than knee level, you may reach for this object, making sure that you are tilting forward at your hip and not bending at your back. In order to stand up from the half-kneeling position, you must straighten your back, push up with your stronger leg, and use a sturdy surface to help stabilize yourself.

"Now, close your eyes and imagine a situation at home where you would need to retrieve something from below your waist possibly at floor level."

Therapist waits for response. If it appears the patient is not visualizing this situation, visual, tactile and auditory suggestions will be offered to encourage visualization.

After it is clear that the patient has visualized a situation where half-kneeling is appropriate, the therapist will ask the patient to visualize himself/herself performing the steps in half-kneeling according to the instructions which were just given.
Instructions for Pivoting Movement

"Pivoting" is a term used to describe a technique that would avoid twisting of the low back. In order to move an object from one place to another you should be careful to avoid twisting at the waist. In order to practice pivoting you should follow these steps. Always take a step toward the direction of movement. Your hip and your shoulders should always remain in a straight line and any movement at the waist should be eliminated. If you will have your nose and your toes facing in the same direction, this will encourage your hips and shoulders to move accordingly.

"Now close your eyes and imagine a situation at home that would tempt you to twist at the waist."

Therapist waits for response. If it appears that the patient is not visualizing a situation in which pivoting would be appropriate, visual, tactile and auditory suggestions will be offered to encourage such visualization.

After it is clear that the patient is visualizing such a situation, the therapist will ask him/her to visualize pivoting according to the instructions which were just given.
Appendix C

Rating Scales
| 0 | Pleasant social interaction behavior; no behavior demonstrated which indicated worry or uneasiness about future health, outcome of treatment, ability to care for self or others or return to former work or leisure activities |

| 1 | Brief, casual, passing behavior suggestive of uneasiness or concern about future health, outcome of treatment, ability to care for self or others or return to former work or leisure activities |

| 2 | Anxiousness/concern expressed, but within normal limits for a post-op patient; raises questions, but accepts answers and indicates no real doubts about ability to deal with self-care and occupational or leisure pursuits. |

| 3 | Frequent demonstration of behavior which indicate uneasiness or worry about health or future outcomes, ability to do exercises or self-care activities; some things must be explained more than once; frequent reassurance needed from therapist. |

| 4 | Constant visible signs of anxiety shown, i.e., crying, continuous reassurance needed; said cannot do self-care or cannot get well or will be unable to engage in any meaningful activities; will be a burden to self and others. |
Rated Rumination Scale

0. No expression of negative or brooding thoughts related to health, outcome of treatment or ability to function

1. Brief, casual, passing expressions of hopelessness or helplessness

2. Some concern expressed via thoughts of hopelessness/helplessness, but no more than average post-op patient; thoughts stopped by therapist intervention

3. Frequently preoccupied with negative thoughts about the outcome of treatment or feelings of being trapped; moderate success resulted from frequent attempts by therapist to divert attention from topics of preoccupation

4. Constantly obsessed with negative thoughts related to outcome of treatment or resulting health; much doubting and inconclusive speculations verbalized; attempts by therapist to divert attention were unsuccessful
Rated Quality of Imaging Scale

0

No images produced even after encouragement from therapist

1

Vague images produced, minimal details provided, required frequent questioning/encouragement from the therapist

2

Average images produced, questions answered directly without providing additional detail

3

Better than average images produced; some details added beyond those called for by questions

4

Very vivid images produced; many details given spontaneously beyond those called for by questions
Occupational Scale Using Ratio of Motoric and Symbolic Attributes of Job

1. Most motoric; least symbolic
   Ratio of motoric to symbolic 4:1 (80:20)
   Example: Manual laborer, House painter

2. Less motoric than 1; more symbolic than 1
   Ratio of motoric to symbolic 3:2 (60:40)
   Example: Furniture mover, Warehouse worker

3. Motoric and symbolic equal
   Ratio of motoric to symbolic 2.5:2.5 (50:50)
   Example: Route salesman, Long distance truck driver

4. More symbolic than 4; less motoric than 4
   Ratio of motoric to symbolic 2:3 (40:60)
   Examples: Computer operator, Typist

5. Most symbolic; least motoric
   Ratio motoric to symbolic 1:4 (20:80)
   Examples: Cost accountant, Systems analyst
### Appendix D

**Occupational Therapy Follow-Up**

**Movement Assessment**

<table>
<thead>
<tr>
<th>Patient's Name</th>
<th>Assessment Date</th>
<th>Surgery Date</th>
</tr>
</thead>
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<tr>
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<table>
<thead>
<tr>
<th>Education</th>
<th></th>
<th>Maximum Score</th>
<th>Obtained Score</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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**Logrolling (in/out bed)**

<table>
<thead>
<tr>
<th>Logrolling</th>
<th>Maximum Score</th>
<th>Obtained Score</th>
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<tbody>
<tr>
<td>Lovers (1)/Raises (1) with elbow</td>
<td>2</td>
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</tr>
<tr>
<td>Raises (1)/Drops (1) feet in co-ordination with move to/from elbow</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>No twist side to back (1) to side (1)</td>
<td>2</td>
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**Half-Kneel**

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<thead>
<tr>
<th>Half-Kneel</th>
<th>Maximum Score</th>
<th>Obtained Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spine straight—shoulder back up (2)/down (2)</td>
<td>4</td>
<td></td>
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<tr>
<td>Wide base of support stable</td>
<td>2</td>
<td></td>
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**Counterbalance**

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<tr>
<th>Counterbalance</th>
<th>Maximum Score</th>
<th>Obtained Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>One leg back</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Spine straight</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Support with hand</td>
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**Up/Down Chair**

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<th>Up/Down Chair</th>
<th>Maximum Score</th>
<th>Obtained Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spine straight up (2)/down (2)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Slide to/from edge</td>
<td>2</td>
<td></td>
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</table>

**Pivoting**

<table>
<thead>
<tr>
<th>Pivoting</th>
<th>Maximum Score</th>
<th>Obtained Score</th>
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</thead>
<tbody>
<tr>
<td>No twist at waist</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Moves feet</td>
<td>3</td>
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</table>

**TOTAL**

<table>
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<tr>
<th>TOTAL</th>
<th>Obtained Score</th>
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<tbody>
<tr>
<td></td>
<td>30</td>
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</table>

**Did patient spontaneously mention the instructions, training, etc.?**

Yes____ No____

**Did patient spontaneously mention that he/she had practiced movements using imagery?**

Yes____ No____

**Comments:**

Therapist's Initials_______
Appendix E

Follow-up Letter

(North Texas Back Institute Letterhead Stationery)

(Date)

(Patient's Name)
(Patient's Address)
(City, State Zip Code)

Dear (Patient's Name):

Our records indicate that we have not seen you in our Occupational Therapy Department for a follow-up evaluation after your surgery. We sincerely hope that you are recovering as expected. We would very much like to see you and assist you in evaluating your progress. We invite you to call the North Texas Back Institute receptionist at 214 867-2720 to schedule an appointment for a follow-up visit with our outpatient occupational therapists.

We care about your recovery.

Sincerely,

(Therapist Name)
Occupational Therapy Department

IF YOU HAVE RECENTLY SCHEDULED AN APPOINTMENT WITH US, PLEASE KEEP THE APPOINTMENT AND KNOW THAT OUR LETTER JUST CROSSED IN THE MAIL. THANK YOU.
Appendix F

Instructions for Treatment Conditions
Procedures for Control Treatment Condition

1. Patient visit to establish rapport and gather demographic data and activities of daily living information. RECORD DATA ON HALF-SHEET.

2. Provide information usually given to patients about the use of body mechanics for daily living activities.

3. RECORD Anxiety and Rumination Rating Scales on DATA HALF-SHEET.

Procedures for Placebo Treatment Condition

1. Patient visit to establish rapport and gather demographic data and activities of daily living information. RECORD DATA ON HALF-SHEET.

2. Before talking with the patient about body mechanics, ask the patient to lie back in the bed, close their eyes and imagine a pleasant, safe place. Tell the patients that relaxing for a few moments before the instructions about body mechanics are presented helps the patient to concentrate better on the information to be presented. Ask the patients questions about the place or event that is being imaged to determine quality of imaging. Questions may be, "Tell me about the place?"

(Therapist waits for response.) Additional questions will depend on the type of place or event presented by the patient but can include questions about color, warmth/coolness, presence of water, sand, trees, clouds,
people, action, noise or sensations of touch such as softness, textures etc.

3. Ask the patient to open their eyes if they have not already done so and continue with the information usually given to patients about the use of body mechanics for daily living activities.

4. RECORD Anxiety, Rumination, and Quality of Imaging Rating Scales on DATA HALF-SHEET.

Procedures for Imagery Treatment Condition

1. Visit patient to establish rapport and gather demographic data and activities of daily living information. RECORD DATA ON HALF-SHEET.

2. Provide information usually given to patients about the use of body mechanics for daily living activities.

3. Present drawings of the five movements in the same order for each patient. Explain the process for the first movement and request patient to imagine performing that movement according to the instructions for that movement. Continue the sequence of presenting the drawing, explaining and imaging for all five movements.

Order of Presentation:

1. LOG ROLLING
2. UP/DOWN FROM CHAIR
3. COUNTERBALANCING
4. HALF-KNEELING
5. PIVOTING
4. Instruct patients to mentally practice the movements several times a day between now and the time of their first OT outpatient follow-up visit. Ask them, as they practice mentally, to see themselves performing the movements correctly and with ease although for a few days in actual practice their movements may be slow and require them to think about the details of each movement.

5. RECORD Anxiety, Rumination, and Quality of Imaging Rating Scales on DATA HALF-SHEET.
Appendix G

Descriptive Tables
Table 1

Chi Square Values for Pre-Treatment Variables
N=35

<table>
<thead>
<tr>
<th>Variable</th>
<th>df</th>
<th>Value</th>
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<tr>
<td>Age</td>
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<td>46.166</td>
<td>0.233</td>
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<tr>
<td>Education</td>
<td>14</td>
<td>12.409</td>
<td>0.573</td>
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<tr>
<td>Race</td>
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<td>6.683</td>
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<tr>
<td>Sex</td>
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<tr>
<td>Surgical Procedure</td>
<td>8</td>
<td>11.135</td>
<td>0.194</td>
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<tr>
<td>Surgery-Initial Contact Days</td>
<td>10</td>
<td>10.390</td>
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<tr>
<td>Prior ADL Training</td>
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<tr>
<td>Anxiety Rating</td>
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<tr>
<td>Imagery Rating (N=25)</td>
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<td>1.863</td>
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<tr>
<td>Occupational Skill Rating</td>
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### Table 2

Chi Square Values for Therapist Variables  
N=35

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<th>Variable</th>
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<tr>
<td>Initial Therapists</td>
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<tr>
<td>Follow-up Therapists</td>
<td>2</td>
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<td>0.478</td>
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### Table 3

Chi Square Values for Post-Treatment Variables  
N=35

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<tbody>
<tr>
<td>Follow-up Letter Sent</td>
<td>2</td>
<td>4.899</td>
<td>0.086</td>
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<tr>
<td>Initial Contact-Follow-up Days</td>
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<td>11.135</td>
<td>0.194</td>
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Table 4

Analysis of Variance Values for Total Movement Score and Treatment Condition

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<tr>
<th>Source of Variation</th>
<th>df</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
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<tbody>
<tr>
<td>Between groups</td>
<td>2</td>
<td>24.938</td>
<td>12.469</td>
<td>0.74 n.s.</td>
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<tr>
<td>Within groups</td>
<td>32</td>
<td>535.747</td>
<td>16.742</td>
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<tr>
<td>Total</td>
<td>34</td>
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n.s. = not significant
Table 5
Pearson Product Moment Correlation Coefficients for Total Movement Score and Selected Variables

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<th>Variable</th>
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<th>r</th>
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<tr>
<td>Sex</td>
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<tr>
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<td>Days, Surgery to Initial Contact</td>
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<tr>
<td>Days, Initial Contact to Follow-up</td>
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<td>.059</td>
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*p < .05
References


*Journal of Sport Psychology, 4*, 52-63.