

THE UNIVERSITY OF MANITOBA

**AN INTERVENTION STRATEGY
TO ENHANCE THERAPEUTIC EXERCISE ADHERENCE**

**BY
LIANE O. BAILEY**

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in Partial Fulfillment of the Requirements
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An Intervention Strategy to Enhance Therapeutic Exercise Adherence

BY

Liane O. Bailey

**A Thesis/Practicum submitted to the Faculty of Graduate Studies of The University
of Manitoba in partial fulfillment of the requirements of the degree
of
Master of Science**

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ABSTRACT

A person with an injury will often seek the help of an athletic therapist, in order to recover. Unsupervised therapeutic exercises are typically used within the field of athletic therapy. It has been reported in the literature that people often do not adhere to these exercises. Thus, the purpose of this study was to test an intervention technique, the keeping of a daily log sheet, and find its effects on adherence to unsupervised therapeutic exercises prescribed by Certified Athletic Therapists.

Thirty-three recreational athletes who met the inclusion criterion were randomly selected and placed into a Control (n = 18) or Experimental Group. (n = 15). There were five additional recreational athletes who did not meet the criterion and were excluded from all analyses, but comments from these subjects were included within the discussion of the paper. Ten days into each subject's therapy, a Therapeutic Exercise Adherence Questionnaire was administered, for the purpose of measuring change in adherence. During the following four weeks, those in the Experimental Group recorded exercises performed on a daily log sheet. Those in the Control Group did not. At the completion of the four weeks, all subjects again completed the Adherence Questionnaire, were interviewed, and rated the importance of variables affecting adherence on a Variable Rating Sheet. Athletic therapists were interviewed once each subject completed the study, to obtain perceptions of patient adherence.

The Adherence Questionnaire required subjects to record adherence on a six-point Likert scale. Responses were examined to observe whether subjects either 1) maintained/increased adherence or 2) decreased adherence. This dichotomous outcome, along with other independent variables, was analyzed using Nominal Logistic Regression to determine if the daily log sheet predicted adherence. Subjects were also asked to explain reasons for incomplete adherence using open-ended comments. These open-ended comments were analyzed using lists, ratings, and percentages. The Variable Rating Sheet was analyzed using a Chi Square test to determine differences in responses between the Control and Experimental Groups. The interviews of the subjects and therapists were analyzed using lists, ratings, and percentages.

The analysis of the Adherence Questionnaire found that the daily log sheet did not significantly predict adherence. However, there was a significant positive relationship between the number of therapy appointments and better adherence to stretching exercises. Also, positive relationships were found between experience with previous therapy and times per day that strength exercises were performed and repetition of strength exercises (though these results were not quite significant). It was determined that many aspects of adherence were initially good (ie. number of prescribed exercises, repetition of prescribed exercises) except frequency that exercises were to be performed.

Through the analysis of the interviews with the subjects, it was discovered that the log sheet delayed a decrease in adherence and if an increase in adherence were to occur, it occurred sooner for those using the log sheet. Most subjects were comfortable with the use of the log sheet and felt it assisted them with adherence to some degree. The log sheet assisted patients in setting goals, observing progress, and documenting programs in a clear, concise manner. Also, the analysis of the Variable Rating Sheet indicated that the Experimental Group rated the importance of filling out a daily log sheet significantly higher than those in the Control Group.

The Interview with the Athletic Therapists revealed that patient adherence is usually estimated inaccurately. This, as well as the discovery of numerous variables that affect adherence, indicates that it is extremely important for the therapist and the patient to practice effective two - way communication.

In conclusion, the use of the log sheet is recommended providing that the patient is having difficulties with adherence and shows no opposition to its use. It is also recommended that the log sheet be used in conjunction with other adherence enhancement strategies outlined within the paper.

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CHAPTER 1

INTRODUCTION

Following a medical diagnosis for an injury, one often seeks athletic therapy, which serves the purpose of returning a patient to normal function. An athletic therapist's goal is to create the best possible environment for healing using a variety of methods to obtain this goal (Arnheim & Prentice, 1993).

Therapeutic exercise is one of the most important tools used by the therapist, especially for achieving symptom-free movement and function (Kisner & Colby, 1985). As a result of injury, a joint or limb is not in use for a period of time. Thus, the patient is at risk for developing muscle atrophy, muscle contractures, inflexibility, and delays in healing due to circulatory impairment (Arnheim & Prentice, 1993). The goals of therapeutic exercise include an increase in strength, mobility and flexibility, muscle relaxation, endurance and cardiovascular fitness (Kisner & Colby, 1985). Prevention of de-conditioning is also an important aspect of therapeutic exercise, so an attempt is usually made to maintain strength, flexibility, endurance, and coordination of the entire body (Arnheim & Prentice, 1993). Activities unrelated to the injured joint, such as pool running, cycling, or contra-lateral exercises can be performed. Other therapeutic modalities are often combined with therapeutic exercise. Thus, a treatment may consist of hot and cold therapy, stretching, strengthening exercise, and electrical modalities such as ultrasound, electrical muscle stimulation, or high volt galvanic stimulation.

Adherence to injury reconditioning and athletic therapy has not been widely studied and few empirical studies have been performed (Duda, Smart, & Tappe, 1989; Fisher, Domm, & Wuest, 1988; Fisher, Mullins & Frye, 1993). Much insight has come from other related areas such as exercise adherence (Dishman & Gettman, 1980; Dishman, 1986), diabetic regimen adherence (Ary, Toobert, Wilson, & Glasgow, 1986), or cardiac rehabilitation adherence (Andrew, et al., 1983). There is also a lack of information examining adherence to therapeutic

exercises, especially those that are meant to be performed without supervision. Literature directly related to the reconditioning of injuries has focused on variables affecting adherence (Fisher, 1990; Fisher, Domm, et al., 1988; Fisher & Hoisington, 1993; Fields, Murphey, Horodyski, & Stopka, 1995) and adherence enhancement strategies (Fisher, Scriber, et al., 1993; Franklin, 1988).

Although reconditioning following an injury is important, injured patients seeking reconditioning often miss appointments and do not participate fully in their treatment program (Byerly, Worrell, Gahimer, & Domholdt, 1994). Fisher (1990) reported that 40% to 65% of patients drop out of a variety of medical programs. Injury reconditioning is not immune to dropout. Dishman and Gettman (1980) reported that 50% of participants drop out in the first six months of a therapeutic exercise program. According to Meichenbaum & Turk (1987) there are approximately 20% to 50% who adhere to therapeutic recommendations. The degree of non-adherence is unfortunate as reconditioning of the injury may be crucial for return to competition, in the case of an athlete, or return to work, in a non-athlete. The efficacy of treatment can only be established when patients adhere to their exercise regimen (Sluijs, Kok, & van der Zee, 1993). In addition, improper reconditioning can result in re-injury (Johnson, 1991). For example, Satterfield, Dowden, and Yasumura (1990) reported on the case of a female runner who had a stress fracture in her femur. This woman repeatedly ignored the advice of the medical staff treating her condition. Advice included such things as rest, progressive non-weight bearing exercises to weight-bearing exercises, and specific strengthening exercises. Her injuries progressed from the stress fracture in the femur to additional stress fractures to her tibia and calcaneus. Following more non-adherence she returned with a stress fracture in her second metatarsal and later, the other tibia. It is very probable that the continuous increase in injury to this woman was due to non-adherence to medical advice and physical therapy.

The terms **compliance** and **adherence** have been used interchangeably within the literature regarding injury reconditioning. **Compliance** refers to the extent to which a patient is ready to follow given instructions. Compliance implies that the behaviour of the patient coincides

with the advice of the health caregiver and yields to the will of others (Sperry, 1985; Ice, 1985; Meichenbaum & Turk, 1987; Fisher, 1990).

The major type of non-compliance is dropping out altogether. A second form includes a reluctance to follow a schedule or program plan. It has been argued that the term compliance implies that the patient plays a passive role, or is coerced, as opposed to playing an active, authoritarian role. It is also implied that the patient is at fault when compliance does not occur, indicating a negative attitude towards the patient (Blackwell, 1976; Sperry, 1985; Meichenbaum & Turk, 1987). For these reasons, the term adherence is preferred.

Adherence implies a partnership approach in which the therapist and the patient collaborate to achieve the desired results of treatment. Choice and mutuality are involved in planning a treatment session. Both parties must conform to an external standard; that is, the patient and provider both expect a particular behaviour pattern (Barofsky, Sugarbaker, & Mills, 1978; Meichenbaum & Turk, 1987). Adherence is an active, voluntary, collaborative involvement to achieve a desired preventative or therapeutic result (Heil, 1993; Sperry, 1985).

Adherence behaviours involve entering into and continuing with treatment, keeping referral and follow up treatments, or following appropriate lifestyle changes. It also includes the avoidance of health risk behaviours and the correct performance of unsupervised therapeutic regimens (Sperry, 1985). Examples of adherence to unsupervised therapeutic regimens include the correct performance of prescribed exercises using the prescribed number of repetitions and sets, or performing the exercises the prescribed number of days per week. Non-adherence is typically failure to perform and adhere to prescribed behaviour. It also includes non-adherence to health advice.

An injured athlete often faces numerous challenges such as emotional and psychological traumas and must often deal with feelings of uncertainty, anxiety, blame, guilt, anger, hopelessness, and loss of control (Petrie, 1993; Fisher, Scriber, Matheny, Alderman, & Bitting, 1993). One may face a threat to one's career, feelings of immortality, and invincibility (Petrie, 1993). Thus, an injured athlete is dealing with a great many personal issues and therapy is often

not the athlete's first concern. Poor adherence can be an early indicator of psychological maladjustment due to the injury (Heil, 1993).

The therapist is trained to recognize and recondition injuries. When a patient is not committed to a program, the therapist's expertise is undermined and he/she may have to deal with feelings of inadequacy (Fisher, Domm, et al., 1988). Therefore, if adherence is increased, it may be possible to increase patient satisfaction as well as increase clinician job satisfaction.

Brewer (1998a) claims that since knowledge about adherence enhancement is becoming greater, it is time to apply this knowledge. Since the effect of an enhancement method on adherence to therapeutic exercise in the field of Athletic Therapy has not been experimentally tested, this study will attempt to do so.

Statement of the Problem

The purpose of this thesis was to determine the effect of an intervention technique, the keeping of a daily log sheet, on the adherence to a prescribed personalized therapeutic home exercise program. The subjects were recreational athletes, who did not have a therapist supervising him/her at practices and games on a regular basis (team therapist).

Research Hypothesis

The subjects in the experimental group, who completed a daily log sheet, will have better adherence to a prescribed personalized therapeutic home exercise program than the control group.

Operational Definitions

Therapeutic Exercise

For the purpose of this study, a therapeutic exercise will be any exercise that is prescribed to the athletic therapy patient for the purpose of restoring or improving the patient's well being.

Adherence to Therapeutic Exercise

The aspect of adherence to be examined in this thesis will involve the correct performance of prescribed exercises using the prescribed number of repetitions and sets, performing the exercises as frequently as prescribed, and performing the prescribed exercises for the amount of time prescribed (ie. holding a stretch for the correct number of seconds prescribed).

Reconditioning

The terms **rehabilitation** and **reconditioning** are often used interchangeably. Both terms imply restoring the patient's health. Reconditioning denotes an active role for the patient, as in the term "conditioning". This term implies the role of exercise in the program and thus will be the term of choice for this paper.

Recreational Athlete

This is a person who participated in a sport no more than five times per week and for the purpose of enjoying oneself. A recreational athlete is not a person participating in an intercollegiate sport or in a sport at a national or provincial level.

Sport

A sport is an activity involving physical exertion individually or with a team. It is an activity participated in for enjoyment and one that is socially recognized as a sport. In this thesis, a sport will not include activities such as weight lifting, bodybuilding, aerobics, jogging for fitness, hunting, or fishing.

Assumptions

1) The measurements taken in this study were based on self-report. It was assumed that the participants would answer honestly.

2) It was assumed that all participants would follow instructions given, and that those in the experimental group would complete the daily log sheets as instructed.

3) It was assumed that patients receiving therapeutic exercises would gradually receive an increasing number of exercises as therapy progressed.

Limitations

1) During the development of this study, there was no measure found, in the field of Athletic Therapy, Sports Physiotherapy or Athletic Training to measure adherence to prescribed therapeutic home exercise programs. Thus, there was no measurement tool already developed for use in this study.

2) At the time that the study was developed no other studies were found, in the field of Athletic Therapy, Sports Physiotherapy, and Athletic Training, that tested a strategy to enhance adherence to therapeutic exercises. Thus, in the development of the methodology, comparisons could not be made to previous work.

3) The interaction between the patient and the athletic therapist and influence of the athletic therapist on the patient could not be controlled.

4) Influences or factors affecting the subject, aside from the daily log sheet, could not be controlled.

Delimitations

1) In order to standardize the type of subjects in this study, the participants involved were recreational athletes who were not in contact with a team therapist or trainer more than twice a week. University athletes and those who were not athletes were not included.

2) As a result of the type of subjects involved in the study, it was difficult to obtain a large number of subjects.

3) Athletes who were under the age of 18 or over the age of 50 were not included in this study.

CHAPTER 2

REVIEW OF LITERATURE

This chapter will examine recent literature concerning adherence to therapeutic exercises in Athletic Therapy. Unfortunately, there was little literature coming from the field of Athletic Therapy and thus, studies in physiotherapy, athletic training, exercise adherence, or those focusing on medical regimens for chronic conditions were also used. Most literature focuses on variables that affect adherence, suggestions for enhancing adherence, and predictors of adherence. Competitive athletes are the participants in most studies, as opposed to recreational athletes. As well, some of the problems concerning the measurement of adherence will be examined. Suggestions for enhancing adherence will be not be discussed in this chapter, but will be discussed in Chapter 5.

VARIABLES AFFECTING ADHERENCE

Commitment of the patient to the treatment program is a key factor in the effectiveness of the treatment (Fisher, Mullins, et al., 1993). However, one cannot dismiss the non-adhering patient as having a "bad attitude", as the issue of adherence is very complex, with more than 200 influencing variables (Meichenbaum & Turk, 1987). Non-adherent behavior may best be regarded as person-situation interaction (Heil, 1993). The variables will be discussed within three main categories (Fisher, Mullins, et al., 1993):

- 1) Injured Patient Characteristics
- 2) Conditions Surrounding Reconditioning
- 3) Therapist-Patient Interactions

Injured Patient Characteristics

Treatment adherence, has been considered to be influenced by the patient's cognitive and emotional responses to injury. The patient's feelings and thoughts following an injury are considered to be affected by the characteristics of the patient (Brewer, 1998b)

Researchers have been looking for a global personality type that predicts adherence to a treatment program. For example, Pargman and Green (1990) examined differences between those with Type A and Type B personalities. The only major difference related to exercise adherence found between the two personality types involved self-motivation. Thus, at the moment, no "default personality" has been discovered (Sperry, 1985; Fisher, 1990; Fisher, Mullins, et al., 1993; Dishman, Ickes & Morgan, 1980). Fifty-five percent of athletic trainers questioned, agreed that personality was not the most important factor involved in reconditioning adherence (Fisher, Mullins, et al., 1993). However, even though no global personality type has been reported, there are numerous characteristics of the patient related to adherence to sports injury reconditioning. Some of these characteristics will be discussed.

Self-Motivation

Self-motivation is described as a personal quality of a person who has the ability to motivate him or herself to perform a given task. One who is self-motivated is influenced by personal goals as opposed to external reinforcement, that is, self-motivation is independent of situational influence (Dishman & Gettman, 1980; Fisher et al., 1988; Fisher, Mullins, et al., 1993). Those with self-motivation have been reported to overcome barriers or inconveniences and adhere better to prescribed behavior (Dishman & Gettman, 1980; Fisher et al., 1988; Fisher 1990). Less self-motivated patients were noted to be more likely to miss appointments, less likely to complete given exercises and less likely to exert maximal effort during exercise performance (Duda, et al, 1989). Dishman, et al. (1980) reported in a study of university undergraduate rowers, that only 40.6% of the subjects adhered to prescribed behaviour if they had low self-motivation while 78.1% of those with high motivation adhered. Also supporting this is research by

Fisher et al., (1988) who studied injured collegiate athletes through the use of a questionnaire. Those who adhered to therapeutic regimens showed greater perseverance in treatment than non-adherents. Research by Fisher and Hoisington (1993) reported 33 of 36 intercollegiate athletes stated that reconditioning adherence was related directly to will power. However, recreational athletes, may not consider recreational activity as a high priority and may not consider reconditioning important. Therefore, perseverance may be less in those who participate in athletics recreationally (Fields, et al., 1995). Athletes recognized contributions of therapists, such as treatment supervision, and thus, it seems that self-motivation may not be enough to carry the patients through difficulties with reconditioning adherence (Fisher & Hoisington, 1993). However, Dishman et al. (1980) felt that when compared to other conceptually relevant psychometric variables, self-motivation was the best discriminator of adherence. Thus, self-motivation appears important in determining adherence to reconditioning programs but it is likely not the only related factor.

Self-Efficacy

Self-efficacy is the belief by the patient that he or she is capable of meeting the reconditioning demands that will lead to improved function (Ewart, 1989; Fisher, 1990). This trait is not global, but rather is related to a specific task, that is, self-appraisals for one task may not generalize to other tasks (Ewart, 1989). It is also influenced by anticipated costs and benefits of action, or outcome expectancy (Lawrance & McLeroy, 1986). Self-efficacy influences choice of behaviour and situations avoided or attempted, the amount of effort spent on a task (more energy is spent when success is perceived), the amount of time the patient will persist, and emotional reactions, such as anxiety (Lawrance & McLeroy, 1986). In addition, the patient must know how to perform the skill and want to be able to perform the skill (Lawrance & McLeroy, 1986).

One can measure self-efficacy by observing whether or not the behaviour is actually performed (Lawrance & McLeroy, 1986). It can also be quantified by summing the confidence

judgments for tasks of increasing difficulty within a specified behaviour domain. For example, one may be confident about the ability to jog one or two miles, but may not believe that he/she can jog ten miles. By summing the number of beliefs in ability, measurement can occur (Ewart, 1989).

Ewart (1989) cited Bandura & Cervone (1983) who reported that people having high self-efficacy for a task worked harder and longer. These people also reported less anxiety and tension. Those with low self-efficacy seemed to show despondency when they failed (Ewart, 1989). Thus, people with high self-efficacy seemed to be more likely to persist and adhere to a reconditioning program.

Pain Tolerance

It is typical for pain to occur as a result of an injury and it is not unusual for the patient to experience some pain and discomfort during reconditioning. In fact, pain, or the anticipation of pain, can often be a barrier to reconditioning adherence, as reported by physical therapy patients (Sluijs, et al., 1993).

Because each individual manages pain differently, some patients can handle pain more effectively than others can and better adherence has been reported for those who are able to tolerate pain (Fisher, et al., 1988). However, this finding was not supported in a survey of athletes (Fisher & Hoisington, 1993) and a survey of athletic trainers (Fisher, Mullins, et al., 1993). Less than half (46%) of athletic trainers felt that pain would decrease the likelihood of adherence. Even fewer athletes (3%) felt pain was a significant factor. All three studies used a questionnaire to obtain information but Fisher, et al. (1988) also took a measure of adherence, examining attendance at reconditioning sessions and a comparison between expected progress and the actual progress that occurred. The other two studies used information based on opinions of athletic trainers and patients, which could obtain accurate information (i.e. an athlete should know why he/she does not adhere) but an actual adherence measure, as used by Fisher, et al. (1988) provides more thorough information. Pain does appear to affect adherence though it may not play a large role. It is important, however, to educate the patient to understand the amount

and type of pain to be expected. The patient must learn to discriminate between detrimental and good pain (Byerly, et al., 1994). An example of detrimental pain is pain resulting from acute inflammation which is different than pain from hard work (Fisher & Hoisington, 1993; Fisher, Mullins, et al., 1993). Thus, it is important to consider methods to decrease pain. However, one must also remember that pain is useful to gauge the intensity of the reconditioning and no efforts should be made to cloud the patient's awareness of pain (Fisher & Hoisington, 1993).

Patient Recall

Recall refers to the patient's ability to remember given advice (Ice, 1985). Even under the best circumstances, it has been reported that only 63% of information given to a patient is recalled (Ice, 1985). Ice (1985) cited information given by Ley (1977) who stated that diagnostic statements were recalled more of the time (58% to 86%) than instructions and advice, which were remembered 28% to 44% of the time.

Many factors affect recall such as the patient's amount of medical knowledge, which is positively correlated to recall. Anxiety also is thought to be an important factor, that is, a moderate amount of anxiety allows for better recall than does high or low anxiety (Ice, 1985). The amount of importance a patient places on the information also affects recall. The more important the information is perceived to be, the more likely it is to be recalled. High complexity of the treatment protocol is likely to decrease recall. Complexity is defined as the number of and difficulty of the actions the patient must remember and carry out (Ice, 1985). Finally, the amount of information given to a patient might affect retention, for example, information overload may decrease recall (Caplan, Harrison, Wellons, & French, 1980). Information overload may cause a patient to omit information, process information incorrectly, or delay retention. Sometimes only the important elements of the given information are retained, or one approximates what he or she has to process. It might be useful to recruit another individual to remember information for the patient or all information might be forgotten (Caplan, et al., 1980). Another suggestion would be to write instructions for the patient.

Perceived Exertion and Effort

This is an estimate of the level and amount of work the patient is performing, and can affect the patient's decision to continue with the program as well as how hard the patient works. Adherents have been reported to perceive a greater amount of effort used as compared to non-adherents (though non-adherents may still perceive relatively high effort) (Fisher, et al., 1988). It has been suggested that if non-adherents perceive a high level of exertion they are less self-motivated to continue because they are less able to handle the pain and discomfort. Perhaps this is because they do not perceive effort accurately (Fisher, et al., 1988). This is unfortunate, as reconditioning will not be as effective without the required effort.

Patient Beliefs

Beliefs regarding treatment and its surrounding situations play a role in adherence to reconditioning programs. There are a variety of beliefs that may directly or indirectly affect adherence. An examination of reasons for dropout in post coronary patients revealed that those who lacked a strong belief in the value of exercise for improved health were more likely to drop out (Andrew, et al., 1981). With regards to injury reconditioning, Sluijs, et al. (1993) reported that among physical therapy patients, exercise occurred less if patients held the belief that exercising would not help. Taylor and May (1996) discovered that those patients with stronger beliefs in their ability to complete the prescribed therapeutic program were more likely to adhere. Additionally, 95% of athletes reported the need to feel that therapy will be successful (Fisher & Hoisington, 1993). It has been suggested that when belief in treatment is high, the patient feels less vulnerable to failure and is more likely to adhere (Blackwell, 1976).

The belief that the illness or injury will not play a significant role in the future can result in non-adherence, as illustrated in a study of non-adherent diabetics (McCord & Brandenburg, 1995). Because diabetics are prescribed exercise as a part of their therapy, it is possible that this belief relates to reconditioning adherence.

Athletes often hold the belief that when something does not work, one should try harder, as opposed to trying something different. Thus, an ineffective exercise program may be continued when instead it should be modified (Faris, 1985). As a consequence, when the exercise program is still not effective following an increase in effort, the patient may give up.

Pessimism toward therapy can be disastrous, as indicated by 87% of athletic trainers who agreed with this statement (Fisher, Mullins, et al, 1993). Anyone who is pessimistic towards a reconditioning program may not have the motivation to adhere to it.

Some examples of adverse patient beliefs include misconceptions regarding treatment, the belief that nothing is wrong, the belief that choice is not allowed, and a belief of being under pressure (Meichenbaum & Turk, 1987). A variety of beliefs regarding injury reconditioning have been demonstrated. A positive attitude shown by the therapist and the expression of these positive beliefs may prevent the negative impact of beliefs.

Stress

The patient appraises the demands of a stressful situation and his/her ability to meet those demands. If the patient's resources exceed those demands, the stress response is minimal. If the demands on the patient exceed his/her perceived resources, the stress response is predominant. Thus, the manner in which the consequences of an event are appraised may influence the stress response of the athlete.

Negative emotions occurring as a result of an injury can influence the patient's attitude towards reconditioning. Some patients are less likely to perceive events as stressful, that is, they have the quality of psychological hardiness. This consists of curiosity, willingness to commit, the ability to view change as a challenge, and a sense of control. It seems that the amount of stress perceived to be involved in reconditioning, as well as the stress caused by the injury itself, and the patient's ability to deal with this stress can influence whether or not the patient adheres to the program (Andersen & Williams, 1988, Crossman, 1997).

Those who appraised an injury as serious, and dealt with the stress of the situation, were more likely to adhere to prescribed modalities of rehabilitation, as found in a study by Taylor and May (1996). Thus, enhancing a patient's perception of the severity of an injury and assisting with coping mechanisms may encourage adherence (Taylor and May, 1996).

Not much literature exists relevant to injury reconditioning and stress. Most research is related to the relationship between stress and injury occurrence (i.e. Botterill, Flint & Ievleva, 1996; Weinburg & Gould, 1995; Andersen & Williams, 1988).

Conditions Surrounding Reconditioning

A variety of situations, or conditions are present in a patient's reconditioning environment. These conditions also influence the adherence. Environmental variables and social support will be discussed.

Environmental Variables

The environment surrounding the reconditioning program and other external barriers may result in adherence problems. For example, athletes agreed that the physical location of the clinic could enhance or hinder adherence (Fisher & Hoisington, 1993). Seventy four percent of these athletes also said that a crowded exercise room would decrease attendance and adherence (Fisher & Hoisington, 1993) whereas only 56% of athletic trainers felt a crowded atmosphere would affect attendance at therapy (Fisher, Mullins, et al., 1993). As well, more athletes (Fisher & Hoisington, 1993) than athletic trainers (Fisher, Mullins, et al., 1993) believed that a crowded clinic would reduce motivation to use effort when performing prescribed exercises. It may be that in this scenario, an athlete would provide more substantial information as it is the athlete performing the therapy.

Scheduling of appointments may also produce a setback in reconditioning adherence as supported by 95% of athletes surveyed (Fisher & Hoisington, 1993). Fisher & Hoisington (1993) and Fisher et al. (1988), reported significant differences between adherents and non-adherents

in regards to scheduling. However, Byerly et al. (1994) did not find scheduling provided a distinction between two groups. The reason for this may be that in the latter study appointments were made to fit the patient's schedule. Fisher et al. (1988) may not have provided the patient with appropriate hours. Scheduling is especially important in the case of an athlete, or a student, as these people have very busy schedules, making it difficult to find time for therapy as well as for unsupervised exercises.

Other barriers have become apparent through the literature. In a study of injured patients, Franklin (1988) reported that the most frequent responses to a question about barriers, included inconvenient or inaccessible program location and lack of time or work conflicts. Sluijs et al. (1993) also reported that physical therapy patients frequently found that adherence did not occur when time to exercise did not fit into their daily schedule. In regards to program locations, those who resided closer to the program location showed better adherence (Franklin, 1988). Other reported barriers have included a lack of individual attention (Fisher, 1990) and inconvenient parking (Andrew, et al., 1988).

It has been suggested that from 10% to 40% of environmental barriers are unavoidable (Dishman, 1986). For example, the location of a treatment centre, though not equally accessible to everybody, may be impossible to change. This also illustrates the fact that dropping out is not always a behavioural problem. However, these are barriers that influence attendance at a therapy appointment. While such environmental barriers are important to consider, because the patient must first attend the appointment in order to receive an unsupervised therapeutic exercise program, these barriers are unlikely to directly affect adherence to an unsupervised program.

Social Support

Heil (1993) defines social support as a connection between people. Supporters provide reassurance and improve communication and understanding. Social support may buffer the

effects of stress on health and enhance recovery. Those who have social support may demonstrate self-efficacy, less anxiety, and better interpersonal skills (Heil, 1993).

There are three distinct types of supporters for an athlete (recreational or otherwise) including an athlete's team, the sport medicine team, and parents, friends, or a spouse. No single group can provide all of the necessary support (Heil, 1993). Caplan et al, (1980) stated that higher levels of support from those at home led to higher levels of perceived support from health care providers. Thus, the levels of support are interactive.

Various researchers have reported that support from others has a positive relationship to adherence (Fisher, et al., 1988; Rotella & Heyman, 1993; Byerly, et al, 1994). Almost unanimous agreement occurred between athletic trainers (Fisher, Mullins, et al., 1993) and athletes (Fisher & Hoisington, 1993) that coaches and therapists were important for reconditioning adherence. It has been hypothesized that social support is important because it increases the chance of committing to others.

Not surprisingly, 60% of athletes in Fisher & Hoisington's (1993) study felt unhappy when teammates showed a lack of support. As a result of an injury, an athlete is unable to participate in team practices and games. This leaves him/her feeling "left-out". Thus, it is important for the athlete to feel he/she is still a part of the team.

Finally, when dropout rates of post coronary patients were studied, the rate of those without spousal support was three times that of those whose spouses were supportive (Dishman & Gettman, 1980). Thus, it appears that social support plays a predominant role in all types of reconditioning, and all types of patients; not just athletes.

Fisher et al. (1988) and Byerly et al. (1994) both agreed that after considering various factors such as: pain tolerance, perceived exertion, scheduling, self-motivation, and environmental considerations, support from significant others showed the most differentiation between adherents and non-adherents. While other factors, such as self-motivation, have an effect on adherence, clearly, encouragement from others is essential (Fisher, et al., 1988). Social support thus plays a predominant role when examining reconditioning adherence.

Therapist - Patient Interactions

Communication and interaction between the therapist and the patient play an important role when examining adherence. For example, the attitude of the therapist and conveyance of this attitude toward the patient is a crucial determinant of adherence (Meichenbaum & Turk, 1987). The therapist's expectations can be self-fulfilling. An example of this occurs when the patient is expected to be non-adherent. The therapist might be less motivated to work with the patient resulting in decreased explanations of the treatment and injury, decreased assessments and requests for participation, decreased monitoring of progress, and decreased motivation of the patient (Fisher, 1990). Thirty-two of 34 athletes surveyed agreed that a good rapport with the athletic therapist is important for adherence (Fisher & Hoisington, 1993).

In addition, the patient cannot give his/her best effort if understanding of the situation does not exist (Heil, 1993). In order to have a better chance of adherence, it is important for the therapist to educate the patient and communicate with him/her. An explanation of the injury and reconditioning program, nature of the injury, prognosis for recovery, and an understanding of the likelihood of pain are deemed important factors to be communicated (Fisher & Hoisington, 1993; Fisher, Mullins, et al., 1993). Patients receiving positive feedback from the therapist were reported to be more adherent than those who had little communication with the therapist (Sluijs, et al., 1993). Therefore, the responsibility of adherence does not rest only on the patient's shoulders, but the therapist plays an important role, as well.

MEASUREMENT OF ADHERENCE

Direct adherence measurement is difficult. One problem concerns the lack of consistency of a definition of adherence (Robison & Rogers, 1994; Martin & Dubbert, 1985). For example, adherence could be considered as attendance at therapy and expected progress (Fisher, et al., 1988; Lampton, Lambert, & Yost, 1993). Byerly, et al., (1994) gave patients points for attendance and for the number of exercises performed in the clinic. Udry

(1997) operationally defined adherence as the ratio of appointments attended compared to the number of recommended appointments. Adherence could also include the performance of prescribed therapeutic home exercises, as in this study. When unsupervised activity is concerned, there is a problem of objectively quantifying adherence (Robison & Rogers, 1994).

One of the more reliable and straightforward measures of adherence is the measurement of attendance to a program. However, measurements such as these are sometimes negatively skewed due to the fact that patients often attend most of their appointments (Brewer, 1998a). This type of measurement also does not include exercise sessions that are performed in the home environment. Measurement of home exercise adherence is difficult. It usually involves a single retrospective report by patients at the end of the program as used in a study performed by Almekinders and Almekinders (1994). These researchers asked the patients if they followed the physical therapy program and if they did not, why? This type of measurement is subject to inaccuracies due to biases or distorted recall (Meichenbaum & Turk, 1987). The fact that correct exercise performance must meet the specific exercise prescription should also be taken into consideration (Martin & Dubbert, 1985). Thus, another method of measurement is the use of exercise recording (Belisle, 1987). However, this type of measurement could affect adherence itself, in the same manner as an intervention, and it involves self-report.

Many measures of adherence in the literature have been based on self-report. In a comparison of self-report to a marked-item technique in diabetics, (Wing, Epstein, Nowalk, Scott, & Koeske, 1985) self-report measures overestimated adherence. While using self-report, 52% to 68% of patients were considered adherent but only 32% to 48% were adherent when using a marked-item technique (a method of marking blood glucose measuring tools). Self-report measures are inexpensive for the researcher but the reliability and validity of this type of measurement is unknown (Williams, Klesges, Hanson, & Eck, 1989). This is because there is a lack of a standard measure available (Robison & Rogers,

1994). There is a possibility of inaccurate reports from the subjects due to forgetfulness, or inaccurate perceptions (Williams, et al., 1989; Dishman, 1986, Brewer, 1998b). Also, it might be difficult to get the patients to adhere to this type of measurement in the first place (Brewer, 1998b). However, an attractive aspect of using self-report measures is that there are a variety of variables that can be measured from the subject that may not be available from other sources. For example, self-report can assess the duration of an activity, the frequency of the activity, or effort involved in the activity (Baronowski, 1988). Self-report measures are also quick, and easy to obtain (Baronowski, 1988). This type of measurement might be improved by increasing the frequency of assessment or by using objective measures.

The use of an electromyographic biofeedback unit during the performance of exercises performed at home was used to assist with reconditioning of post-operative patients recovering from minor arthroscopic knee surgery (Levitt, Deisinger, Wall, Ford, & Cassisi, 1995). In addition to assisting with muscle contraction, this unit prompted patients for the proper timing of exercises and also stored data that verified patient adherence. This type of measurement does not have the biases that self-report has, and may provide more accurate results, however, this method could be expensive, especially if monitoring a large number of patients.

Direct observation of the activity could be the best method of measuring adherence. However, this requires a large amount of time on the part of the observer. It could also be expensive (Matthews & Freedson, 1995). The use of a family member, as an observer, has been suggested by Epstein and Cluss (1982) but therapeutic exercises are not always performed in the presence of a member of the family. They may be performed at work or school. Also, the presence of an observer might affect the actions of the patient and obstruct accurate measurement. If examining adherence within the clinic, direct observation is easier to use. There have been at least two (and probably more that are unknown) instruments developed for the use of observing patient behaviour in a clinic. The Sports Medicine

Observation Code (SMOC) was developed by Crossman and Roch (1991). This is an in-depth measure recording 13 possible behaviours at 10 or 20 second intervals. It is obvious that this measure could require a great time commitment on the part of the observer. The other measurement tool is the Sport Injury Rehabilitation Adherence Scale (SIRAS). This is used by Laubach, Brewer, Van Raalte and Petitpas (1996) and also Daly, Brewer, Van Raalte, Petitpas and Sklar (1995). This measurement does not observe behaviour as thoroughly as the SMOC but is less time consuming and less intense. It involves obtaining the therapist's perception of the patient's degree of effort, adherence to instructions, and receptivity to rehabilitation protocol changes. As well it measures the attendance at rehabilitation sessions in order to observe adherence. These measures give an idea of what is happening in the clinic setting but still do not include aspects of adherence that occur away from the clinic setting. Regardless of instrument choice, when observing behaviour, it is important to record observations as soon as they occur in order to ensure accuracy (Brewer, 1998a).

One study used the therapist's opinion to judge adherence to the reconditioning plan (Wittig & Schurr, 1994). The therapist was asked to evaluate adherence as: a) much less than usual, b) less than usual, c) average, d) more than usual, and e) much more than usual. There are some problems with this method. Firstly, this method involves the therapist's judgement only, which may not be an accurate measure of the actual situation. Secondly, what is usual? How can a therapist judge what "usual" adherence is for each individual, especially those who may never have been to therapy before? Determining usual adherence could be a separate study in itself.

The measure of healing rate has been used to assess adherence, using the assumption that adherents heal quicker (Fisher, et al., 1988, Lampton et al., 1993, Brewer, 1998a). For example, Bassett and Petrie (1999) measured strength and range of motion as a portion of an adherence measure. The other portion included having the participants complete an exercise diary, which as already discussed, could be an intervention in itself.

When considering healing rate as a measurement tool, it must be recognized that individuals may have different metabolism, thus healing at different rates, even if the injury is the same. As well, different injuries will probably heal at different rates.

For the purpose of this study, the chosen adherence measurement tool consists of a questionnaire involving a six point Likert Scale, measuring responses to questions about adherence behaviours. Depending on the question, 1 equaled either "none" or "never" and 6 equaled either "all prescribed exercises" or "always". Prior to the development of this study this type of questionnaire was found in one study, involving adherence to medical regimens at home, work or in social and recreational settings amongst those recovering from myocardial infarction. This was called the Health Adherence Scale . This tool had established content validity (Stegman, Miller, Hageman, Irby, Kositzky-Klutman, & Rajek, 1987). Though this method is based on self-report, Williams, et al. (1989) mentioned that when careful attention is paid to methodology and instrument design, self-report can be found reliable (Williams, et al., 1989). Following the development of this study on the affect of a daily log sheet on adherence to therapeutic exercise, a similar measure was found in a study by Taylor and May (1996). In their study, both the physiotherapist and the patient estimated adherence to different components of the reconditioning (ie. mobility, stretching, strengthening, hot/cold therapy, and rest). They scored adherence on a scale from none (0) to all (5). The scores for each component were averaged in order to obtain one score. The patient recorded adherence to prescribed rest by scoring the number of activity sessions participated in that were not advised. Unlike the current study, this study did not examine each component of adherence individually when coming up with a total adherence score. Thus, important information may have been missed. However, the study by Taylor and May (1996) did examine adherence to rest separately which is an important aspect of reconditioning.

In conclusion, it is obvious that there are many issues to be examined when considering the measurement of adherence. Different tools have been developed, but as of yet, an ideal tool does not exist.

PROGRESS MONITORING

Observing and monitoring treatment is important to guide the patient's expectations of progress. In one study (Sluijs, et al., 1993), patients who were monitored by the therapist were more likely to adhere. Almost all athletic trainers (95%) surveyed agreed that regular monitoring and supervision (92%) seemed important to adherence. Also, 80% of these trainers felt that athletes are less likely to perform their reconditioning workouts on their own, without supervision of a therapist (Fisher, Mullins, et al., 1993). When a patient observes success, adherence is promoted (Fisher, Scriber, et al., 1993; Fisher, 1990). Both therapist and patient should be involved in monitoring (Fisher, 1990).

It must be realized that a plateau is usually reached at some point during treatment, that is, it cannot be expected that the progress rate will remain the same throughout the entire program. A plateau usually occurs towards the end of reconditioning so the therapist must assist the patient in coming to grips with this. Thus, it is important to have a time lapse between progress monitoring periods. If monitoring occurs every day, then the patient is not likely to see much change, but if monitoring occurs once a week, more progress should be observed (Fisher, Scriber, et al., 1993).

A good monitoring tool is a notebook or a chart. Keeping records of one's activities may also serve as a cue to remembering to perform them, especially if they are posted in a visible place (Knapp, 1988), or carried with the patient (Hackman, Kutra, & Geertsen, 1992). It also allows the patient to become more involved in his/her care (Southam & Dunbar, 1986). Exercise has been reported to increase for those who simply self-monitored their exercise (Knapp, 1988). This strategy should be effective for therapeutic exercise, as well. The act of obtaining simple

feedback and observing the amount of exercise performed can serve as reinforcement for the patient. When charts are posted, favorable attention from others serves as reinforcement, as well (Knapp, 1988).

Daily self-monitoring was the intervention chosen for this study. A monitoring chart is a simple tool for athletic therapists to give to a patient and requires little time consumption on the part of the therapist. As well, the cost is inexpensive. If the therapist cannot afford to photocopy record keeping charts, patients can be instructed to formulate their own. Patients were allowed to set small goals, through listing the prescribed method of performing the exercise as a "target" behaviour. They were also asked to monitor their pain in hopes that they would observe progress. As well they were asked to return a completed log sheet to the researcher in order to create a small amount of supervision. They were not asked to return the log sheet to the therapist because this might bias the way in which they completed the log sheet. A multifaceted approach has been suggested to enhance adherence (Fisher, 1990). The intervention used for this study was kept simplistic because it would be difficult to assess which part of the intervention was effective, if an in depth multifaceted approach was utilized (Robison & Rogers, 1994). Thus, the intervention for this study remained simple, and perhaps further studies can provide additions for this intervention.

FACTORS SUITABLE FOR PREDICTION OF ADHERENCE

In addition to determining which variables affect adherence, some researchers have tried to predict adherence. However, this is difficult. Though there are many related variables, the literature supports the view that neither global personality nor demographic variables are useful predictors of adherence behaviour (Fisher, 1990). Variables that have been suggested as predictors of adherence include: self-efficacy or belief in oneself (Fisher & Hoisington, 1993), self-motivation (Martin & Dubbert, 1982), perceived social support, and belief in the efficacy of

treatment (Duda, et al., 1989). Personal control was also suggested to predict protocol completion (Duda, et al., 1989).

Social support appears to be one of the more important predictors. In fact, it was a significant predictor of adherence for patients with diabetes. However, a single item measure of the number of significant others did not predict adherence, suggesting that it is the quality of the relationship that is important to the patient, rather than the quantity of supports (Sherbourne, Hays, Ordway, Di Matteo, & Kravitz, 1992). Though some predictors appear more important than others, it is obvious that no single predictor of adherence can be found. As patients are individuals and hold different personal characteristics, this does not seem unreasonable.

It is doubtful that only one characteristic will differentiate between adherents and non-adherents. Determining dropouts and adherents is difficult, which may be the reason early attempts have not been extremely successful (Dishman, et al., 1980).

SUMMARY

An in-depth examination of variables affecting adherence to sport injury reconditioning has been completed. Such variables included: injured patient characteristics, conditions surrounding the reconditioning program, and therapist-patient interactions. This review determined that numerous variables affect adherence. It is unlikely that only one variable can determine whether or not adherence will occur. Also, patients portray individual characteristics and are affected by different variables. Thus, it can be concluded that an interaction of many variables affects adherence to reconditioning programs. No single factor will predict adherence conclusively and it is difficult to determine between dropouts and those who will adhere.

Literature regarding reconditioning adherence has a number of shortcomings. For instance, measures of adherence have been based on self-report, attendance at the clinic and participation in therapy. Thus, there is little information available regarding unsupervised adherence to prescribed "take-home" exercises. Few studies were found examining adherence

to unsupervised therapeutic exercise (Taylor and May, 1996; Alkeminders and Alkeminders, 1994). Most of the subjects were competitive athletes as opposed to recreational athletes. As well, few specific interventions or methods of promoting adherence have been measured in an athletic therapy or injury reconditioning setting. There are few articles assessing the success of suggested interventions (Posavac, Sinacore, Brotherton, Helford, & Turpin, 1985; Bassett & Petrie, 1999). Literature related to injury reconditioning has been based on variables affecting adherence and suggestions to enhance it. As a result, numerous problems are available for future research.

CHAPTER 3

METHODOLOGY

Overview of the Study

In order to explore the effects of daily record keeping on adherence to a prescribed personalized therapeutic home exercise program, two groups of subjects were chosen to be tested: an experimental group and a control group. Once subjects were selected and randomly placed into one of the two groups, personal information was obtained from each subject (i.e. name, address, age, previous injury history).

Ten days into each subject's therapy program, he/she was given a Therapeutic Exercise Adherence Questionnaire in order to obtain a measure of adherence. Following this, those in the experimental group received a daily log sheet to record the exercises that they performed. They used the daily log sheet for four weeks. The control group received no intervention. Following the four-week period, both groups were again given the Therapeutic Exercise Adherence Questionnaire.

As well, subjects in both groups received a list of variables that may have affected adherence and subjects were asked to rate these variables on a scale of 1 to 6 (1= low effect, 6= large effect). The Adherence Questionnaire was statistically analyzed to determine if there was a difference in adherence patterns between the control group and the experimental group.

All subjects were interviewed following the four-week period and questioned regarding adherence habits, changes in adherence, and factors affecting adherence. Athletic therapists who treated the subjects were interviewed and asked to assess whether or not he/she felt the subject adhered to the prescribed therapeutic home exercise program.

Finally, the researcher obtained a record of the number of visits each subject made to the therapist.

Subjects

Over a period of approximately 18 months, 41 recreational athletes were recruited from five athletic therapy centres in Winnipeg, Manitoba (University of Manitoba Athletic Therapy Centre: 32 subjects, Sport Tec Athletic Therapy Centre: 1 subject, University of Winnipeg Athletic Therapy Centre: 5 subjects, Kilcona Athletic Therapy Centre: 2 subjects, Pan Am Reconditioning Centre: 1 subject). Nine Certified Athletic Therapists were approached and asked to grant permission to obtain subjects from their clinics (See Appendix A for letter). Four athletic therapists were from the University of Manitoba Athletic Therapy Centre, two were from the Kilcona Athletic Therapy Centre, and one athletic therapist came from each of the remaining clinics. An unsuccessful attempt was made to have an equal number of males and females in the study. Subjects ranged in age from 18 to 44. The mean age was 29.61 years.

The selection criteria included subjects entering athletic therapy with an injury requiring at least three weeks of therapy. Only subjects participating in a recreational sport were included. Those participating in an intercollegiate sport, or at a national or provincial level were not included. The subjects did not participate in practices or games more than five times per week. Also, if the subject or his/her team had a "Therapist" or "Trainer" attending practices on a regular basis, the subject was not to be in contact with the "Therapist" or "Trainer" more than twice a week. Each participant was required to have a prescribed personalized therapeutic home exercise program.

Upon selection for the study, each subject was randomly placed into a control group or experimental group. Pieces of paper numbered from 1 to 41 were placed in an envelope and the researcher picked a number out of the envelope. If an odd number was selected, the subject was in the experimental group; if an even number was selected, the subject was in the control group.

All subjects gave informed consent prior to participating in the study. Those in the control group received a consent form that did not include any information regarding the intervention in the study (Appendix B). Those in the experimental group received a consent form explaining all aspects of the study (Appendix C). Both consent forms were developed following an example in

Thomas & Nelson (1996).

Three subjects were dropped from the study due to improper completion of the instruments. Thus, data were collected from 38 subjects (23 males, 15 females). Of these subjects, five (3 males, 2 females) did not see an athletic therapist for the required three weeks. Data collected from these subjects were not included in the analysis of the Adherence Questionnaire or the Variable Rating Sheet. However, as some of the information collected in the interview was interesting, they remained in a separate grouping. As a result, all data collected from 33 subjects were utilized, and only some data used from five subjects.

After subjects were dropped or regrouped, there remained 18 subjects in the control group (m=11, f=7) ranging in age from 18 to 39 (mean = 28). There were 15 (m=9, f=6) subjects ranging in age from 23 to 41 (mean = 32) in the experimental group. Each subject participated in at least one recreational sport and twenty-seven different sports were noted (ie. basketball, volleyball, hockey, baseball, curling).

Demographic and Injury Characteristics of Subjects

Subject characteristics were obtained. Table 1 includes a summary of these characteristics.

Table 1 Demographic and Injury Characteristics for Subjects

	<u>Control Group</u>	<u>Experimental Group</u>	<u>Total</u>
<u>Type of Injury*</u>			
Lower Limb	7	7	14
Upper Limb	5	4	9
Neck and Trunk	6	3	9
<u>Occupation**</u>			
Student	6	2	8
Employed	7	11	18
Student and Employed	3	2	5
<u>Payment for Services***</u>			
Insurance Coverage	14	11	25
Paid Out of Pocket	1	2	3

* One person from the experimental group did not include his/her injury on the background information sheet.

** Data were missing from two control group subjects.

****Data were missing from three control group subjects and two experimental group subjects.

Instruments

Therapeutic Exercise Adherence Questionnaire

This adherence measurement instrument constructed by the author consisted of several questions regarding patient adherence behavior (Appendix D). The questions occurred in two sections, with a number of questions in each section. An outline of question topics appears below:

A) Stretching Exercises

- Frequency
- Time to Hold Stretches
- Repetitions

▪ B) Strengthening Exercises

- Frequency
- Repetitions

The subject responded to each question on a Likert scale of 1 to 6. Following each question, if the subject did not have full adherence, an explanation was requested. At the end of the questionnaire the subject was asked to give his/her "Overall Perception" on adherence using the Likert Scale. Measures were obtained at the beginning and end of four weeks and compared in the data analysis. Below is a sample question:

1) Consider the number of days per week prescribed to perform your stretching exercises. **How many** of the prescribed days per week do you usually perform your stretching exercises?

1	2	3	4	5	6
none	less than half prescribed	half	more than half prescribed	almost all	all prescribed

If you did not perform your stretches all of the prescribed days per week, please explain why.

This instrument was pilot tested by athletic therapy patients and it was also tested for reliability through a test-retest method. The pilot subjects completed the instrument initially and again two days later, which resulted in similar answers. This instrument had face validity demonstrated through the pilot testing.

Daily Log Sheet

The experimental group completed a daily log sheet (Appendix E). They recorded the manner in which each exercise was prescribed (target) and the actual manner in which it was performed (i.e. number of repetitions, number of sets, or amount of time a stretch was held).

This instrument also asked the subject to rate on a scale of 0 to 10 how the injury felt that day during exercising (0 = very poorly, 10 = 100%). At the end of the week, the subject summed the rating scores and divided them by the number of scores recorded, in order to come up with an average score for the week. This allowed the patient to observe progress of the injury throughout the four weeks. The log sheet also allowed the patient to observe his/her completion of the exercises and perhaps, feel pride in their completion. The patient was encouraged to carry the sheets to work or school in order to serve as a reminder to perform the exercises.

This instrument was also pilot tested by athletic therapy patients. Those pilot testing the above instruments were asked to examine the instruments and to complete them. They were also asked to provide feedback regarding the appearance, wording, and effectiveness of the instruments. Very few changes had to be made.

Variable Rating Sheet

Each patient in both groups was asked to rate a number of variables that might affect his/her adherence. Each variable was rated on a scale of 1 to 6 (from no effect to large effect) regarding the importance of each variable to the patient's adherence (Appendix F).

Variables included:

- support from significant others
- interaction with the athletic therapist
- respect for the athletic therapist
- goal setting
- patient knowledge of the injury and therapy
- filling out a daily log sheet
- self-motivation
- patient beliefs about the importance of therapy
- others

These variables were selected from the literature review. The Variable Rating Sheet was included in order to determine the effect and importance of completing a daily log sheet, following the four-week intervention. The rating of other variables was included so subjects would not know that they were directly being questioned about the log sheet and respond honestly. Using the variable-rating sheet, the researcher could observe any difference in the perceived importance of the daily log sheet between the experimental and control groups. This instrument was pilot tested by athletic therapy patients.

Procedures

Once a subject was selected and placed into the control or experimental group, information about the subject was collected (Appendix G). Information included:

- name and age
- address and phone number
- sex
- the nature of the injury
- previous injury and therapy history
- employment status

- the sport(s) played

Ten days into athletic therapy, each patient met with the researcher and was measured on adherence to his/her therapeutic exercises using the Adherence Questionnaire. The patient was not measured sooner than ten days to ensure that he/she had been in therapy long enough to be prescribed exercises. Also, pain is often greater at early stages of therapy, providing additional barriers to adherence.

Those in the experimental group were given several log sheets to record the exercises performed on a daily basis. They were also asked to rate, on a scale of zero to ten, how the injured area felt while performing the exercises. The log sheet included a carbon copy. This was so that a weekly copy could be placed in a sealed envelope and returned to the clinic where the subject was receiving therapy. The researcher picked up the log sheets from the clinic. The athletic therapist was asked not to question the subject regarding the contents of the envelope. Thus, the athletic therapist did not know how the patient was responding to the daily log sheet. This was to aid in ensuring that the patient filled out the log sheet as honestly as possible without feeling that he/she must impress the athletic therapist. Following a period of four weeks, each subject was measured on adherence again.

The control group was also measured on adherence to prescribed therapeutic exercises ten days into their therapy program and four weeks following the first measurement. During the four-week period, these subjects participated in their therapy without any intervention.

After the second measure of adherence, all of the subjects were asked to complete the Variable Rating Sheet (Appendix F). As well, they were interviewed (See Appendix H for interview questions) regarding perceptions of their adherence. Reasons for adherence or non-adherence were discussed. Those participating in the experimental group also discussed the pros and cons of the daily log sheet and indicated whether or not the recording affected their adherence. During this time, subjects were informed of the group in which they participated and given the opportunity to ask questions.

Following the four weeks, the athletic therapist who treated each subject was interviewed in order to obtain his/her experienced judgment regarding whether or not he/she felt that the subject adhered to the prescribed therapeutic home exercise program. This was determined in relation to the subject's progress (See Appendix I for questions) and was carried out in an attempt to assist in validation of the adherence measurement tool. As well, at this time, a record of the number of patient visits to the therapist was obtained.

Experiment Design and Analysis

The design of the study was a pretest-posttest randomized-groups design (Thomas & Nelson, 1996). The main independent variable was the daily log sheet and the dependent variable was the subject's measure of adherence. The Adherence Questionnaire was analyzed with Nominal Logistic Regression using the JMP Start Version 3 Statistical Package. This test had the ability to determine if the log sheet significantly predicted a change in adherence. This test was used because while predicting the effect of the daily log sheet, it also controlled for other independent variables such as:

- age
- gender
- previous therapy experience
- number of therapy appointments
- score at Time 1 on the Adherence Questionnaire

The reason to control for age or gender is self-explanatory. A subject with previous therapy experience might be familiar with certain exercises or other therapy protocol, which might affect adherence. The score at Time 1 on the Adherence Questionnaire was examined to see if those who initially scored high changed adherence differently than those who initially scored low. The number of appointments might affect adherence because some subjects would see the therapist more or less than others.

Nominal Logistic Regression is commonly used to test dichotomous outcomes. Since the

researcher wanted to know if the subject either: 1) maintained/increased adherence or 2) decreased adherence, this test was suitable to predict whether these outcomes were a result of the daily log sheet. Each question on the questionnaire was analyzed separately, with the exception of questions about Strengthening Exercise Repetitions, (see Results Chapter for an explanation) in order to obtain as much information as possible. The probability of a Type I error occurring was set at .05. The open-ended comments on the questionnaire were analyzed using lists, ratings, and percentages.

A second analysis occurred on the Variable Rating Sheet, in order to determine if there were significantly different responses between the control and experimental groups. The responses were analyzed using Jmp Start Version 3 Statistical Package to perform a cross tab table and a Chi-Square analysis. A t-test was not performed because the data were considered categorical. Sall and Lehman (1996) define a categorical response as one in which the response is from a limited number of choices. The subjects only had six responses to choose from. Using this analysis it is still possible to determine if there is a significant difference between the manner in which experimental group and control group responded. The manner in which the subjects scored "Filling Out A Daily Log Sheet" was the only variable analyzed. Again the probability of a type I error occurring was set at .05.

The subject interview and therapist interview were analyzed using qualitative methods such as lists, ratings, and percentages.

CHAPTER 4

RESULTS AND DISCUSSION

Each instrument used in this study will be analyzed and discussed in separate sub-sections of this chapter. As well, further discussion is included regarding methods to address adherence issues that were discovered in the analysis. The following topics will be addressed:

- Therapeutic Exercise Adherence Questionnaire
- Interview with the Subject
- Variable Rating Sheet
- Interview with the Therapist

THERAPEUTIC EXERCISE ADHERENCE QUESTIONNAIRE

The Therapeutic Exercise Adherence Questionnaire was completed at two separate times by each subject. The first was completed ten days following the first appointment with the therapist; the second, four weeks later. Recall that the experimental group completed log sheets for their exercises during this four-week period and the control group did not. The purpose of the questionnaire was to obtain a measure of adherence to the home exercise program for each subject. The goal was to determine if each subject's adherence either: 1) maintained/increased, or 2) decreased. For the statistical analysis, maintained and increased adherence was combined, as both results were considered beneficial effects of the log sheet, and achieving either of these was the goal of the researcher. Table 2 indicates the number of subjects in each group that maintained adherence (M), increased (I), or decreased (D).

Table 2 Changes in Adherence for Each Question on the Adherence Questionnaire

Question	Experimental Group N = 15			Control Group N=18		
	<u>M</u>	<u>I</u>	<u>D</u>	<u>M</u>	<u>I</u>	<u>D</u>
<u>Stretching Exercises</u>						
▪ Frequency						
1. Days per week	6	2	7	3	5	8
2. Times per day	9	2	4	7	6	3
3. Number of stretches	8	1	6	8	2	7
▪ Time to hold Stretch	13	1	1	11	2	4
▪ Stretching Repetitions	9	3	3	7	4	6
<u>Strengthening Exercises</u>						
▪ Frequency						
1. Days per week	6	2	6	2	2	11
2. Times per day	7	1	6	7	4	4
3. Number of strengthening exercises	7	2	5	10	0	5
▪ Repetitions	6	2	5	7	2	6
▪ Overall Perception	7	0	7	7	1	8

Nominal logistic regression was utilized in order to determine if changes in adherence could be predicted by the completion of a daily log sheet. This was the main objective of the analysis. Other independent variables that might affect adherence were included in the analysis.

These variables are as follows:

- age
- gender
- previous therapy experience

- score at Time 1 on the Adherence Questionnaire
- number of appointments with the athletic therapist during the duration of his/her participation in the study.

The results from the analysis of the Adherence Questionnaire are presented and discussed as follows:

1. The nominal logistic regression analysis for each individual question is introduced and discussed.
2. The table illustrating the results of the statistical analysis is presented.
3. Reasons for not adhering are presented in the format of a table.
4. A discussion of reasons for not adhering occurs.

For the questions in the sections: Stretching Frequency and Strengthening Frequency, the presentation of the reasons for not adhering does not occur until after analysis results for each question in the section have been presented.

Stretching Frequency

Each question in this section of the Adherence Questionnaire was analyzed separately in order to obtain as much information as possible. This was because there was a lot of variation in scores. If question scores had been summed, an individual score could change but it would be difficult to determine where the change had occurred or the direction of the change.

The Number of Days per Week that Stretches Were Performed

The following table, Table 3a, indicates that 31 observations were made. In the Methodology Chapter it was noted that there were 33 subjects included in the analysis of the questionnaire. For each analysis, the occasional subject was excluded by the statistical program due to a score or question that was not completed by the subject.

For the question involving the prescribed days per week that patients were required to perform stretches (Table 3a), a significant result ($p=0.02$) was obtained on the whole model test

of the logistic regression. This indicates that when examining the ability of the independent variables, as a whole, to predict adherence, there was a significant relationship. However, this really does not give much information because when examining the results of the Wald Test for Effects, no individual parameter was significant. However, notice that the relationship between the number of appointments and adherence almost had a significant value ($p=0.09$). Recall that the prime objective of the study was to determine if the log sheet (treatment) effectively predicted the experimental group's adherence to a home exercise program when compared to the control group.

Table 3a Number of Days per Week that Stretches Were Performed

Test N = 31	Chi Square	Prob>Chi Square
• Whole Model Test	15.39	0.02*
• Wald Test for Effects		
Treatment	0.24	0.62
Initial Score	0.01	0.93
Gender	0.43	0.51
Age	0.22	0.64
Previous Therapy	0.13	0.71
Number of Appointments	2.92	0.09

(* = significance at $p<0.05$)

Times per Day that Stretches Were Performed

In Table 3b, there was no significant result of the whole model test on adherence to the times per day that stretches were to be performed, but when examining the individual parameters, the only significant variable was the number of appointments ($p = 0.04$). Through further analysis, as seen in Graph 1, it can be observed that as appointments increased, probability of adherence to the times per day to perform the stretch increased as well. The reason for this is likely due to the greater contact of the patient with the therapist. As well, when a patient is visiting the clinic more often, the exercises are performed more often, as most therapists will have the patient perform exercises during a visit and the frequency that the patient has to perform the exercises unsupervised is less, making it easier to adhere.

At this stage of the analysis, the log sheet appears unable to predict adherence. The

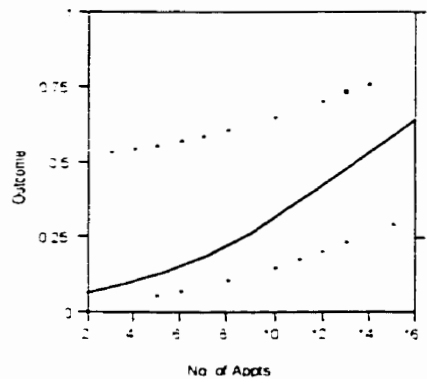
mean number of appointments in the control group was 7.3 and in the experimental Group was 8.6 so since the means are similar between groups, the number of appointments had by each subject was unlikely to affect the significance, or insignificance, of the log sheet. If the control group had seen the therapist more often than the experimental group, the effect of the log sheet might have been obscured.

Table 3b Times per Day that Stretches Were Performed

Test N = 32	Chi Square	Prob>Chi Square
▪ Whole Model Test	8.24	0.22
▪ Wald Test for Effects		
Treatment	0.03	0.87
Initial Score	2.01	0.16
Gender	0.80	0.37
Age	0.16	0.69
Previous Therapy	0.53	0.47
Number of Appointments	4.12	0.04*

(* = significance at $p < 0.05$)

Graph 1 Outcome Probabilities as Predicted By Number of Therapy Appointments



Number of Prescribed Stretches that Were Performed

As seen in Table 3c, of the 32 observations made, no significant results were indicated. Again, it appears that the log sheet did not significantly predict adherence.

Note that in Table 3c, the Chi Square analysis and probability for the subject's initial score is 0.00. This does not indicate a significant result but only that there was not enough

variance in the data to complete the test. Thus, the statistical program excluded this variable. If the raw data is examined (Appendix J) it is possible to see that the initial scores for the subjects were all above three (on the questionnaire: 4 = more than half of the prescribed exercises were performed, 5 = almost all of the prescribed exercises were performed, and 6 = all of the exercises were performed) indicating that subjects in both groups consistently performed at least more than half of the stretches when they did their exercises. In fact, most subjects scored 5 or 6.

Table 3c Number of Prescribed Stretches that were Performed

Test N = 32	Chi Square	Prob>Chi Square
▪ Whole Model Test	0.54	0.99
▪ Wald Test for Effects		
Treatment	0.01	0.91
Initial Score	0.00	0.00
Gender	0.21	0.66
Age	0.16	0.69
Previous Therapy	0.01	0.99
Number of Appointments	0.05	0.83

It should also be noticed in Tables 3a and 3b, that the number of appointments had a significant predictability or close to a significant predictability of adherence. However, in Table 3c the number of appointments was not close to having any significance (0.83). It is possible that this occurred because when one is visiting the therapist he/she is normally required to perform the prescribed exercises at the clinic, thus affecting adherence to the number of days per week that stretches were performed (Table 3a) and adherence to the times per day that stretches were performed (Table 3b). However, if the patient is not closely supervised, even at the clinic, it is easier to cheat, and not perform as many of the exercises that were prescribed. Thus, this could be the reason for the result in Table 3c (The Number of Prescribed Stretches that were Performed).

Open-Ended Comments From Subjects Explaining Incomplete Adherence to Prescribed Frequency of Stretching Exercises

After rating their adherence on the Likert scale, subjects were asked to respond to an open-ended question on why they did not adhere. Responses are given in Table 4.

Table 4 Reasons Given by Subjects for Not Adhering Fully to Prescribed Frequency of Stretching Exercises

	Control Group	Experimental Group
Time 1	<ol style="list-style-type: none"> 1. <u>Time Constraints</u>: 46% (11/24 comments) 2. <u>Inconvenient to perform exercises (ie. location)</u>: 17% (4/24 comments) 3. <u>Pain</u>: 8% (2/24 comments) 4. <u>Other</u>: 21% (5/24 comments) 	<ol style="list-style-type: none"> 1. <u>Time Constraints</u>: 31% (4/13 comments) 2. <u>Pain</u>: 23% (3/13 comments) <u>Forgetfulness</u>: 23% (3/13 comments) 3. <u>Inconvenient to perform exercises (ie. area/surface for exercising)</u>: 15% (2/13 comments) 4. <u>Other</u>: 8% (1/13 comments)
Time 2	<ol style="list-style-type: none"> 1. <u>Time Constraints</u>: 41% (12/29 comments) 2. <u>Pain</u>: 10% (3/29 comments) <u>Forgetfulness</u>: 10% (3/29 comments) <u>Unsure of Exercise Prescription</u>: 7% (3/29 comments) 3. <u>Illness</u>: 7% (2/29 comments) <u>Fatigue</u>: 7% (2/29 comments) <u>Inconvenient to perform exercises (ie. exercises require props)</u>: 7% (2/29 comments) 4. <u>Other</u>: 10% (3/29 comments) 	<ol style="list-style-type: none"> 1. <u>Time Constraints</u>: 43% (9/21 comments) 2. <u>Forgetfulness</u>: 14% (3/21 comments) <u>Pain</u>: 14% (3/21 comments) 3. <u>Decreased Motivation</u>: 9% (2/21 comments) <u>Subject felt other exercises or Activities he/she was involved in was enough</u>: 9% (2/21 comments) 4. <u>Other</u>: 9% (2/21 comments)

When examining the reasons for non-adherence to the prescribed program for stretching exercise frequency, it can be observed that for both times, both subject groups listed a lack of time to be the prime concern when trying to perform the exercises. As well, pain, forgetfulness, uncertainty about the exact exercise prescription and the inconvenience of performing the exercises appear consistently as reasons for not adhering to the stretching program. A discussion of the major responses follows.

Time Limitations and Self-Motivation

If time is a limiting factor to adherence, then this might explain the non-significant effect the log sheet seemed to have on predicting improved adherence in the experimental group. If one does not feel there is time to exercise, then there will also not be time to fill out the log sheet. However, shouldn't one's health be a priority? It seems that having a lack of time might simply be an excuse used by many of the subjects. A lack of self-motivation might be what prevented subjects from making more effort to schedule exercises into the day. Researchers have claimed that those with self-motivation have been reported to better overcome barriers to adherence (Dishman & Gettman, 1980; Fisher et al., 1988; Fisher 1990). A comparison of barriers between those who had a high intention to exercise and those who had a low intention to exercise, revealed that low intention coronary heart disease patients, pregnant women, and the general public, all claimed difficulty in time management to be a major barrier to exercise (Godin, Desharnais, Valois, Lepage, Jobin, & Bradet, 1994). This, again, shows that having less motivation to exercise may increase the perception of having difficulties in scheduling exercises.

Field, et al. (1995) have also noted that for recreational athletes, perseverance may be less than those who participate in sport competitively. However, Pease (1998) states that it is often assumed that successful, competitive athletes have high levels of self-motivation but in fact, some athletes with great ability have limited commitment to their sport and have low intrinsic motivation. Therefore, having self-motivation to overcome barriers of adherence seems to be required for both recreational and competitive athletes. In addition to addressing motivation, effective time management seems to be a necessity (Crossman, 1997).

In order to accomplish this, a therapist can meet with the patient and discuss scheduling and set specific times into which the patient can fit some stretching exercises. If a reconditioning program is to have a high priority with the patient, it must be realistic and fit into the daily schedule (Dishman & Gettman, 1980, Webborn et al., 1997). The importance of performing the exercises should be stressed and some goals should be set. By scheduling a specific time of the day to do this, forgetfulness might also be reduced. One might also expect that a log sheet would help to decrease forgetfulness and improve motivation.

Exercise Inconvenience

In the first questionnaire both the control and the experimental group mentioned inconvenience of exercise performance. In the second questionnaire the control group but not the experimental group mentioned it again. Could it be that the log sheet had some sort of effect on motivating the experimental group subjects to overcome the barrier of inconvenience?

While assisting the patient in scheduling, modifying the exercises so they are not inconvenient to perform and may be performed in any space, would be beneficial. For example, if a stretch requires a prop that is used at the clinic, the therapist can suggest a tool that is found at home and equivalent to the prop. Also, showing the patient how to perform different stretches in different environments (ie. the office) could be beneficial.

Uncertainty About Exercise Prescription

Comments made in the second questionnaire by subjects in the control group, regarding uncertainty about exercise prescription, are of concern. This may be a result of forgetfulness, (which was also a reason for non-adherence) or a lack of understanding of the therapist's instructions. Recall from the literature review, that it has been reported that only 63% of information given to a patient is recalled (Ice, 1985). It is important for the therapist to ensure that the patient understands the prescription in order for adherence to occur. A more complex program, or information overload, is likely to decrease recall of the program (Ice, 1985; Caplan, et al., 1980). As well, the patient needs to communicate to the therapist what exercises he/she is doing so that the therapist can confirm with the patient whether or not enough is being done. Asking the patient to repeat the exercise prescription ensures that the patient understands what is to be performed (Fisher, Scriber, et al., 1993; Meichenbaum & Turk, 1987).

It is important to notice that those with uncertainty about exercise prescription were those in the control group. By completing the log sheets, the subjects in the experimental group were outlining their exercises on paper, and if not sure about prescription, might have been motivated to confirm with the therapist in order to complete the log sheet. Therefore, experimental group subjects may have not had the same uncertainty that the control group subjects had.

Pain

The fact that pain was often reported to be a barrier to adherence is in agreement with a study conducted by Sluijs, et al., (1993) who found that physical therapy patients reported similarly. To overcome this the patient can be taught pain control techniques and educated about expected pain levels. It is important for the patient to understand the difference between "good" pain and "detrimental" pain (Byerly, et al., 1994). For example, when stretching, one might feel a muscle stretch type of pain but not necessarily the pain of the injury, or acute inflammation. A second example would occur if performing strength exercises. Often, muscle fatigue should be felt. However, this might not be a contraindication to exercise, whereas feeling pain from the injury might be. The patient is often instructed not to perform an exercise if it is causing a certain type of pain (ie. detrimental pain). This would mean that many subjects, by not performing the exercises, might have actually been adhering to instructions given by the therapist, even though they did not realize that they were doing so. Further study might examine the type of pain felt by subjects in relation to adherence.

An in depth discussion of methods to address the above barriers to adherence will occur in Chapter 5.

Time Prescribed to Hold Stretching Exercises

Out of 32 observations, no significant results were indicated when examining adherence to the time prescribed to hold a stretch (Table 5). Specifically, the log sheet did not significantly predict adherence.

Table 5 Time Prescribed to Hold Stretches

Test N = 32	Chi Square	Prob>Chi Square
• Whole Model Test	1.51	0.96
▪ Wald Test for Effects		
Treatment	0.34	0.56
Initial Score	0.01	0.96
Gender	0.20	0.65
Age	0.03	0.87
Previous Therapy	0.01	0.95
Number of Appointments	0.41	0.52

Open-Ended Comments From Subjects Explaining Incomplete Adherence to Prescribed Time to Hold Stretches

Table 6 Reasons Given by Subjects for Not Adhering Fully to the Prescribed Time to Hold Stretches

	Control Group	Experimental Group
Time 1	<ol style="list-style-type: none"> 1. <u>Pain</u>: 67% (2/3 comments) 2. <u>Subject counted too quickly</u>: 33% (1/3 comments) 	<ol style="list-style-type: none"> 1. <u>Subject unsure of exercise prescription</u>: 67% (2/3 comments) 2. <u>Pain</u>: 33% (1/3 comments)
Time 2	<ol style="list-style-type: none"> 1. <u>Time Constraints</u>: 50% (1/2 comments) <u>Illness</u>: 50% (1/2 comments) 	<ol style="list-style-type: none"> 1. <u>Pain</u>: 50% (1/2 comments) <u>Boredom</u>: 50% (1/2 comments)

Again, no obvious differences appeared between the control group and experimental group in the types of comments made.

Pain and Exercise Technique

Even though there appeared to be no differences between groups, an examination of the comments made demonstrates that incorrect performance of the stretches may be the key to explaining some of the above comments. For example, a certain type of pain should not occur if a stretch is performed correctly. Again, education in regards to the type of pain to be expected appears important here. Counting too quickly or uncertainty about the prescription also indicates the possibility of improper stretching technique. To rectify this situation, a therapist can demonstrate the correct technique, ask the patient to show him/her the technique upon the initial demonstration as well as on return visits to the clinic (Faris, 1986). Monitoring the patient's technique appears important here. The log sheet does not address this concern, but perhaps could do so if there were space for key reminders involving stretching technique.

Boredom

To reduce boredom, communication with the subject is important to determine the cause of the boredom. Modifying the exercise or prescribing a different exercise that gets the same

results might prevent boredom.

The number of comments actually made in each group (range from 2 to 3 - see Table 4) also indicates that subjects seemed to feel that adherence to the amount of time prescribed to hold stretches actually occurred. This is because subjects were only asked to comment if they did not fully adhere to the program. A quick glance at the raw data (Appendix K) confirms this. The scores were mostly 5 or 6 which indicates that most subjects claimed to hold stretches "almost all" or "all of the time prescribed".

Stretching Repetitions

Table 7 shows no statistical significance for the Whole Model Test or the Wald Test for Effects, from the 32 observations. The Chi Square and Probability scores of 0.00 for the "Initial Score" variable resulted because this variable was excluded from the Wald Test for Effects due to a lack of variance in the raw data. Examination of the raw data (Appendix L) indicates that none of the initial scores were three or below (mostly 5's and 6's = "almost all" or "all of the prescribed repetitions") which may indicate that athletic therapy patients did not have trouble adhering to stretching repetitions in the first place.

Table 7 Repetitions Prescribed for Stretches

Test N = 32	Chi Square	Prob>Chi Square
• Whole Model Test	1.64	0.91
• Wald Test for Effects		
Treatment	0.54	0.46
Initial Score	0.00	0.00
Gender	0.40	0.53
Age	0.08	0.78
Previous Therapy	0.37	0.54
Number of Appointments	0.01	0.98

Open-Ended Comments From Subjects Explaining Incomplete Adherence to Prescribed Stretching Repetitions

Table 8 Reasons Given by Subjects for Not Adhering Fully to Stretching Repetitions

	Control Group	Experimental Group
Time 1	<ol style="list-style-type: none"> <u>Time Constraints</u>: 60% (3/5 comments) <u>Pain</u>: 20% (1/5 comments) <u>Fatigue</u>: 20% (1/5 comments) 	<ol style="list-style-type: none"> <u>Time Constraints</u>: 67% (2/3 comments) <u>Pain</u>: 33% (1/3 comments)
Time 2	<ol style="list-style-type: none"> <u>Time Constraints</u>: 33% (2/6 comments) <u>Pain</u>: 17% (1/6 comments) <u>Subject feels stretched enough</u>: 17% (1/6 comments) <u>Illness</u>: 17% (1/6 comments) <u>Subject did not like the exercise</u>: 17% (1/6 comments) 	<ol style="list-style-type: none"> <u>Time Constraints</u>: 50% (1/2 comments) <u>Pain</u>: 50% (1/2 comments)

No obvious differences were noted between the two groups but some interesting comments were made as follows:

Time Constraints

According to Table 8, time, or lack of, was the major factor in non-adherence for both the control and experimental groups. There was no difference in this result when examining comments for both Time 1 and Time 2, indicating that perhaps subjects were neglecting to perform all of the repetitions in order to fit the stretches into a limited slot of time .

Pain

The fact that pain was often mentioned could indicate that stretching exercises were not being performed correctly, or that subjects were unfamiliar with the type of pain to be expected. By not performing exercises, subjects might actually have been adhering to the therapist's directions without realizing it because in most cases, a therapist will tell the patient not to perform a stretch if there is pain.

Communication

Some interesting comments included those indicating that one subject often felt he/she had stretched enough and another who did not like the exercises. These comments stress the importance of two-way communication between the therapist and the patient. Pease (1998) noted that it is often assumed that the athlete already knows the reason for the exercise prescription, which may not be true. The patient needs to understand the importance of performing the exercises prescribed by the therapist but also needs to feel comfortable in expressing his/her needs or concerns in regard to the specific exercises that were prescribed. Both parties need to listen to what the other has to say (Fisher, Scriber, et al., 1993). Those who provide social support, such as family, or the therapist, during the recovery phase of an injury are partly responsible for educating the athlete (Pease, 1998).

The Log Sheet

Space was provided on the log sheet to record the target number of stretch repetitions prescribed, but it appears that setting this small goal on the log sheet may not have been enough for some subjects to overcome some of the other factors that subjects claimed prevented them from adhering to their programs. However, more importantly, there were not that many comments made by the subjects (2 to 6) in both groups, confirming results from Table 5 that adherence was fairly high to begin with, as they were only asked to comment if not fully adherent.

Strengthening Exercise Frequency

Number of Days per Week that Strength Exercises Were Performed

As seen in Table 9a, of the 29 observations tested, none of the examined variables significantly predicted adherence.

Table 9a Number of Days per Week that Strength Exercises Were Performed

Test N = 29	Chi Square	Prob>Chi Square
• Whole Model Test	5.31	0.51
• Wald Test for Effects		
Treatment	1.69	0.19
Initial Score	1.36	0.24
Gender	0.01	0.92
Age	0.11	0.75
Previous Therapy	0.12	0.73
Number of Appointments	0.94	0.33

Times per Day that Strength Exercises Were Performed

Of the 29 observations tested in Table 9b, the Whole Model Test did not reveal a significant result. When looking at the individual effect of each variable (Wald Test for Effects), it seems possible that there was an influence of having had experience with therapy prior to the study. Even though the result of the Chi Square test was not significant, it was relatively close ($p = 0.06$). In order to determine how the influence of previous therapy might predict adherence, Graph 2 and Table 9c can be examined. In this case, considerably more subjects maintained/increased ($n=19$) in adherence to the times per day that strength exercises were supposed to be performed, as compared to those who decreased ($n=19$). Of the subjects that increased, 68% were those who had previous therapy. Of the subjects that decreased, only 20% had previous therapy. This supports the Wald Test for Effects which was close to significant ($p=0.06$).

In consideration of the log sheet and its non-significance, the Experimental group included nine subjects who had previous therapy and six subjects who did not. The Control group included only six subjects who had previous therapy and 10 subjects who did not. Therefore, as having previous therapy appeared to predict better adherence, and the experimental group had more people with previous therapy experience, one would expect that if the log sheet had the ability to predict better adherence, then the previous therapy experience might have contributed to this result. However, since no significant probability resulted for the log sheet, it can be assumed that completing the log sheet truly did not affect the ability to predict adherence to the

times per day that strength exercises were to be performed.

Table 9b Times per Day that Strength Exercises were Performed

Test N = 29	Chi Square	Prob>Chi Square
• Whole Model Test	10.27	0.11
• Wald Test for Effects		
Treatment	0.24	0.62
Initial Score	0.01	0.94
Gender	0.01	0.94
Age	0.33	0.56
Previous Therapy	3.47	0.06
Number of Appointments	0.59	0.44

(* = significance at $p < 0.05$)

Graph 2 Outcome Probabilities as Predicted by Having Had Therapy Previously

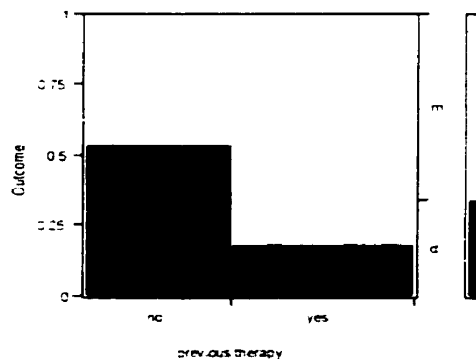


Table 9c Cross Tabs of Adherence Change by Previous Therapy

Previous Therapy	Adherence Change		Total
	d	m	
No	8	6	14
Yes	2	13	15
Total	10	19	29

d = decreased m = maintained/increased

Number of Prescribed Strength Exercises Performed

As seen in Table 9d there was no statistical significance in the Whole Model Test or the Wald Test for Effects. Neither the log sheet nor any of the other tested variables significantly

predicted adherence to performing the number of strength exercises prescribed. Again, no variance occurred in the initial score, indicating scores of 3 or above (Appendix M).

Table 9d Number of Prescribed Strength Exercises Performed

Test N = 29	Chi Square	Prob>Chi Square
▪ Whole Model Test	2.67	0.75
• Wald Test for Effects		
Treatment	0.15	0.69
Initial Score	0.00	0.00
Gender	2.09	0.15
Age	0.19	0.66
Previous Therapy	0.01	0.95
Number of Appointments	0.04	0.83

Open-Ended Comments From Subjects Explaining Incomplete Adherence to Prescribed Frequency of Strength Exercises

Table 10 Reasons Given by Subjects for Not Adhering Fully to Prescribed Frequency of Strength Exercises

	Control Group	Experimental Group
Time 1	<ol style="list-style-type: none"> <u>Time Constraints</u>: 50% (10/20 comments) <u>Forgetfulness</u>: 10% (2/20 comments) <u>Fatigue</u>: 10% (2/20 comments) <u>Inconvenience (ie. unavailable Equipment, location)</u>: 10% (2/20 Comments) <u>Other</u>: 20% (4/20 comments) 	<ol style="list-style-type: none"> <u>Time Constraints</u>: 67% (2/3 comments) <u>Forgetfulness</u>: 20% (2/10 comments) <u>Other</u>: 50% (5/10 comments)
Time 2	<ol style="list-style-type: none"> <u>Time Constraints</u>: 37% (10/27 comments) <u>Pain</u>: 15% (4/27 comments) <u>Inconvenience</u>: 11% (3/27 comments) <u>Illness</u>: 11% (3/27 comments) <u>Fatigue</u>: 11% (3/27 comments) <u>Other</u>: 15% (4/27 comments) 	<ol style="list-style-type: none"> <u>Time Constraints</u>: 42% (8/19 comments) <u>Inconvenience (ie. access to equipment)</u>: 21% (4/19 comments) <u>Subject did work related or sports related exercise instead</u>: 11% (2/19 comments) <u>Other</u>: 26% (5/19 comments)

Time

Lack of time, again, is a major consideration for all subjects who did not adhere fully to the prescribed frequency of strength exercises (Table 10). Obviously, this is an important issue that needs to be addressed.

Differences Between Time 1 and Time 2

At Time 1, forgetfulness is rated the number two reason for non-adherence. However it is not even rated at Time 2. This occurrence cannot be related to the completion of the log sheets as it occurs for both the control and experimental groups.

At Time 2, a variety of comments were made similar to questions examined previously. Pain again is a factor, but only a response made by members of the control group. Some subjects in the experimental group reported that they were actually substituting other exercises for the prescribed program. Though, this was not was prescribed by the therapist, it was at least exercise, as compared to the control group, that again claimed, illness, fatigue, or inconvenience as reasons for not adhering fully to the prescribed frequency for performance of strength exercises.

Repetitions Prescribed for Strength Exercises

Two questions measured adherence to Repetitions Prescribed for Strength Exercises. The scores on the two questions were summed to arrive with a total score for this section. This occurred because there was little variation in the manner that subjects answered both questions. Any change that occurred tended to be in both questions of the section so even if the scores were summed, there was still a good indication of the type of change. The raw data in Appendix N demonstrate this.

As seen in Table 11, there were no significant results in the Whole Model Test or the Wald Test for Effects. Even though the log sheet provided a section for the subject to record the target number of repetitions so he/she would be able to see what exactly was prescribed, there seemed to be no prediction of adherence. There was no variance in the initial score of the

subjects. All scores were above "half of the repetitions prescribed" (Appendix O) indicating that adherence to strength exercise repetitions was not necessarily a challenge for the subjects. However, the relationship between previous therapy experience and adherence to Strength Repetitions is close to significant. Through further analysis (Graph 3), it can be observed that of those who increased in adherence, 71% had previous therapy. Of those who decreased, only 36% had previous therapy. Thus, there does seem to be a relationship between previous therapy and adherence, even though this is not significant. Those who have had past experience with therapy seemed to adhere better. More people had previous therapy in the experimental group (n = 9) than in the control group (n = 6). However, the effect of the log sheet remained insignificant. Thus, having had previous therapy had no effect on the treatment results.

Table 11 Repetition Prescribed for Strength Exercises

Test	Chi Square	Prob>Chi Square
N = 28		
▪ Whole Model Test	7.64	0.18
▪ Wald Test for Effects		
Treatment	0.13	0.73
Initial Score	0.00	0.00
Gender	1.53	0.21
Age	0.17	0.68
Previous Therapy	3.64	0.06
Number of Appointments	2.77	0.10

Graph 3 Outcome as Predicted By Previous Therapy

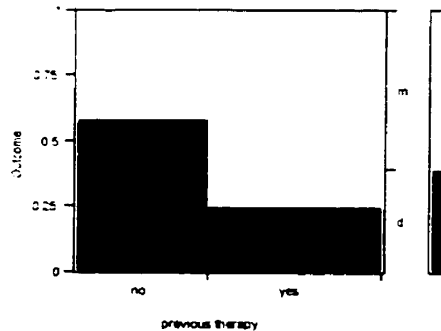


Table 11a Cross Tabs of Adherence Change by Previous Therapy

Previous Therapy	Adherence Change		Total
	d	m	
No	7	5	12
Yes	4	12	16
Total	11	17	28

d = decreased m = maintained/increased

Open-Ended Comments From Subjects Explaining Incomplete Adherence to Prescribed Strength Repetitions

Table 12 Reasons Given by Subjects for Not Adhering Fully to Prescribed Strength Repetitions

	Control Group	Experimental Group
Time 1	<ol style="list-style-type: none"> <u>Pain</u>: 67% (2/3 comments) <u>Time Constraints</u>: 33% (1/3 comments) 	<ol style="list-style-type: none"> <u>Pain</u>: 40% (2/5 comments) <u>Time Constraints</u>: 20% (1/5 comments) <u>Forgetfulness</u>: 20% (1/5 comments) <u>Difficulty of Exercises</u>: 20% (1/5 comments)
Time 2	<ol style="list-style-type: none"> <u>Pain</u>: 30% (3/10 comments) <u>Time Constraints</u>: 20% (2/10 comments) <u>Other</u>: 50% (5/10 comments) 	<ol style="list-style-type: none"> <u>Time Constraints</u>: 40% (2/5 comments) <u>Pain</u>: 40% (2/5 comments) <u>Boredom</u>: 20% (1/5 comments)

Differences Between Time 1 and Time 2

Note the variation in comments made about non-adherence to strength repetitions in Table 12. At Time 1, comments about pain occurred more often than comments about time. However, time was still the second most popular comment.

Again, it is important to notice that few comments were actually made, in the first questionnaire, about non-adherence. As the question only asks the subject to comment if full adherence did not occur, the low number of comments made would imply that adherence was actually fairly good for both groups, confirming results in Table 9c.

Upon examination of the comments made at Time 2, it is noticed that the total number of comments made for the control group increased, indicating a possible drop in adherence. In the experimental group, the number of comments remained the same. When comparing comments of the control and experimental group, it is noticed that the nature of the comments made by both groups stayed the same (ie. pain, time, inconvenience, etc.). However, at Time 2, a member of the experimental group commented that boredom prevented him/her from adhering fully to the prescribed program. Even though the log sheets accommodate for a change in exercise prescription, it obviously is important for the therapist to address this issue. Perhaps changing the exercises or changing a selected goal may reduce boredom. Again, emphasis is on the importance of two-way communication between the therapist and the patient, as the patient needs to communicate to the therapist that boredom is occurring and the therapist needs to respond to this concern.

Subject's Overall Perception of Adherence

Finally, the subject's overall perception of adherence was tested and no factors were found to significantly predict adherence (Table 13). For this question, subjects were not asked to make comments to explain their lack of adherence.

Table 13 Subject's Overall Perception of Adherence

Test N = 30	Chi Square	Prob>Chi Square
• Whole Model Test	4.44	0.62
▪ Wald Test for Effects		
Treatment	0.01	0.97
Initial Score	0.01	0.92
Gender	0.11	0.74
Age	0.94	0.33
Previous Therapy	0.46	0.51
Number of Appointments	0.13	0.72

Summary of Adherence Questionnaire Analysis

1) Log Sheet

Using the Nominal Logistic Regression analysis, the log sheet did not significantly predict adherence. However, the open-ended comments from people in the experimental group sometimes differed from those who did not complete log sheets. For example, in the section on Stretching Frequency, the experimental group less often reported that uncertainty of the exercise prescription and exercise inconvenience were barriers to adherence. In the section on Strengthening Frequency, the experimental group less often reported pain to be a deterrent for adherence. As well, those in the experimental group reported doing some type of exercise, even if it was not the prescribed exercise, as compared to the control group. The log sheet may have had some influence over those in the experimental group when it came to performing the therapeutic exercise program. The log sheet allowed the subject to outline the prescribed exercises, making them clear to the subject. As well, the log sheet may have provided extra motivation to overcome the barrier of exercise inconvenience. Pain may have been reported less, perhaps because some sort of exercise was being done, thus positively influencing the patient's health.

2) Other Results from the Nominal Logistic Regression Analysis

In summary, significant results arising from the Nominal Logistic Regression analysis of the Adherence Questionnaire were:

- a significant effect of all of the independent variables as a whole on the Number of Days per Week that Stretches were performed, as indicated in the Whole Model Test. However, no individual variable was discovered.
- a positive relationship between the number of therapy appointments and better adherence to the Times per Day that Stretching Exercises were prescribed to be performed.

It is likely that having more appointments with the therapist increased one's chance for adherence because the patient had greater contact with the therapist. Also, exercises are usually

performed during visits to the clinic and thus, the patient probably had less days and times per day that the exercises had to be performed unsupervised, making it easier to adhere.

Values close to significance ($p = 0.06$) were found for:

- the effect of Previous Therapy on the Times per Day that Strength Exercises were performed.
- the effect of Previous Therapy on Repetitions Prescribed for the Strength Exercises.

Even though having previous therapy experience did not affect the frequency that exercises were performed, it did seem to affect the manner in which the exercises were performed, in terms of repetition for each exercise and times performed during the day. It is possible that having familiarity with the method of performing some exercises assists in performing them as prescribed.

3) Adherence

Adherence was initially good in the following areas:

- the number of prescribed stretches performed
- the time prescribed to hold the stretches
- repetition of stretches
- the number of prescribed strength exercises performed
- the repetition of strength exercises

The subjects scored 4 (more than half prescribed) or more on each of the above questions. In fact, most subjects scored either 5 or 6 (almost all, all prescribed) indicating high adherence to the prescribed method of performing the exercises. This explains the large number of insignificant results found in the analysis of the Adherence Questionnaire, because since both groups were consistently good at these aspects of adherence throughout the entire study, there was no difference between group performance. Thus, there was no need to improve these aspects of adherence via a log sheet or otherwise. If the log sheet did have a small effect on the experimental group, it would be difficult to observe any change. However, there are still some aspects of adherence that need to be addressed.

4) Explanations for Non-Adherence

Upon examination of the explanations given by subjects for not fully adhering to different aspects of adherence, it is obvious that time restrictions were a large deterrent to adherence in all areas. This may be related to having decreased self-motivation. Thus, it is imperative that the patient realizes the importance of performing the exercises as prescribed and prioritizes the exercises differently. The therapist can assist the patient by fully educating him/her about reasons for performing the exercises as well as helping to schedule times during the day in which to perform the exercises. The therapist must also be aware that the patient may not have as much motivation to complete the exercises as the therapist would like.

5) Communication

Two - way communication appears to be of extreme importance when considering adherence. For example, many subjects complained of pain as being an adherence deterrent. Thus, giving the patients pain expectations and pain management skills should be of benefit. As well, ensuring the correct exercise technique might decrease pain if improper technique was the cause of the pain. Ensuring patient understanding of the exercise prescription is also important in preventing confusion for the patient. A study conducted by Webborn, Carbon and Miller (1997), examined injured athletes' perceptions of understanding their exercise prescription. They found that only five out of 22 patients understood all of the instructions that they were given and four out of five misunderstood a component of their exercise prescription. Patients especially misunderstood the frequency that exercises were to be performed, and the repetitions prescribed. Six of the patients were not told by the therapist the number of repetitions or frequency of required exercises. All of the patients believed that they had understood the prescription correctly, even though 77% actually did not. Only three subjects received written instructions from the therapist and those three also understood their program correctly. All of the patients were questioned about their exercises only minutes after the prescription. Imagine what they would remember weeks later! The above study indicates how important it is to clearly prescribe exercises and reinforce understanding of them. The patient also must take the responsibility to question the therapist if there is a lack of understanding. Asking the patient to outline the

exercises to the therapist and to demonstrate them might be a good way to ensure patient understanding of the program.

Boredom might also be prevented through good communication techniques. The therapist must ensure that the patient feels comfortable in communicating concerns about the exercises prescribed. As well, the patient must commit to expressing concerns to the therapist. Then the therapist can attempt to make modifications to the exercises in order to suit the patients' needs both physically and mentally. By ensuring good communication between the therapist and patient, many of the patients' individual needs can be met and better adherence might occur.

The following examination of the Interview with Subjects will further investigate the effect of a log sheet on therapeutic exercise adherence.

THE INTERVIEW WITH SUBJECTS

Following the four-week period from the initiation of the study and the completion of the follow-up Adherence Questionnaire, each subject was interviewed. Questions were the same for both groups with the exception of two additional questions asked of the experimental group regarding the log sheets. The format of this section will be:

1. Presentation of the question
2. Subjects' responses
3. Discussion about the responses

Extent of Adherence

Question 1: a) Do you feel you always adhered to your prescribed therapeutic home exercise program? b) Please rate your overall level of adherence on a scale of 1 to 6? (1 = no adherence whatsoever. 6 = 100% adherence)

Table 14 Subjects Perceptions of Adherence

Response	Experimental Group N = 15	Control Group N = 18
a)		
YES	7% (1 subject)	17% (3 subjects)
NO	73% (11)	72% (13)
CLOSE	20% (3)	6% (1)
NO RESPONSE		6% (1)
b)		
RATING:		
1		6% (1)
2		
3	27% (4)	28% (5)
3.5	7% (1)	
4	20% (3)	22% (4)
4.5	7% (1)	
5	33% (5)	33% (6)
6		6% (1)
MEAN SCORE	4.1	4
NO RESPONSE	7% (1)	6% (1)

Adherence Response

As seen in Table 14, in both control and experimental groups, more than half of the people felt they did not adhere fully to the prescribed therapeutic home exercise program. There was not much difference in responses between the two groups. The control group actually had more people who claimed to have better adherence (17%) than the experimental group (7%).

Ratings Response

An examination of self-ratings of adherence, showed little difference in responses between the two groups. The mean rating score was 4.1 for the experimental group and 4 for the control group. In both groups 33% rated themselves as a 5 (almost full adherence), and 20% in the experimental group and 22% in the control group rated themselves as a 4. Only one person in the control group rated him/herself lower than the experimental group, and only one person in the control group rated him/herself higher than anyone in the experimental group. Therefore, the results of this specific question about adherence showed similar results to those in the analysis of the Adherence Questionnaire, in regards to the effect of the log sheet on adherence. Because there was no difference in responses between the two groups, the log sheet did not have an effect on the subjects' self-perception of full adherence.

Question 2: When you did perform your exercises, did you usually perform all or part of your prescribed program?

Table 15 The Amount of the Prescribed Exercise Program Adhered to by Subjects

Response	Experimental Group N = 15	Control Group N = 18
ALL	67% (10 subjects)	72% (13 subjects)
PART	33% (5)	22% (4)
NO RESPONSE		6% (1)

* Note: Subjects that answered "almost all" or "most" were placed in the "Part" category.

Again, subjects in both groups answered this question similarly. The majority of subjects in both groups replied that if they did do their exercises, they performed all of them (exp. group = 67%. cont. group = 72%). This is consistent with the analysis of the Adherence Questionnaire, which showed that, generally, adherence to the method or technique of performing the prescribed exercises was fairly good. It appeared that it was the prescribed frequency to perform the exercises that caused deficiencies in adherence, not the manner in which the exercises were performed. Again, because there is no obvious difference between the two groups in replies, it

seems that the log sheets had no effect on adherence to the manner in which exercises were performed.

Changes in Adherence

Question 3: Do you feel that your level of adherence changed throughout the last four weeks?

Table 16 Changes in Adherence

Response	Experimental Group N = 15	Control Group N = 18
NO	20% (3 subjects)	17% (3 subjects)
YES	80% (12)	83% (15)

* Responses such as: "no, except last week or two because I was sick" and " no, except last week" were included in the YES response because these responses indicate that there was actually a change in adherence

When questioned about a change in adherence during the four weeks between the administration of the Adherence Questionnaire at Time 1 and Time 2, the majority of subjects in both groups answered that yes, they perceived that there was a change in some manner (exp. group = 80%, cont. group = 83%). In order to determine the type of change the following questions were examined.

Question 4a): If YES, then how did it (level of adherence) change?

Table 17a Manner that Adherence Changed

Response	Experimental Group N = 15	Control Group N = 18
▪ Decreased	47% (7 subjects)	61% (11 subjects)
▪ Adherence was Inconsistent	7% (1)	
▪ Decreased Strengthening Compared to Stretching		11% (2)
▪ Stopped	7% (1)	
▪ Increased	20% (3)	11% (2)
▪ No Change	20% (3)	17% (3)

When questioned about the type of change that occurred during the previous four weeks, Most subjects responded that overall, they decreased, in some manner, in adherence. Forty - seven per cent of the experimental group responded that they decreased, compared to 61% of the control group. The experimental group appeared to decrease to a lesser extent, however, if other comments are included, such as the statement that adherence was inconsistent and adherence stopped, there does not appear to be much difference between the two groups. Two subjects in the control group claimed that they decreased in their strengthening exercises compared to their stretching exercises. The reason for this difference in adherence was not determined, but perhaps the stretches were easier to perform, as strength exercises usually require more effort.

However, there was a slight difference in the number of subjects who claimed to have increased, in some manner. In the experimental group 20% of the subjects stated that an increase occurred compared to 11% of the control group. This is a difference of only one person, however. Since there are more people in the control group than the experimental group, it is considered to be a greater portion of the experimental group that claimed to have increased. There was also a slightly greater portion of subjects in the experimental group who claimed to

have no change in adherence throughout the study (exp. grp. = 20%, cont. grp. = 17%). It is possible that the log sheets completed by the experimental group had an effect on the above differences. The results of the Adherence Questionnaire were not consistent with this statement so further comments from the subjects will be examined to determine what effect the log sheet had.

Question 4b): If YES, then when did it change? Is there a point in time when you stopped adhering or increased your adherence?

Table 17b Time that Adherence Changed

Response	Experimental Group N = 15	Control Group N = 18
• Decreased after 1-2 weeks		33% (6 subjects)
• Decreased after 2-2.5 weeks	13% (2 subjects)	
• Decreased after 3-4 weeks	27% (4)	17% (3)
• Decreased on and off	13% (2)	17% (3)
• Stopped after 2-2.5 weeks	7% (1)	6% (1)
• Increased after 1 week	13% (2)	
• Increased after 1.5 weeks		6% (1)
• Increased after 2 weeks	7% (1)	
• Increased when saw results		6% (1)
• No Change	20% (3)	17% (3)

As can be observed in Table 17b, 33% of subjects in the control group who had a change in adherence, decreased after one to two weeks. In the experimental group, nobody decreased this early in the program. The earliest that any of the experimental group claimed to have decreased was following two to two and a half weeks (13%), which is at a later point in time than the control group. In fact, 27% did not decrease until after three to four weeks. This makes 40% of the experimental group who began to decrease at a later point in time than the control group.

The control group only had 17% who began to decrease following three to four weeks. Also, in an examination of times that subjects increased, it appears that the majority of those in the experimental group who increased, experienced the increase following one week. In the control group, those who increased found that the increase occurred after one and a half weeks or after seeing results. Therefore, it seems that subjects in the experimental group decreased in adherence later in time than the control group and increased in adherence earlier in time than the control group. Even though in the analysis of the questionnaire it appeared that there were no differences between the experimental and control groups and that the log sheet was insignificant, it seems that the log sheet may have had an effect on delaying the point in time at which a decrease in adherence occurred as well as helping to create an increase in adherence (even though it might be slight) a little earlier. Thus, the log sheet, may delay the time it takes to decrease adherence and with a combination of other factors may contribute to maintaining or increasing adherence.

Reasons for Changes in Adherence

Question 4c): If YES, then why did it change? Are there specific reasons for the change?

Table 17c Reasons for Changes in Adherence

Response	Experimental Group	Control Group
DECREASED OR STOPPED:	<u>Total of 12 responses given</u>	<u>Total of 19 responses given</u>
<ul style="list-style-type: none"> ▪ Time Constraints ▪ Pain ▪ Stopped Seeing Therapist ▪ Felt Better and Got Away from Daily Routine ▪ Sick ▪ Not Happy with Exercises (ie. bored. didn't think they were working, keeping subject awake at night) ▪ Not Sure of Prescription ▪ Didn't Want to Push Too Hard ▪ Decreased Motivation 	67% (8/12 responses) 17% (2) 8% (1) 8% (1)	26% (5/19 responses) 11% (2) 11% (2) 16% (3) 21% (4) 5% (1) 5% (1) 5% (1)
INCREASED	<u>Total of 4 responses given</u>	<u>Total of 2 responses given</u>
<ul style="list-style-type: none"> ▪ Decreased pain, saw improvements ▪ Habit Formed ▪ Returning to Sport 	75% (3/4 responses) 25% (1)	50% (1/2 responses) 50% (1)
NO CHANGE	20% (3/15 subjects)	17% (3)

* 60% (3/5 comments) of those in exp. group for <3 weeks stopped because they decreased therapy

Reasons for Decrease

Subjects were questioned about reasons for the changes they had in adherence. In examining their replies, again, time constraints seemed to be the number one reason in both groups for not adhering to their program. Recall, from the analysis of the Adherence

Questionnaire that this seems to be a major issue that needs to be dealt with by both the therapist and the patient. Responses from the control group included comments about exercise prescription, decreased motivation and unhappiness with the exercises. These were comments not made by the experimental group and may have been addressed to some extent, by completing a log sheet. For example, the log sheet allowed one to write down the exercises so that one could be certain of the exercises to be performed. As well, if the patient was not sure of what to write down on the log sheets the patient would recognize that more questions must be asked of the therapist, opening the lines of communication. Recall, that the importance of communication with the therapist was confirmed when the analysis of the Adherence Questionnaire was discussed. A further confirmation of the need for communication with the therapist was the comments about feeling pain and feeling better, being deterrents for adherence. In these situations the patient needs to be aware of the amount and type of pain to be expected. It is often the case where the patient should be continuing with exercises even though he/she is feeling better. At this point in time, the subject will probably need some extra motivation to continue with the exercise program.

Interestingly, subjects in the experimental group expressed feelings that when they were not seeing the therapist as often, they felt that adherence did not occur. Of those subjects who only saw the therapist for less than three weeks, 60% of their comments included the fact that their adherence decreased because they were no longer visiting the clinic. The log sheet apparently did not assist some people in continuing with a program once the therapist was not involved, indicating the importance of the therapist in helping to ensure adherence.

Reasons for Increase

There were not many subjects who increased in adherence. Of those who did, explanations given by the experimental group included such factors as observing improvements, having decreased pain and forming a habit. Only two comments were made by the control group, one involving observed improvements and the other noting that the desire to return to sport was a motivator for adherence. The fact that the log sheet appeared to delay a decrease in adherence,

perhaps assisted those in the experimental group to continue with exercises long enough to see the benefits of the exercise and to form a habit to continue with the exercises.

Factors Contributing to Adherence

Question 5a): In general, what factors do you think would contribute to adherence?

Table 18a Factors Contributing to Adherence

Response	Experimental Group <u>Total of 29 responses given</u>	Control Group <u>Total of 37 responses given</u>
▪ Support from Others (ie. family, therapist, fellow workers)	24% (7/29 responses)	5% (2/ 37 responses)
▪ Time Management	21% (6)	27% (10)
▪ Personal Motivation/Goals (ie. Desire to return to work, keep up with young daughter, or to participate in sport)	17% (5)	16% (6)
▪ Education About Therapy	14% (4)	11% (4)
▪ Suitable Environment for Exercise (ie. available equipment)	10% (3)	
▪ Good Relationship with Athletic Therapist/ Comfortable Clinic Atmosphere	7% (2)	3% (1)
▪ Guilt/ Being Told Patient Would Not Get Better Otherwise	7% (2)	
▪ Working With a Partner	3% (1)	
▪ Seeing Results/ Feeling Better		14% (5)
▪ Visiting Therapist Regularly/ Check Ups From Therapist		8% (3)
▪ Belief in Exercises		5% (2)
▪ Having a Specific Program Setup/ Doing Exercises in Same Place or With Workouts		8% (3)
▪ Adherence Depends on How Subject is Feeling		3% (1)

Surprisingly, when questioned about factors contributing to adherence, the most common answer given by the experimental group was having support from others such as family, the therapist, or fellow workers. Some other studies have also reported that those who adhered, were those with support from significant others (Fisher et al., 1988; Byerly et al., 1994). In light of previous responses given, one would expect time management to have been the most common answer. It was, however, the second most common response for the experimental group and the most common for the control group. Other than this, there was not much difference between groups in the manner that they responded to this question aside from some comments in regards to personal preferences, and some comments from the control group that might be resolved through the use of a log sheet. These will be mentioned in a discussion of the log sheet.

It is obvious that having social support is not the only factor that contributes to adherence. Another common response selected by both groups was having personal motivation or personal goals. A variety of other responses were also given, as seen in Table 18a, indicating the many different factors that individuals felt were important to them.

The above results appear consistent with other studies. Fisher, Mullins, et al. (1993) reported that surveyed athletic trainers were unanimous in agreement that having social support is crucial. As well, they agreed that having self-motivation is important and that being supervised and monitored is necessary as well. Finally, these researchers claimed that setting short-term goals can be important as a confidence builder. Fisher, et. al., (1988) also found that those having support from significant others were better adherents than those who did not. As well, they reported that those who adhered were more self-motivated, perceived that they worked harder, tolerated pain better, and were less distracted by scheduling or environmental barriers. Therefore, it seems that it is important for the therapist to determine what factors the patient feels are necessary in order to assist him/her to adhere to the exercise program.

The Log Sheet

The log sheet possibly assisted some in setting goals and observing progress. It laid out the exercise program so that exercises were clear to the patient, and perhaps by scheduling

times on the log sheet to do the exercises, one may be assisted with time management, as well. It should be noted that 8% of the comments coming from the control group (See Table 18a) involved having a specific program setup. The experimental group did not mention this. It might be the case that this need was satisfied for those in the experimental group as they were required to outline their program on the log sheet. However, as discussed previously, communication between the therapist and the patient appears to be important so it may be necessary to have a few discussions with the patient to determine his/her needs before the log sheet is introduced.

Factors Contributing to Non-Adherence

Question 5b): In general, what factors do you think would contribute to non-adherence?

Table 18b Factors Contributing to Non-Adherence

Response	Experimental Group	Control Group
	<u>Total of 25 responses given</u>	<u>Total of responses given</u>
▪ Time Conflicts	44% (11/25 responses)	33% (12/36 responses)
• Pain	16% (4)	8% (3)
▪ Fatigue	8% (2)	
▪ No Progress Observed	8% (2)	8% (3)
▪ Boredom	4% (1)	6% (3)
▪ Forgetfulness	4% (1)	3% (1)
▪ Equipment Availability/ Inconvenience	4% (1)	8% (3)
• Feeling Better	4% (1)	3% (1)
• Being Considered a Number	4% (1)	
▪ Not Wanting to Go Back to Work	4% (1)	
▪ Lack of Motivation		11% (4)
• Unhappiness With Exercises/ No Belief in Them		6% (2)
▪ Lack of Education in Regards to Exercises		3% (1)
▪ Unable to Continue to Visit Therapist		6% (2)
▪ Exercise Program Not Structured		3% (1)
▪ Adherence Depends on How Subject is Feeling		3% (1)

Subjects were questioned about factors they considered to contribute to non-adherence. Responses were repetitive and consistent with reasons for their own non-adherence, and these were previously discussed in the analysis of the Adherence Questionnaire and in question 4c of the Interview (See Table 17c). For both experimental and control groups, having time conflicts

was the number one factor contributing to non-adherence. Again, it must be stressed that patients do not seem to make their health a priority and more discussion must occur with the therapist in order to educate the patient about the importance of taking proper care of the injury.

Comparison of Groups

Generally, both groups responded similarly. In addition to time constraints, both groups suggested similar factors, such as pain, not observing progress, boredom with exercises, and inconvenience, as deterrents for adherence. Previous studies agree that those with better pain tolerance and those not concerned with environmental considerations (ie. inconvenience of exercises) were better at adhering (Fisher, Mullins, et al., 1993, Fisher, et al., 1988). Many of these factors could be addressed through discussion about pain expectations, and having awareness of what the subjects' needs are, in order to have motivation to perform the exercises. As discussed earlier, using a log sheet appears to delay a decrease in adherence and thus, may keep the subject performing the exercises long enough to be able to observe progress and therefore, have some additional motivation to continue with the program.

Additional comments expressed by the control group that were not expressed by the experimental group included having a lack of motivation, being unhappy with the exercises or program structure, being uneducated about the exercises, and being unable to continue to visit the therapist. It might be possible that the subjects in the experimental group did not express these factors as concerns because the log sheet gave them some additional motivation, and opened up the opportunity to discuss exercises with the therapist because, in order to complete the log sheet, the subject had to be familiar with the exercises.

Suggestions for Improving Adherence

Question 6 for Control Group and Question 8 for Experimental Group: Can you suggest some other methods that might help you to adhere to your program?

Table 19 Suggestions for Improving Adherence

Response	Experimental Group <u>Total of 15 responses given</u>	Control Group <u>Total of 26 responses given</u>
NO SUGGESTIONS	33% (5/15 responses)	4% (1/26 responses)
▪ Give Log Sheets to Therapist	13% (2)	
▪ More Money/ Not Having to Go to Work	13% (2)	
▪ Time Management	13% (2)	23% (6)
▪ More Appointments with the Therapist/ Regular Checkups or Reminders from Therapist	27% (4)	15% (4)
▪ Using Log Sheets as a Daily Reminder	7% (1)	8% (2)
▪ Access to Therapeutic Tools/ Equipment	7% (1)	4% (1)
▪ Have a Workout Partner	7% (1)	4% (1)
▪ Self - Motivation	7% (1)	
▪ Better Instruction/ Education of Exercises ie. Pictures, Written Protocol	7% (1)	23% (6)
▪ Being Able to See Benefits		4% (1)
▪ Pain Control/ Logging Pain		4% (1)
▪ Positive Attitude, Encouragement and Praise from the Therapist		4% (1)
▪ More Self Discipline		4% (1)
▪ Not Being Sick		4% (1)

Subjects were asked to suggest some specific methods that they felt might address some of the deterrents to their own adherence. Five people in the experimental group said "no", they did not have any other suggestions, and one in the control group had nothing to contribute. It is assumed that these people did not feel that their adherence needed any improvement and were

satisfied with the adherence motivators they already had in place. The fact that more people in the experimental group had no other suggestions indicates that they may have been happy with the set up of the log sheet that they used.

Regular Check Ups

The most common suggestion coming from the experimental group was having more appointments with the therapist or having regular check ups or reminders from the therapist (27% of the comments). Fifteen per cent of the comments coming from the control group also made this suggestion. This is similar to a study by Sluijs, et al. (1993) who reported that patients who were monitored by the therapist was more likely to adhere.

Time Management

Of course, time management was recommended by 23% of the comments in the control group and 13% of the experimental group as means of improving adherence. In fact 13% in the experimental group even suggested, that they would adhere better if they had more money and did not have to go to work. As this is unrealistic, a better way of managing time must be discovered. Breaking up the exercise program so small portions of it would fit into different parts of the day might be one way to remedy this problem. For example a patient could stretch while waiting for the bus, or during a coffee break. Some exercises could even be performed while sitting at a desk or in an elevator. Getting up earlier in the morning might help also. The therapist could assist by modifying exercises to help the patient to fit exercises into a daily routine.

The Log Sheets

Both groups suggested the use of a log sheet (exp. grp. 7% - 1 person, cont. grp. 8% - 2 people). Even though, on its own the log sheet did not appear to increase adherence, (as seen in the analysis of the Adherence Questionnaire), it did delay decreases in adherence, and some subjects requested this method to assist them.

Another suggestion coming from the experimental group was to give the log sheets to the

therapist (13% of the comments). Perhaps if the patient were to complete the log sheets and hand them in to the therapist on a regular basis, the need for therapist check ups would be satisfied as well as having the log sheet available as a motivational tool and program structural tool for the patient. In fact, 23% of the comments made by the control group, and 7% of comments from the experimental group suggested that having better instruction of exercise performance and being educated about them, in the form of pictures and written protocol would help them to adhere. The fact that less people in the experimental group suggested this, might indicate that the log sheet already satisfied these needs. However, improvements could be made to the log sheet to provide more space for key reminders about exercise technique, or pictures.

Some subjects in the control group also suggested that they would like to be able to see the benefits of the exercise (4% of the comments) and be able to log their pain (4% of the comments). If they had completed the log sheets in the study, they may not have made these requests because when using the log sheets, subjects were asked to log their pain in order to monitor improvements or setbacks. This request was not made by any subjects in the experimental group so perhaps by completing the log sheets this need was fulfilled.

It should also be noted that the subjects were required to hand the log sheets in to the researcher on a weekly basis. Subjects were not very compliant to this request. Thus, it seems that they may not have seen the researcher as someone who would be an authority figure or motivator to complete log sheets. However, the subjects did adhere to the completion of the log sheets, to the best of the researcher's knowledge. It also should be noted that, even though some subjects suggest that giving log sheets to the therapist may assist in adherence, the therapist may have a difficult time in obtaining log sheets from patients, as they may forget to hand them in, or not want the therapist to know that the patient was not very adherent to the exercises.

Other Suggestions

Other suggestions made by subjects to improve adherence (as seen in Table 19) included having:

- access to therapeutic tools and equipment

- a work out partner
- better self motivation
- encouragement from the therapist
- more self discipline
- perfect health - no illness

Obviously, there is not much that can be done if one is ill. If the patient is encouraged to express needs to the therapist, the therapist might be able to do the following:

- help the patient find a work out partner
- give the patient more encouragement if needed
- help the patient to have access to therapeutic tools
- suggest some methods to help motivate the patient (ie. log sheet).

It is clear that this study confirms the statement made by Meichenbaum and Turk (1987) claiming that there are more than 200 variables influencing adherence. It is important to recognize the barriers to adherence and to try to eliminate them (Fisher, Mullins, et al., 1993) Repeatedly, it has become apparent that an important step in assisting a patient with adherence is communicating with him/her and finding out what needs must be met to assist with adherence.

Prior Use of Lists and Log Sheets

Question 7 for Control Group and Question 9 for Experimental Group: Are you normally the type of person that likes to keep lists to ensure that you get certain tasks completed? Do you normally keep daily log sheets to complete your exercises?

Table 20 Prior Use of Lists and Log Sheets

Response	Experimental Group N = 15	Control Group N = 18
LISTS/LOG SHEETS OF EXERCISES:		
▪ Yes	7% (1 subject)	0% (0 subjects)
▪ No	87% (13)	100% (18)
NO RESPONSE	7% (1)	
LIST KEEPER:		
▪ Yes	40% (6)	17% (3)
▪ No	40% (6)	72% (13)
▪ Just starting to/ trying to be more organized		6% (1)
▪ Only at Work	7% (1)	6% (1)
▪ Sometimes	13% (2)	

This question was asked in order to determine if subjects were completing a log sheet or list of some sort on their own to help themselves with adherence. The largest concern was with the control group because if any subjects were filling out log sheets on their own, this would affect the results. As can be seen in Table 20, only one person (experimental group) of all of the subjects claimed to already keep a list or log sheet for exercises. More people claimed to keep lists (40% exp. grp., 17% cont. grp.), and some only for work purposes (7% exp. grp., 6% cont. grp.). However, since only one person claimed to do so for the purpose of completing exercises, there would be minimal effect.

Evaluation of Log Sheets

Question 6 for Experimental Group: How do you feel about the daily log sheets that you kept? Do you feel that they assisted you in adhering to your prescribed therapeutic home exercise program?

Table 21a Assistance Provided by the Log Sheet

Response About Log Sheet	Percentage of Responses
▪ ASSISTED	53% (8/15 subjects)
▪ DID NOT ASSIST	13% (2/15)
▪ NOT SURE	7% (1/15)
▪ ASSISTED DURING THE FIRST COUPLE OF WEEKS	27% (4/15)

It is with the above question and the following question that we will observe what the subjects felt about the log sheets. As can be seen in Table 21a, 53% of the subjects felt that the log sheet assisted them in adhering to their prescribed home program. Though a significant change in adherence did not appear through the analysis of the Adherence Questionnaire, this analysis did not take into account the feelings of the subjects. Twenty - seven per cent of the subjects felt the log sheets assisted in the first couple of weeks of the study. This is consistent with the results in Table 15b that describes the time period in which subjects felt their adherence changed. It was observed in Table 15b that 13% of those in the experimental group decreased in adherence following two to two and a half weeks and 27% decreased following three to four weeks. This confirms that even though the log sheet may not have increased adherence significantly, it did affect the amount of time it took for a decrease in adherence to occur.

Also, as can be seen in previous discussion, it appears that each person requires individual needs to be met in order to have adherence. Those who felt that the log sheets assisted, probably found that the log sheets met some of their needs. The 13% that stated that the log sheets did not assist, and the 7% that was not sure, probably had other needs that were not met by the log sheets. Again, this confirms the importance of discussion between the

therapist and the patient to determine his/her needs.

Table 21b Comments About the Log Sheets

Comments about Log Sheets	Percentage of Responses
	<u>Total of 14 responses given</u>
▪ Served as a reminder	29% (4/14 responses)
▪ Kept track of exercises and what to do	29% (4)
▪ Log sheet did not help during the last two weeks because there were too many exercises	7% (1)
▪ Did not need the log sheet after 2 weeks because subject began to see results	7% (1)
▪ Once exams began they did not help	7% (1)
▪ Helped at home but subject forgot to take them to work	7% (1)
▪ Helped give direction for exercise because direction from the therapist was not clear	7% (1)
▪ Subject used to use log sheets and got fanatical about them because subject not doing things subject would like to now	7% (1)

Table 21b shows comments about the log sheets that were made by subjects in the experimental group. The two most common comments were that the log sheets: 1) served as a reminder to do exercises and 2) helped the subjects to keep track of exercises and how to do them. Another comment related that the log sheets helped to give direction for the exercises because instructions from the therapist were not clear. Thus, the log sheets did indeed help subjects to remember to do the exercises as well as provide an outline for them to follow. Recall that many subjects complained that adherence did not occur because they forgot to do the exercises or they were unsure of the exercise prescription.

Through an examination of the remaining comments it seems that for some, the log sheets did not assist, following a certain period of time, or when "life became a little busy" (again consistent with results from Table 17b).

Comments that differed from the above, from patients who were involved in therapy for

less than three weeks, revealed that one subject hates log sheets because "they are like doing work". Another subject felt that the log sheets did not help after therapy appointments were finished, and a third felt that the log sheets helped to increase the "guilt factor" if exercises were not performed.

Therefore, it appears that many subjects did find that the log sheets benefited them to some extent. However, it must be remembered that people have individual likes and dislikes in regards to filling out a log sheet, and one who does not care for such a practice is probably not going to receive any benefit from completing one. One question that now appears obvious is "What can be done to maintain adherence following the first couple of weeks?" and "How can adherence be promoted once 'life becomes extremely busy'?" As has been discussed previously, subjects had issues with time management and this seems to be the key to promoting better adherence for athletic therapy patients.

Suggestions to Improve the Log Sheet

Question 7 for Experimental Group: Do you have any suggestions to improve this log sheet?

Table 22 Improvement of the Log Sheets

Suggestions to Improve Log Sheets	Percentage of Responses
	<u>Total of 9 responses given</u>
▪ Would like space to write comments at the end of each day instead of the end of each week	22% (2/9 responses)
▪ Would like more space for more exercises	22% (2)
▪ Would like a smaller form/ there were too many pages	22% (2)
▪ Would like a code at the beginning (ie. numbers for exercises)	11% (1)
▪ Would like the names of the exercises described on the back of the sheet	11% (1)
▪ Would like to be able to take into account the changing of exercises	11% (1)
NO SUGGESTIONS FOR IMPROVEMENT	53% (8/15 subjects)

As can be seen in Table 22, just over half of the subjects in the experimental group were content with the set up of the log sheet and made no suggestions for improvement. Many of the comments made were a result of the subject either not paying close attention to instructions given, or forgetting instructions. However, each subject was given instructions in both verbal and written format. For example, if subjects wanted more space on the log sheet for exercises, they were instructed to contact the researcher for more sheets. Also, in order to take into account the changing exercises, subjects were directed to write them in as they changed. Again, if more sheets were required, the subject could contact the researcher. The subjects were given permission to write the exercises in the appropriate space in whatever manner they chose. For example, they were told that they could write exercises in code (ie. assign a number to them) or draw a little picture, or write the name. If they would like a code at the top of the log sheet or have the exercises described on the back, it was up to them to do so. Thus, when giving patients direction or instructions, it is important to be very clear and repetitive to ensure that details are not missed (Fisher, 1990).

It might be possible to make the log sheets smaller and condense them into a booklet in order to make them easier to use. Also, making space to place comments at the end of the day instead of the end of the week might, not be a problem. However, providing both at the same time might be difficult. Thus, size might have to be compromised for more space, or vice versa.

A couple of comments from those who were in therapy for less than three weeks included one who felt that filling out the repetitions, sets and time of day for the exercise was confusing (See log sheet in Appendix E) and another who would have liked to have had visual rewards or prizes awarded. Thus, again, the therapist should be clear with instructions and be creative with patients in helping to motivate them.

Question to Subjects About Further Research

Out of curiosity, subjects were asked if they had any ideas for future research in the area of athletic therapy adherence. Many subjects had no suggestions, but there were a few interesting ideas that came out of the conversation.

Many suggestions were actually related to comments made by subjects about reasons for non-adherence. For example subjects wondered the following:

- Would better access to facilities help people adhere?
- How does goal setting affect adherence?
- Do many people actually know about the benefits of the exercises? and how long should they do them for?
- Do explanations and education help adherence?
- How do you get around having pain and its adverse relationship with adherence?
- How do you know that you are getting better because of the exercises?
- How do you know which exercises are the best for healing?
- It would be interesting to strength test during therapy to see if changes are occurring (*Note: Most therapists do this throughout therapy in order to assess which stage the patient is at)

Summary of the Interview with Subjects

Through an in depth examination of the interview that subjects underwent many observations can be made. It was determined that only one subject who was in the experimental group normally kept a log sheet or list for recording exercises so the answers from the subjects were not biased.

1) Subjects' Perceptions About Their Own Adherence

Most subjects agreed that they did not fully adhere to their programs (exp. grp = 73%, cont. grp.= 72%) however most adhered to all of the exercises prescribed (exp. grp. = 67%, cont. grp. = 72%), but not necessarily performing them as often as they were supposed to. This information is consistent with the analysis of the Adherence Questionnaire, where it was discovered that subjects tended to adhere better to the manner in which the exercises were supposed to be performed as opposed to the prescribed frequency of the exercises.

2) Change in Adherence

The majority of subjects (exp. grp. = 80%, cont. grp. = 83%) felt that a change in adherence did indeed occur during the four week period between questionnaires. Forty-seven per cent in the experimental group and 61% in the control group claimed to decrease adherence. Seven per cent of the experimental group stopped performing exercises altogether. Twenty per cent of those in the experimental group, and 11% in the control group claimed to increase. There was a slight difference in adherence between the control and experimental groups, indicating that perhaps the log sheet had somewhat of a positive effect on adherence.

3) Time Taken for a Change in Adherence to Occur

Through an examination of the time when a change occurred, it was possible to see that most of those in the experimental group who decreased, tended to begin to decrease in adherence following three to four weeks. The earliest that a decrease occurred was from two to two and a half weeks. Most who decreased in the control group began to decrease following one to two weeks. It was also observed that those in the experimental group who increased did so following one week or two weeks as compared to a smaller number in the control group that increased after one and a half weeks or once results were observed. Therefore, completing the log sheet delayed a decrease in adherence and also decreased the time before which an increase in adherence occurred.

4) Reasons for a Change in Adherence

Subjects were questioned about reasons why they decreased, increased, or stopped adhering to their exercises. Again, time restrictions were a major contributing factor for those who decreased or stopped adhering. However, the log sheet did seem to assist in outlining a program and allowing subjects to continue with the program long enough to see benefits, as only the control group complained about uncertainty about exercise prescription and not being able to see benefits. This probably occurred because subjects were unable to stick with the exercises long enough to see benefits.

For those subjects in the experimental group that increased in adherence, reasons included observing improvements, having decreased pain or forming a habit. Again, the log sheet might have assisted the subjects in performing the exercises over enough time to be able to observe benefits and form a habit. In the control group, those that increased either had the additional motivation of wanting to return to sport, or were able to observe the benefits of the exercise.

5) Factors Contributing to Adherence

When questioned about factors contributing to adherence, it became apparent that people may have different preferences. A variety of responses were given, such as having support from others, being educated about the therapy, goal setting, being able to observe progress, and the ever - popular, having better time management. It is obvious that as each person is motivated by different factors, it is important for the therapist to try and determine which factors are important to the patient, especially if planning on utilizing a motivation tool such as a log sheet. Having discussion with the patient is probably the best way of communicating with him/her, though the therapist might also wish to develop a questionnaire to assist in determining these factors. Taylor and May (1996) used a Sports Injury Rehabilitation Beliefs Survey (SIRBS) in their study to determine the health beliefs of their patients. Godin, et. al. (1994) also used a questionnaire to determine barriers to adherence.

6) Deterrents to Adherence

As important as it is to determine which factors will assist a patient to adhere, it is also important to address factors that act as a deterrent. Repeatedly, subjects referred to time conflicts. Once again, they consistently reported pain, unhappiness with the exercises, inconvenience of exercise, not being able to see progress, lack of motivation and various other factors (Table 18b). The log sheet may keep the patient performing exercises long enough to allow benefits of the exercises to be observed, also providing some extra motivation. Filling out the exercises to be performed also helps the patient to be sure of what exercises are to be

performed. Discussion with the therapist prior to beginning the program might help to iron out some of the other difficulties.

7) Suggestions from Subjects for Improving Adherence

One suggestion for improving adherence included having more check ups or appointments with the therapist. Some subjects in both groups also suggested the use of log sheets and giving them to the therapist. As well, subjects would like to have written protocol and pictures of the exercises with better instruction. It seems that the use of the log sheet may fulfill these requests. The log sheet could be improved by adding space for key reminders about exercises and pictures with instructions. If the patient was required to hand the log sheet into the therapist on a weekly basis, the patient would also be checking in with the therapist, perhaps having a little extra motivation to adhere to the protocol.

8) Subject Opinions of the Log Sheets

Specific questions about the log sheets revealed that over half of those in the experimental group (53%) felt that they were assisted in some way by completing the log sheets. An additional 27% felt that they were assisted for at least the first two weeks. Through an examination of the comments made by these subjects it seemed that the log sheets served as a reminder for some subjects, helped some to keep track of the exercises and gave some direction for the subjects. However, the log sheets only appeared to help to a certain extent: once the lives of the subjects changed or became a little busier, the log sheets did not have much effect on the subjects. Thus, a major concern that needs to be addressed is finding a method to assist subjects in maintaining adherence once an interruption in the daily routine occurs.

9) Suggestions to Improve the Log Sheets

An examination of suggestions to improve the log sheets revealed that some improvements could be made to make the log sheet more space efficient in terms of making it a smaller size or providing more space for patients to write in. Other suggestions made it apparent

that subjects may have forgotten instructions or not paid close attention, or instructions were not clearly given. Thus, it is important to ensure clear direction. Otherwise, it seemed that most subjects were fairly content with the use and the set up of the log sheets.

THE VARIABLE RATING SHEET

Following the four - week period, subjects were asked to complete a Variable Rating Sheet rating the importance of different variables, which might affect their adherence. Variables were rated on a scale of 1 to 6, 1 meaning no importance whatsoever, and 6 meaning the variable is the most important. The list included the variable: "filling out a daily log sheet". The goal was not to determine what factors were important to each subject, as that would be a separate study, but to determine whether those in the experimental group rated "filling out a daily log sheet" differently than those in the control group. The other variables listed on the sheet were there to act as buffers, so subjects would answer honestly and not know that they were being asked directly about the log sheet.

The sheet was analyzed using Jmp Start Version 3 Statistical Package performing a cross tab table and using Chi Square analysis. A t-test was not performed because the data was considered categorical, as explained in the Methodology Chapter (Chapter 3). Using this analysis it is possible to determine if there is a significant difference between the manner in which experimental group and control group rated "filling out a daily log sheet". The results were as follows:

Table 23 Cross Tabs Table for Variable Rating Sheet Responses to the Importance of "Filling Out a Daily Log Sheet"

Score	Control	Experimental
1	11	2
2	3	1
3	1	1
4	2	7
5	0	3
6	1	1

Table 24 The Difference Between Groups on Rating of "Filling Out a Daily Log Sheet"

Test N = 33	Chi Square	Prob>Chi Square
Likelihood Ratio	14.73	0.01*
Pearson	12.84	0.02*

(* = significance at $p < 0.05$)

As can be seen in Table 23, 11 out of the 18 subjects in the control group scored the log sheet as a 1. The remaining few scored the log sheet 4 or lower with the exception of one subject who claimed that he thought the log sheet would be a good idea. In the experimental group, only two people scored the log sheet as a 1. The score selected the most by the experimental group was 4, selected by seven people. The remaining few subjects' scores ranged from 2 to 6. Through an examination of the cross tabs table it can be observed that when compared to the control group, the experimental group typically scored the log sheet as being more important.

Table 24 indicates a significant difference in the way the experimental group and the control group scored the log sheet. Thus, even though the quantitative analysis of the Adherence Questionnaire failed to show the importance of the log sheet, further investigation showed that subjects felt that it was important. To view the manner in which subjects rated other adherence variables, see Appendix P.

INTERVIEW WITH THE THERAPIST

The nine therapists involved in the study were interviewed (see Appendix I for interview questions) following the four - week period in hopes of validating the questionnaires. However, it was discovered that this method, or this specific interview, was not an accurate tool for validating the questionnaires. There was often some discrepancy between the therapists' opinion about the patient's adherence and the patient's own opinion about his/her adherence. Example of this are presented in Appendix Q.

The following table indicates the number of therapists that accurately and inaccurately described their patient's adherence according to the patient's description.

Table 25 Therapist Perceptions of Patient Adherence

Total	Experimental Group	Control Group	Entire Group
Overestimated	6/15 = 40%	11/18 = 61%	17/33 = 52%
Underestimated	3/15 = 20%	2/18 = 11%	5/33 = 15%
Accurate	5/15 = 33%	5/18 = 28%	10/33 = 30%
Data unavailable	1/15 = 7%		1/33 = 3%

As can be seen in Table 25, of the entire group of subjects, the athletic therapists overestimated their patients' adherence in 52% of the cases. They underestimated for 15% of the subjects, making a total of incorrect assumptions for 67% of the entire group. There was a small portion of correct estimations (30%). It must be remembered, however, that subject adherence was measured using self-report on a number of specific questions. Thus, some inaccuracies may be present. Using the information that is available, though, it seems that very often therapists will overestimate their patients' adherence. This seems to reinforce the need to spend time communicating with the patients in order to enhance trust between the patient and the therapist. Thus, it is hoped that the patient will honestly convey to the therapist how well they are adhering with their exercises.

A study conducted by Taylor and May (1996) used physiotherapists' perceptions of compliance to different factors as well as patient perceptions in order to determine adherence. They used a scale from zero to five, summed the values from each factor and divided by the number of factors to arrive with a compliance score. Both parties completed an adherence data sheet three to ten days after the first appointment. In this study, the physiotherapists and the patients had similar perceptions of adherence. However, the difference between that study and the current one is the fact that in the study by Taylor and May (1996), the measurement completed by each party was the same. This indicates that it seems important, if trying to create validity, to have both the therapist and the patient complete the same report.

It can be concluded that the interview given to the therapists was not an effective tool to validate the questionnaires given to the subject. An appropriate method to do this in the future might be to ask the therapist to complete the same questionnaire as the patient. As well, the fact

that therapists' perception of their patients' adherence was inaccurate is an important finding. It appears that the therapist might need to take more steps to make themselves aware of the patient's adherence. This seems to reinforce the importance of the development of a tool for accurately measuring adherence.

CHAPTER 5

ADDRESSING PATIENT ISSUES WITH ADHERENCE

There were many issues, indicated by the subjects, which seemed to be deterrents to adherence. It seems that patients have a variety of needs to be addressed, by both themselves and their therapist. Some methods for addressing these needs will be discussed in this chapter.

Educating and Communicating with the Patient

Some subjects in the current study indicated that they were unsure of their exercise prescription, had no belief in their exercises, or wanted to be educated about their therapy. While examining the results of the questionnaire analysis and the interview analysis, it became obvious that communication between the therapist and patient is critical. Thus, a discussion about information to convey and ways to convey it will occur.

Education

One of the first steps of therapy is education of the patient regarding his/her condition. Duda et al. (1989) studied adherence behaviours and noted that athletes who felt knowledgeable about their treatment were more likely to feel in control of their treatment and less likely to depend on the therapist. These athletes were also more likely to perceive strong social support from therapists and other significant others. Thus, education is the foundation upon which the alliance of the patient with other members of the sports medicine team is built (Heil, 1993).

What Information Should Be Provided?

Each patient has individual needs for varying amounts of information. Failure to offer any information might result in decreased motivation as the patient may not see the need for treatment (Fisher, Scriber, Matheny, Alderman, & Bitting, 1993; Johnson, 1991). The patient cannot give optimal effort to something he/she does not understand (Heil, 1993). Some important questions have been raised. Issues include choosing the information that should

be given to the patient, the amount to communicate, and the method in which the therapist delivers this information. Some relevant information that may be delivered includes:

- previous injury history
- patient's role on the team, even if it is recreational
- motivation level
- personal reactions
- effects of the injury
- activity limitations
- pain expectations and tolerance
- body responses to the injury
- expectations for reconditioning
- relapse prevention training

(Weinberg & Gould, 1995; Fisher, Scriber, et al., 1993; Heil, 1993; Wiese & Weiss, 1987).

For example, if a patient has suffered a sprained ankle, a therapist might teach this patient the anatomy of the ankle and structure(s) damaged. Next, the reconditioning methods and what to expect in terms of pain and body reactions can be explained. Finally, the patient should be given a time frame for recovery. Depending on the injury and patient, other information will have to be shared, as mentioned above.

Almost everyone experiences a relapse. The patient needs to realize this and the probability of relapse occurring should be discussed. Lapses in reconditioning should be viewed as temporary. It should be pointed out to the patient that therapy is not an "all or none" process, that the patient is not a failure if one appointment is missed, and that a reconditioning program is a continuous process (Fisher, 1990; Fisher, Scriber, et al., 1993). Further, when explaining the reconditioning program, it should be broken down into steps so the patient will understand what will happen first, second, third, and so forth. This assists with ensuring understanding (Faris, 1986).

The main challenge of education is deciding which points of information to share with the patient. The easiest, and possibly the best method of dealing with this challenge is by asking the

patient: "Do you want to know what happened and what's to follow?". Normally, the patient will begin to ask questions. All 36 athletes questioned in Fisher & Hoisington's (1993) study agreed that emphasis on knowledge of the reconditioning program was more important than knowing details of the injury. Thus, determining what the patient wants to know is important.

Two important factors need to be shared with the patient. First, the patient needs to know that the athletic therapist does not work for the patient, but guides him/her through the reconditioning process. The patient must realize his/her responsibilities and be able to work effectively, alone and with the therapist. This factor implies a partnership relationship, with the patient and therapist working together to establish an overall recovery plan (Fisher, Scriber, et al., 1993; Faris, 1986). Second, sufficient interaction between the therapist and the patient is necessary to create a beneficial healing environment (Fisher, Scriber, et al., 1993). In order to enhance these interactions, the patient needs to be reassured and included in the planning of the treatment program (Fisher, 1990). Instructions given to the patient should be repeated in order to enhance retention (Fisher, 1990). Written instructions may also prove useful (Ary, et al., 1986).

Instruction

Once it comes time for the patient to begin performing exercises, he/she should be instructed regarding what the drills or exercises are, why they are being performed, and how to perform them correctly. It is useful for the therapist to demonstrate proper technique and reinforce these directions verbally. Next, the therapist should observe the patient to ensure that he/she is performing the exercises properly (Faris, 1986). As observed in the present study, it would be beneficial to write instructions as well.

Education is not a guarantee that adherence will occur, but without it, a lack of understanding on the part of the patient could lead to decreased motivation, self-efficacy, and competence.

Communication

The manner and quality with which information is communicated can determine how it is received and processed. Long-term motivation and adherence is related to rapport between the athletic therapist and the patient (Fisher, Scriber, et al., 1993, Webborn, et al., 1997). The attitude of the therapist can be conveyed to the patient. If the therapist expects non-adherence, the less motivated he or she will be to help the patient adhere, and explanations of exercises may be lazy (Webborn, et al., 1997). As well, the patient may feel that if the therapist does not care about the exercise prescription then why should the patient? Taking the time to get to know the patient earns respect, reduces anxiety, and earns cooperation and trust (Faris, 1985). The therapist should use a positive and sincere communication style and convey optimism (Fisher, Scriber, et al., 1993).

Communication Guidelines

Several guidelines have been established in order to form a good communication base with the patient. They are as follows:

1) A trusting and supportive relationship with the patient should be established. One can do this by showing interest in the patient, giving him/her undivided attention, and making eye contact. A warm, empathetic manner can be portrayed and care and concern shown both verbally and non verbally. One should also convey competence, confidence, and knowledge. It is possible to do this by sharing past successful experiences with the patient as well as by sharing personal experiences (Fisher, Scriber, et al., 1993; Wiese & Weiss, 1987).

2) The athletic therapist should be specific and clear, and give detailed and concise instructions. Explaining terms and instructions in non-technical language without using medical jargon is useful in this regard (Fisher, Scriber, et al., 1993; Faris, 1985).

3) Both visual and written material should be used together and information supplemented with

models, booklets, and articles (Fisher, Scriber, et al., 1993).

4) Important information should be repeated and essential points reinforced in order to ensure retention (Fisher, Scriber, et al., 1993; Meichenbaum & Turk, 1987; Blackwell, 1976).

5) The importance of the patient's choices of course of action should be stressed as these determine much of the effectiveness of the treatment (Fisher, Scriber, et al., 1993; Meichenbaum & Turk, 1987). If a patient perceives him or herself as being an important part of the process, commitment is more likely to occur (Wayda, Armenth-Brothers & Boyce, 1998)

6) The patient should be asked to repeat information. This assists in ensuring that the patient remembers and understands the information (Fisher, Scriber, et al., 1993; Meichenbaum & Turk, 1987).

Additional communication skills include showing interest in an athlete's sport, emphasizing praise and rewards, and corrective feedback. (Wiese, & Weiss, 1987). Adherence has been significantly related to positive feedback (Sluijs, et al., 1993). Thus, the therapist should focus on elements performed correctly and provide praise and rewards, inserting corrective feedback between positive comments. The patient should also be encouraged to share his or her concerns (Wiese & Weiss, 1987).

With athletes (recreational or otherwise), it is important, if the team has a coach, for the coach to reinforce the information received from the athletic therapist. The athlete needs consistency within the program, not contradicting messages received from the coach and therapist (Wiese & Weiss, 1987; Fisher, Scriber, et al., 1993). In addition, the athlete may sometimes be treated by more than one therapist and so it is important that the patient receives consistent messages about the reconditioning program from the therapy staff (Brewer, 1998).

It may be helpful to encourage the patient to ask questions and share concerns with the therapist. Establishing trust and a good rapport with the patient, using the above methods will

probably encourage the patient to feel comfortable in expressing concerns. The essence of effective communication is that both parties listen to what each other has to say. Communication is a two-way process between the athletic therapist and the patient (Fisher, Scriber, et al., 1993).

Time Management and Motivation Tools

It became very clear, in this study, that time management was a huge issue with the subjects. It may be that in addition to feeling stressed for time, subjects had a lack of motivation to make the necessary changes in their life to be able to perform the exercises.

Modifying the Daily Schedule

As noted earlier, the therapist may be able to assist the patient with time management by reviewing his/her schedule. Then, the therapist could assist in scheduling times of the day in which the exercises may fit into his/her lifestyle. The program could even be broken up so that the patient is performing exercises during little breaks in the day instead of all of them at once. For example, the patient might be able to perform a couple of stretches at the bus stop, during a coffee break, or right after getting out of the shower. Strengthening exercises may be a little more difficult to fit in but keeping hand weights, tubing or other tools for strengthening at work or visible in the home might help.

Sometimes, the therapeutic exercise program involves going to a work out facility. In this case, scheduling a specific time to do this and making it a routine part of the day might be beneficial to the patient. Arising earlier in the morning is another way to fit more activities into the schedule.

Goal Setting

A long recovery can be difficult for an athlete, so one manner in which motivation can be promoted is through goal setting. When the mind is made up to complete a task, goal orientation can assist to overcome some day to day difficulties (Fisher & Bitting, 1996). Short and long term goals give a sense of accomplishment. Short-term goals allow for immediate improvement and

provide optimism. They therefore, can serve as a confidence builder (Fisher, Mullins, et al., 1993). The patient can take pride in working hard to complete a task and when success is achieved, the patient feels control over the task and commitment becomes more likely (Fisher & Bitting, 1996). For example, 83% of athletes in Fisher & Hoisington's (1993) study agreed with the significance of seeing immediate results. Long-term goals do not provide daily motivation but are necessary for long-term guidance (Wiese & Weiss, 1987; Fisher, 1990). For goals to provide a challenge, they must be realistic, attainable, and flexible (Wiese & Weiss, 1987; Ice 1985). Also, patients should be actively involved in goal setting in order for goals to be personally important (Rotella & Heyman, 1993). Bassett and Petrie (1999) discovered that patients who worked with the therapist to design goals adhered better than those who were not allowed to participate in the goal setting process. Also, goals should be individualized for the patient (Wayda, et al., 1998). Goal setting can clarify each person's role in the process when planning the guidelines for the goal as well as assist the patient to overcome barriers to adherence (Wayda et al., 1998)

Goal Setting Guidelines

Guidelines have been specified for goal setting:

- 1) Goals should be specific and measurable. They should be written down and posted and answer the questions: Who? What will be done? When? (Wiese & Weiss, 1987).
- 2) Goals should be stated in positive instead of negative language. For example, the patient needs to know what to do to guide behaviour, as opposed to knowing what to avoid (Heil, 1995).
- 3) The patient must learn strategies to achieve the set goals. Examples include: obtaining knowledge of proper technique, gaining an understanding of the program, and knowing what increases will lead to goal achievement. This knowledge gives the athlete a sense of control, accomplishment and motivation (Wiese & Weiss, 1987).

4) Periodic evaluation of goals would give feedback to the patient. It may be necessary to re-establish the goals (Wiese & Weiss, 1987; Fisher, 1990). Re-establishing goals may also help to prevent boredom with the program. Many subjects in the current study claimed that boredom prevented them from adhering to their home exercise program. Progress can be recorded daily or weekly, and this allows the patient to observe improvement (Fisher, Scriber, et al., 1993). Specific target dates should also be established or re-established based on the evaluation (Wiese & Weiss, 1987; Fisher, 1990). Patients can be encouraged to reward themselves for making progress. A reward needs to be of some importance to the patient in order to be meaningful. For example, a patient might go out for dinner with friends as a reward for successful adherence to the therapeutic exercises for the week (Crossman, 1997).

5) Sport goals should be linked to life goals. Sport and reconditioning are identified as life learning experiences helping the athlete to put sport in a broader perspective. For athletes whose return to sport is doubtful, this is especially important (Heil, 1993).

It is important to remember that too many goals set too soon can be overwhelming for the patient. Goals that are too general are difficult to evaluate and it is also difficult to understand how to reach them. Examples of specific goals include: the number of times per week an exercise is performed, the amount of range of motion to achieve, or target dates for a specific objective to be obtained (Weinberg & Gould, 1995).

The athletic therapist should not fail to create a supportive atmosphere or to recognize individual differences of the patients. Thus, modification of goals should not be neglected. Impossible goals can easily cause an athlete to drop out (Fisher, 1990). The log sheet was designed to include small goal setting. The subjects were required to record the target or prescribed amount of repetitions, sets, or time, for the exercise to be performed. Then they recorded the manner in which they actually performed the exercises. The idea was to have the subject try to perform the exercise as close to the target as possible. As observed in the analysis of the questionnaire, subjects were fairly competent at performing their exercises in the manner

prescribed. However, it was in performing the exercises as frequently as prescribed, where the subjects generally failed. Perhaps if the log sheet had also required the subjects to record the target frequency to perform the exercises, they may have been more successful at adherence. Also, the subjects were not involved at all in setting these goals and if they were, the goals may have been more meaningful to them, thus assisting them in adherence.

Contracting

Another motivating technique is contracting. Contracting involves developing a formal commitment in writing. Within the contract, rewards and punishments should be clearly stated and related to the particular behaviour (Fisher, 1990). A time guideline should be set and the means by which measurement occurs should be specified (Meichenbaum & Turk, 1987). It is thought that contracting benefits adherence because it creates a social pressure to perform the outlined behaviour. Self-disapproval may also be present if one does not perform the behaviour (Fisher, 1990), thus motivating the patient to adhere.

Patient Responsibility

If the therapist makes the patients responsible for their own behaviours, adherence is more likely. Encouraging the patient to participate in setting up the treatment and monitoring it is useful. The therapist can set minimum and maximum standards for the patient to reach and hold him/her accountable for attainment of the standards. Giving the patient choices regarding treatment protocol also helps to give the patient responsibility. For example, the patient can choose between using the bike or the treadmill for his/her warm-up (Fisher, Scriber, et al., 1993).

The patient also can take responsibility by providing his/her own prompts and cues to encourage the desired behaviour (Ice, 1985). Leaving notes on the refrigerator or carrying shorts and running shoes around are examples of cues. Having a prompt or cue is hoped to encourage adherence to reconditioning programs.

Patient Characteristics

As each patient has individual characteristics, he/she will have different preferences with regards to treatment. Thus, it is important to match the treatment to patient characteristics (Fisher, Scriber, et al., 1993). For example, a manageable program should be designed (Fisher, 1990). If a patient has low motivation, then he/she should begin with less exercises whereas a patient with high motivation is probably capable of more exercises (Fisher, Scriber, et al., 1993).

"Tailoring" is a term commonly used when discussing the personalization of treatment. Tailoring focuses on individualized progression as opposed to textbook progression (Fisher, Scriber, et al., 1993). For example, if it is stated that by the second week of an ankle sprain recovery the patient should be performing active exercises with weights, this does not mean that every patient will be performing in this manner. Some may progress faster or slower and catering to the individual's progression will promote reduced failure.

In summary, neglecting athlete's input is ignoring important information: remembering individual differences and progression rates is important to promote adherence as well as motivation to continue working to obtain optimal health.

Daily Record Keeping

Daily record keeping was the motivational technique used in this study. It was hoped that the log sheets would provide a reminder for subjects to perform the exercises, as well as allow the subject to observe some progress through monitoring their pain and exercise performance and attain some goals. Knapp (1988) has reported that exercise can actually increase for those who self-monitored their exercise. Gilbourne and Taylor (1995) agreed that diary maintenance can enhance self - efficacy and treatment efficacy.

Pain Control

As noted earlier in the paper, pain is likely to be involved in a reconditioning program as well as being a major deterrent for adherence, so having the ability to manage pain can be central to completing a reconditioning program successfully. The athletic therapist should be aware of the

different strategies that might assist the patients to deal with pain and these strategies should be taught to the patient (Pen & Fisher, 1994; Fisher, 1990). As mentioned earlier, it is important for the patient to be able to distinguish between "normal" pain and pain from the injury. Thus, the therapist must take the time to explain this to the patient.

Cognitive Pain Control Methods

A variety of cognitive methods can assist an individual to cope with pain. Dissociation or distraction techniques involve focusing attention away from the pain. One can focus on internal factors, such as visualization of pleasurable activities, repeating a selected phrase or word, or controlling breathing (Pen & Fisher, 1994; Fisher, 1990.). External factors, such as listening to music or watching videos, are also good pain controllers (Pen & Fisher, 1994).

A second technique, association, involves concentrating on feedback from the body. The patient maintains awareness of the physical factors related to performance and can either focus on the bodily sensations or use these sensations to monitor the internal states of the body (Fisher & Pen, 1994).

Relaxation, imagery, and visualization strategies also may be employed. These can be used in conjunction with each other to deal with stress and anxiety resulting from the injury or pain (Wiese & Weiss, 1987, Crossman, 1997). One can imagine generalized feelings of anesthesia, or imagine the pain being moved away from an area of the body through the blood circulation (Heil, 1993).

A patient can restructure negative thoughts about pain by using positive self-talk. By controlling negative thoughts, the perception of pain can be decreased or diminished and direction and motivation can be increased (Wiese & Weiss, 1987).

Non-Cognitive Pain Control Methods

Non-cognitive strategies are also available to manage pain. Electrical modalities such as Trans Electrical Nerve Stimulation (TENS), or Ultrasound are often used to manage pain. However, these are normally only used in the clinic. At home, cryotherapy (ice) could be used

(Byerly, et al., 1993; Fisher, Mullins, et al., 1993). The therapist must remember to educate the patient about how to use ice safely and effectively.

Logging Pain

Some subjects in the control group of this study suggested logging pain in order to be aware of changes. The log sheet used in this study required those who used it to rate their pain on a daily basis and obtain an average score for each week. The purpose of this was to help subjects to be aware of pain that occurred and it was hoped that patients would be able to monitor days that were better or worse, as well observe the exercises that helped to control pain. As well, through monitoring pain, it was hoped that patients would be allowed to observe progress as one would expect pain to decrease as one improved in performing exercises.

Therefore, through the use of both cognitive and non-cognitive coping strategies, patients can be helped to manage their pain.

Social Support and Encouragement Enhancement

Recall, from the analysis of the interview, that 24% of the experimental group stated that having support from others was an important factor contributing to adherence. Social support includes the use of other individuals to provide support for injured patients (Wiese & Weiss, 1987).

Encouragement enhancement involves providing emotional support, caring for, listening to, and encouraging the patient. Therapists need to encourage positive self-thoughts and enhance self-confidence and athletic therapists can provide a powerful support with only a little effort (Fisher, 1990; Fisher, Scriber, et al., 1993; Botterill, et al., 1996).

Methods of Providing Social Support

The therapist can show interest by visiting or phoning the patient, which is important especially after the novelty of the injury has worn off, because the patient may begin to feel forgotten (Weinberg & Gould, 1995). In the case of more serious athletes, coaches and

teammates can be encouraged by the therapist to accompany an athlete at treatment sessions to show their support (Fisher, 1990; Fisher, Scriber, et al., 1993). Other important figures could be co-workers, friends and family members.

Minimizing the distance an athlete (even a recreational athlete) has from sport is likely to enhance adherence. Recreational athletes may also have difficulty in coping with the inability to play their favorite sport (Samples, 1990). For example, instead of cycling at a clinic, the athlete can transport the stationary bike to the gym or field (Fisher, Scriber, et al., 1993; Wiese & Weiss, 1987). This is important because athletes are likely to have a greater than normal need to feel accepted, appreciated, and included (Botterill, et al., 1996).

Some patients in the current study indicated the need to have a work out partner. A patient could be matched with another injured patient so that they could work together and share concerns. Injured patients would understand each other and help each other to realize that they were not alone (Fisher, Scriber, et al., 1993; Weise & Weiss, 1987). Also, an injured patient could be put in touch with a previously injured patient who has since recovered successfully. An injury support group would also be beneficial to the patient. All of the above assist in increasing self-efficacy of the patient.

Finally, it must be mentioned that one should be careful not to breach the confidence of the patient by discussing the situation with the patient's parents, or others, without permission. In particular, sometimes patients do not want family involvement (Fisher, Scriber, et al., 1993).

Environmental Variables

Recall that many patients in the study indicated that it was sometimes inconvenient to perform their home exercise program. It could be extremely difficult to change environmental variables that would affect adherence to participating in treatment at the clinic. Scheduling an appropriate treatment time for the patient is possible. This is an important factor for allowing an athlete to attend appointments as athletes are very busy (Ice, 1985). Ninety five per cent of athletes surveyed by Fisher & Hoisington (1993) agreed that their program should be planned around their schedules. Training assisting staff to meet the individual needs of the patient could

provide a more comfortable setting for the patient (Andrew, et al., 1981).

Methods of Providing a Suitable Environment

Some additional suggestions include:

- 1) Keep the clinic from becoming crowded with people passing by or visiting.
- 2) Provide a parking pass for those unable to walk from a distant parking lot.
- 3) Play music in the clinic.
- 4) Attempt to provide an informal, comfortable setting for the patient.

With a comfortable, enjoyable environment, there is an increased chance that the patient will find some enjoyment in attending treatment appointments.

In order to assist in preventing the inconvenience of performing a home exercise program a therapist might try to become aware of the difficulties each patient has. For example, a patient may not own hand weights, or have access to special equipment for reconditioning so the therapist can suggest other tools utilized in every day life for the use of strengthening such as soup cans, surgical tubing, or text books. Prescribing exercises that are difficult to perform at home or that require travelling to an inconvenient location or gym will obviously not promote adherence. (Webborn et al., 1997). Importantly, it seems that a therapist needs to be open to listening to the patient's concerns and use creativity to modify exercises or exercise settings to allow the patient to perform the program without too much inconvenience.

Boredom

Subjects in the current study sometimes claimed that boredom prevented them from adhering to their exercise program. In this case it seems likely that the therapist must first become aware of this problem and this occurs through communication with the patient. A suggestion for assisting with this concern would be to change the exercises occasionally so that the same therapeutic goal is achieved but a different exercise is performed. Also, the changing goals allows the subject a different perspective. A creative therapist might try to make the exercises fun or turn them into a challenge. Importantly the therapist should be aware that

boredom may occur and attempt to deal with it.

Patient Monitoring

When asked for suggestions for improving adherence, subjects commented on the desire to observe progress as well as to be monitored closely by the athletic therapist. This finding is in agreement with Fisher, Mullins, et al. (1993) who reported that almost all athletic trainers surveyed (95%) agreed that regular monitoring and supervision seemed important to adherence. It was hoped that the log sheet used for this study would satisfy this desire and since it was a portion of the control group and not the experimental group, that made the suggestion of being able to see benefits, it may have to some extent. The subjects in the experimental group were allowed to observe progress by monitoring pain during the exercise program. However, both groups suggested having more check ups with the therapist and the control group suggested handing the log sheet in to the therapist. The log sheet was to be handed in to the researcher but it seems that the therapists' judgement is more important to the subjects. Thus, if using the log sheet in the future, it is suggested that the therapist have the patient show him/her the log sheet on a regular basis.

A couple of other issues in regards to promoting adherence were found in the literature and will be discussed, even though they were not mentioned by subjects in the current study. They are as follows:

Self-Efficacy Enhancement

Self-efficacy arises from prior performance, social modeling, persuasion by a respected authority, and internal feedback from physiological states (Bandura, 1977; Ewart, 1989; Lawrance & McLeroy, 1986). If a patient lacks self-efficacy there are a variety of strategies to manage this.

Instead of providing a number of exercises at once, the therapist should prescribe activity in gradually increasing doses so the patient can master the activity at each increment. It is also beneficial to arrange for the patient to see others perform the activity successfully. A third method

is to provide reassurance and emphasize the patient's accomplishments. As well, the athletic therapist should arrange for the setting to be "upbeat" and relaxed (Ewart, 1989). Finally, giving the patient frequent reinforcement will enable him/her to feel that success and recovery is possible (Ice, 1985). If the above suggestions are utilized, an increase in self-efficacy and thus, adherence should occur.

Threats and Scare Tactics

Some feel that negative reinforcement is motivational but there is also some danger in using this strategy. For example, the therapist could risk harming rapport with the patient (Fisher, Scriber, et al., 1993). Of athletes surveyed, 58% disagreed with the effectiveness of threats and 56% did not agree with the use of scare tactics (Fisher & Hoisington, 1993). An example of a scare tactic would be a threat to cease preventive taping unless the patient continues reconditioning exercises. A second problem involves the decision regarding what to do if the patient still does not do what is asked. It could be harmful for an athlete to play without being taped so then the athletic therapist may have to prevent the athlete from playing. This could cause many hard feelings between the involved parties (Fisher, 1990; Fisher, Scriber, et al., 1993). Instead, the therapist could attempt to change the threat into a challenge. For example, rather than demanding a specific goal, the patient could be challenged to obtain that goal (Fisher, Scriber, et al., 1993).

However, sometimes in extreme situations, threats and scare tactics do work. In the current study, in fact, two subjects in the experimental group (See Table 16a), expressed that they would like to be told that if they didn't do their exercises they would not get better. This is somewhat of a threat. Some personalities may find that this is the motivator that they need. However, in most cases it may be that threats and scare tactics should only be used as a last resort (Fisher & Hoisington, 1993). Again in this situation, getting to know the patient would be pertinent.

Summary

Numerous issues related to adherence to reconditioning programs have been discussed. It appeared that using a log sheet alone was not enough to promote or increase adherence. As every patient has individual characteristics, not every method suggested may be successful. However, by determining which factors may become a barrier for the patient the therapist can choose some suitable strategies to allow the patient to have the best possible chance for adherence.

CHAPTER 6

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The purpose of this study was to determine the effects of keeping a daily log sheet on adherence to unsupervised therapeutic exercises, that were prescribed by a Certified Athletic Therapist. Recreational athletes were recruited and randomly placed into a control or experimental group. Both groups completed an Adherence Questionnaire at the beginning and end of the four-week period. They also completed an adherence Variable Rating Sheet and were interviewed. The experimental group was asked to complete a Daily Log Sheet during the four-week time period. The Athletic Therapist was asked to estimate the amount of adherence that occurred by the patient.

The data obtained from the Adherence Questionnaire were analyzed using Nominal Logistic Regression. The Variable Rating Sheet was analyzed using a Chi Square test and the remaining instruments were analyzed with lists, ratings, and percentages.

Numerous discoveries were made during the analyses. From the Adherence Questionnaire, there was no significant relationship between the log sheet and adherence. It also became obvious that only some aspects of adherence, in both groups, were poor while others were not. When subjects performed exercises, they tended to perform them with the technique that was prescribed. For example, there was good adherence to:

- the number of prescribed stretches
- the time prescribed to hold the stretches
- the number of prescribed strength exercises
- the repetition of strength exercises.

However, the prescribed frequency to perform exercises seemed to be the aspect of adherence with which subjects had difficulty.

Also, from the Adherence Questionnaire analysis, there was the discovery of a positive relationship between the number of therapy appointments made by the subject and better

adherence to stretching exercises. As well, having had previous therapy positively affected the times per day that strength exercises were performed and also affected the repetition prescribed for the strength exercises (though the latter results were not quite significant).

The interview revealed that the log sheet did have some positive benefits. Though it did not cause an overall increase in adherence over time, it did seem to delay a dropout or decrease in adherence. Also, for those who increased in adherence, the increase occurred sooner for those who completed the log sheets than for those who did not.

The majority of subjects in the study were comfortable with the log sheets provided to them and felt that keeping a daily log sheet provided assistance for exercise adherence. For example, some felt the log sheets served as a reminder while others noted that writing the exercises on the log sheet assisted in keeping track of the exercises to be performed. The usefulness of the log sheet varied as a result of personal preference.

A few suggestions were made to improve the log sheets, though overall, subjects seemed content with their structure. These improvements will be discussed in the recommendation section.

The variable rating sheet revealed a significant difference between groups in the rating of the variable, "Filling Out a Daily Log Sheet". Those who completed the log sheet scored its importance to adherence higher than those in the control group did.

Therapists' estimations of patients' adherence tended to be inaccurate. The tool used to obtain therapists' opinions was not an appropriate tool for validating the questionnaire given to the subjects.

There were numerous variables affecting adherence to a home exercise program. The most common complaint was having a lack of time to perform exercises. This is a concern because it appears that subjects do not make the exercises a priority. Some other concerns included: pain, the ability to observe progress, having the necessary social support, being able to set goals, and many others, as noted throughout this paper. It is obvious that each patient has individual concerns that should be addressed by the therapist. The examination of the effect of the log sheet was an attempt to address some of these concerns.

CONCLUSIONS

- 1 The log sheet did not significantly predict an increase, maintenance, or decrease in adherence over a four-week period. However, most subjects in the experimental group appreciated the log sheet.
- 2 The log sheet delayed a drop in adherence for those in the experimental group, when compared to the control group. The log sheet did not prevent a decrease in adherence once the patient stopped visiting the therapist. For those who increased in adherence, the log sheet assisted the experimental group with an earlier increase than those in the control group.
- 3 The log sheet assisted patients in setting goals and observing progress. It allowed patients to document their programs in a clear, concise manner.
- 4 Patients were not opposed to using a daily log sheet and felt there was benefit to its use.
- 5 Adherence was initially good in the following areas:
 - prescribed time to hold stretches
 - stretching repetition
 - prescribed number of strengthening exercises
 - repetition of strength exercises.
- 6 Therapists tend to inaccurately estimate adherence of their patients.
- 7 Numerous variables affect adherence. Communication is important for the treating therapist to determine concerns of the patient and to develop trust. Two - way communication between the therapist and the patient is the key.

RECOMMENDATIONS FOR THE LOG SHEET AND FOR ADHERENCE IMPROVEMENT

1. The following additions/changes could be made to the log sheet:

- decrease the overall size of the log sheet
- provide space for comments at the end of each day
- provide space for key reminders and pictures
- provide space to record the prescribed frequency to perform the exercises
- provide space for scheduling times of the day to perform the exercises
- attach lists or provide space for goals on the sheets.

Bassett and Petrie (1999) used this method in a study examining the effects of goal setting on adherence. However, the log sheet/diary that they used was for the purpose of measuring adherence.

It may be difficult to decrease the size of the log sheet and provide more space for comments, reminders and pictures. Thus, one change may have to be compromised for another.

2. In order to promote adherence, the suggested steps for an Athletic Therapist to take are the following:

a) When prescribing the exercises, educate the patient regarding the importance and purpose of the exercises.

b) Ensure proper instruction of the exercises (ie. demonstrate, give pictures, give written instructions, ask the patient to repeat or demonstrate instructions)

c) Ensure communication with the athlete. Find out what potential barriers might be to adherence and ensure the patient is comfortable in sharing concerns. Use guidelines for communication discussed previously.

d) Address the potential issues regarding adherence (ie. assist with scheduling, educate on pain management, etc.) and find out factors that are important to the patient.

e) Work with the patient to set meaningful long and short-term goals, according to previously discussed guidelines.

f) Give the patient a log sheet if he/she is willing to accept it. Ensure clear instruction and ask the patient to return the log sheet on a regular basis (ie. weekly) in order to monitor the patient's actions. If necessary, assess the patient's actions and make the appropriate changes.

g) Most importantly, communicate, listen, and address concerns of the patient.

Many enhancement strategies are available to the Athletic Therapist, and different patients may react to the various methods differently. There is no specific method to promote adherence, but a multifaceted approach is promising. Using a variety of strategies to suit each patient's needs might prove to be appropriate to ensure that a variety of the challenges that the patient faces will be addressed (Fisher, 1990). However, there are no guarantees. Each strategy only increases the chance for adherence to occur.

RECOMMENDATIONS FOR FUTURE RESEARCH

1. More research into the issue of time management is recommended. Is the perception of having “not enough time” really a reason for non-adherence or is the patient simply not making the exercises a priority?
2. Further examination of the estimation of patients' adherence by therapists is warranted. The development of an appropriate measurement tool for this is suggested in order to determine the extent of inaccurate evaluation. There is still no method to predict those people who will not adhere.
3. The development of a standardized tool for the assessment of adherence would be valuable to the field of Athletic Therapy.
4. The development of a tool to assess the most appropriate adherence-improving method to utilize with each patient is suggested.

REFERENCES

- Alkeminders, L.C. & Alkeminders, S.V. (1994). Outcome in the treatment of chronic overuse sports injuries: A retrospective study. Journal of Orthopaedic and Sports Physical Therapy, 19(3), 157-161.
- Anderson, M.B. & Williams, J.M. (1988). A model of stress and athletic injury: Prediction and prevention. Journal of Sport & Exercise Psychology, 10, 294-306.
- Andrew, G.M., Oldridge, N.B., Parker, J.O. Cunningham, D.A., Rechnitzer, P.A., Jones, N.L., Buck, C., Kavanagh, T., Shephard, R.J., Sutton, J.R., & McDonald, W. (1981). Reasons for dropout from exercise programs in post-coronary patients. Medicine and Science in Sports and Exercise, 13(3), 164-168.
- Arnheim, D.D. & Prentice, W.E. (Eds.). (1993). Principles of Athletic Training, 8th ed. St. Louis, MO: Mosby Year Book.
- Ary, D.V., Toobert, D., Wilson, W., & Glasgow, R.E. (1986). Patient perspective on factors contributing to non adherence to diabetes regimen. Diabetes Care, 9(2), 168-172.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. Psychology Reviews, 84(2), 191-215.
- Barofsky, I., Sugarbaker, P.H., & Mills, M.E. (1978). Compliance and quality of life and assessment. In S.J. Cohen (Ed.) New Directions in Patient Compliance. Lexington, MS: Lexington Books.
- Baranowski, T. (1988). Validity and reliability of self report measures of physical activity: An information-processing perspective. Research Quarterly for Exercise and Sport, 59(4), 314-327.
- Bassett, S.F. & Petrie, K.J. (1999). The effect of treatment goals on patient compliance with physiotherapy exercise programmes. Physiotherapy, 85(3), 130-137.
- Belisle, M. (1987). Improving adherence to physical activity. Health Psychology, 6(2), 159-172.

- Blackwell, B. (1976). Treatment adherence. British Journal of Psychiatry, 129, 513-531.
- Botterill, C., Flint, F.A., & Ievleva, L. (1996). Psychology of the injured athlete. In J.E. Zachazewski, D.J. Magee, & W.S. Quillan (Eds.) Athletic Injuries and Rehabilitation. Philadelphia: W.B. Saunders Company.
- Brewer, B.W. (1997). Sport injury rehabilitation adherence measurement strategies. In Lidor, R. & Bar-Eli, M. (Eds.) Innovations in Sport Psychology: Linking Theory and Practice. Israel: International Society of Sport Psychology IX World Congress of Sport Psychology.
- Brewer, B.W. (1998a). Adherence to sport injury rehabilitation programs. Journal of Applied Sport Psychology, 10, 70-82.
- Brewer, B.W. (1998b). Fostering treatment adherence in athletic therapy. Athletic Therapy Today, 3(1), 30-32.
- Brewer, B.W., Daly, J.M., Van Raalte, J.L., Petitpas, A.J., & Sklar, J.H. (1994). A psychometric evaluation of the rehabilitation adherence questionnaire. Journal of Sport and Exercise Psychology, 16, S34.
- Byerly, P.N., Worrell, T., Gahimer, J., & Domholdt, E. (1994). Rehabilitation compliance in an athletic training environment. Journal of Athletic Training, 29(4), 352-355.
- Caplan, R.D., Harrison, R.V., Wellons, R.V., & French, J.R.P. (1980). Social Support and Patient Adherence: Experimental and Survey Findings. Ann Arbor, MI: Institute for Social Research, The University of Michigan.
- Crossman, J. (1997). Psychological rehabilitation from sports injuries. Sports Medicine, 23(5), 333-339.
- Crossman, J. & Roch, J. (1991). An observation instrument for use in sports medicine clinics. The Journal of the Canadian Athletic Therapists Association, April, 10-13.
- Daly, J.M., Brewer, B.W., Van Raalte, J.L., Petitpas, A.J., & Sklar, J.H. (1995). Cognitive appraisal, emotional adjustment, and adherence to rehabilitation following knee surgery. Journal of Sport Rehabilitation, 4, 23-30.
- Dishman, R.K. (1986). Exercise compliance: A new view for public health. The Physician and Sportsmedicine, 14(5), 127-142.

- Dishman, R.K. & Gettman, L.R. (1980). Psychobiologic influences on exercise adherence. Journal of Sport Psychology, 2, 295-310.
- Dishman, R.K., Ickes, W., & Morgan, W.P. (1980). Self-motivation and adherence to habitual physical activity. Journal of Applied Social Psychology, 10(2), 115-132.
- Duda, J.L., Smart, A.E., & Tappe, M.K. (1989). Predictors of adherence in the rehabilitation of athletic injuries: An application of personal investment theory. Journal of Sport & Exercise Psychology, 11, 367-381.
- Epstein, L.H. & Cluss, P.A. (1982). A behavioral medicine perspective on adherence to long-term medical regimens. Journal of Consulting and Clinical Psychology, 50(6), 950-971.
- Ewart, C.K. (1989). Psychological effects of resistive weight training: Implications for cardiac patients. Medicine and Science in Sports and Exercise, 21(6), 683-688.
- Faris, G.J. (1985). Psychological aspects of athletic rehabilitation. Clinics in Sports Medicine, 4(3), 545-551.
- Fields, J., Murphey, M., Horodyski, & Stopka, C. (1995). Factors associated with adherence to sport injury rehabilitation in college-age recreational athletes. Journal of Sport Rehabilitation, 4, 172-180.
- Fisher, A.C. (1990). Adherence to sports injury rehabilitation programmes. Sports Medicine, 9(3), 151-158.
- Fisher, A.C. & Bitting, L.A. (1996). Rehabilitation adherence: Do's and don'ts for both parties. Athletic Therapy Today, 1(5), 42-44
- Fisher, A.C., Domm, M.A., & Wuest, D.A. (1988). Adherence to sports-injury rehabilitation programs. The Physician and Sportsmedicine, 16(7), 47-52.
- Fisher, A.C. & Hoisington, L.L. (1993). Injured athletes' attitudes and judgments toward rehabilitation adherence. Journal of Athletic Training, 28(1), 48-54.
- Fisher, A.C., Mullins, S.A., & Frye, P.A. (1993). Athletic trainers' attitudes and judgments of injured athletes' rehabilitation adherence. Journal of Athletic Training, 28(1), 43-47.
- Fisher, A.C., Scriber, K.C., Matheny, M.L., Alderman, M.H., & Bitting, L.A. (1993). Enhancing athletic injury rehabilitation adherence. Journal of Athletic Training, 28(4), 312-318.

Franklin, B.A. (1988). Program factors that influence exercise adherence: Practical adherence skills for the clinical staff. In R.K. Dishman (Ed.), Exercise Adherence: Its Impact on Public Health. Champaign, IL: Human Kinetics Books.

Gilbourne, D., & Taylor, A.H. (1995). Rehabilitation experiences of injured athletes and their perceptions of a task-oriented goal-setting programme: The application of an action research design. Journal of Sports Sciences, 13(1), 54-55.

Godin, G., Desharnais, R., Valois, P., Lepage, L., Jobin, J., Bradet, R. (1994). Differences in perceived barriers to exercise between high and low intenders: Observations among different populations. American Journal of Health Promotion, 8(4), 279-285.

Hackman, R. M., Katra, J.E., & Geertsen, S.M. (1992). The athletic trainer's role in modifying nutritional behaviors of adolescent athletes: Putting theory into practice. Journal of Athletic Training, 27(3), 262-267.

Heil, J. (1993). A comprehensive approach to injury management. In J. Heil (Ed.), Psychology of Sport Injury. Champaign, IL: Human Kinetics Publishers.

Ice, R. (1985). Long-term compliance. Physical Therapy, 65(12), 1832-1839.

Johnson, R.J. (1991). Help your athletes heal themselves. The Physician and Sportsmedicine, 19(5), 107-110.

Kisner, C. & Colby, L.A. (Eds.). (1985). Therapeutic Exercise: Foundations and Techniques, (2nd ed.) Philadelphia: F.A. Davis Company.

Knapp, D.N. (1988). Behavioral management techniques and exercise promotion. In R.K. Dishman (Ed.), Exercise Adherence: Its Impact on Public Health. Champaign, Illinois: Human Kinetics Books.

Lampton, C.C. & Lambert, M.E., & Yost, R. (1993). The effects of psychological factors in sports medicine rehabilitation adherence. The Journal of Sports Medicine and Physical Fitness, 33(3), 292-299.

Laubauch, W.J., Brewer, B.W., Van Raalte, J.L., & Petipas, A.J. (1996). Attributions for recovery and adherence to sport injury rehabilitation. The Australian Journal of Science and Medicine in Sport 28(1), 30-34.

Lawrance, L., & McLeroy, K.R. (1986). Self-efficacy and health education. Journal of School Health, 56(8), 317-321.

Levitt, R., Deisinger, J.A., Wall, J.R., Ford, L., & Cassisi, J.E. (1995). EMG feedback-assisted postoperative rehabilitation of minor arthroscopic knee surgeries. Journal of Sports Medicine and Physical Fitness, 35, 218-223.

Martin, J.E. & Dubbert, P.M. (1985). Adherence to exercise. In R.L. Terjung (Ed.), Exercise and Sport Sciences Reviews. New York: Macmillan Publishing Company.

Martin, J.E. & Dubbert, P.M. (1982). Exercise applications and promotion in behavioral medicine: Current status and future directions. Journal of Consulting and Clinical Psychology, 50(6), 1004-1017.

Matthews, C.E. & Freedson, P.S. (1995). Field trial of a three-dimensional activity monitor: comparison with self report. Medicine and Science in Sports and Exercise, 27(7), 1071-1078

McCord, E.C. & Brandenburg, C. (1995). Beliefs and attitudes of persons with diabetes. Clinical Research and Methods, 27(4), 267-271.

Meichenbaum, D. & Turk, D.C. (1987). Facilitating Treatment Adherence: A Practitioner's Guidebook. New York, NY: Plenum Press.

Oldridge, N.B. & Jones, N.L. (1983). Improving patient compliance in cardiac exercise rehabilitation: Effects of written agreement and self-monitoring. Journal of Cardiac Rehabilitation, 3, 257-262.

Pargman, D., & Green, L., (1990). The type A behavior pattern and adherence to a regular running program by adult males ages 25 to 39 years. Perceptual and Motor Skills, 70, 1040-1042.

Pease, D.G. (1998). Psychological factors of rehabilitation. In Andrews, J.R., Wilk, K.E., & Harrelson, G.L. (Eds.), Physical Rehabilitation of the Injured Athlete 2nd Ed. Philadelphia, Pennsylvania: W.B. Saunders Company.

Pen, L.J. & Fisher, A.C. (1994). Athletes and pain tolerance. Sports Medicine, 18(5), 319-329.

Petrie, G. (1993). Injury from the athlete's point of view. In J. Heil (Ed.), Psychology of Sport Injury. Champaign IL: Human Kinetics Publishers.

Posavac, E.J., Sinacore, J.M., Brotherton, S.E., Helford, M.C., & Turpin, R.S. (1985). Increasing compliance to medical treatment regimens: A meta-analysis of program evaluation. Evaluation and the Health Professions, 8(1), 7-22.

Robison, J.I. & Rogers, M.A. (1994). Adherence to exercise programmes: Recommendations. Sports Medicine, 17(1), 39-52.

Rotella, R.J. & Heyman, S.R. (1993). Stress, injury, and the psychological rehabilitation of athletes. In J.M. Williams (Ed.), Applied Sport Psychology: Personal Growth to Peak Performance. Mountain View, CA: Mayfield Publishing Company.

Sall, J. & Lehman, A. (1996). JMP Start Statistics: A guide to statistics and data analysis using JMP and JMP IN software. Belmont, CA: Duxbury Press.

Samples, P. (1990). How to communicate with injured athletes. The Physician and Sportsmedicine, 18(7), 125-129.

Satterfield, J.M., Dowden, D., & Yasumura, K. (1990). Patient compliance for successful stress fracture rehabilitation. Journal of Orthopaedic and Sport Physical Therapy, 11(7), 321-325.

Sherbourne, C.D., Hays, R.D., Ordway, L., DiMatteo, M.R., & Kravitz, R.L. (1992). Antecedents of adherence to medical recommendations: Results from the Medical Outcomes Study. Journal of Behavioral Medicine, 15(5), 447-468.

Sluijs, E.M., Kok, G.J., & van der Zee, J. (1993). Correlates of exercise compliance in physical therapy. Physical Therapy, 73(11), 771-782.

Southam, M.A. & Dunbar, J. (1986). Facilitating patient compliance with medical interventions. In K. A. Holroyd & T.L. Creer (Eds.), Self-Management of Chronic Disease: Handbook of Clinical Interventions and Research. Orlando, FL: Academic Press, Inc.

Sperry, L. (1985). Treatment noncompliance and cooperation: Implications for psychotherapeutic, medical, and lifestyle change approaches. Individual Psychology: The Journal of Adlerian Theory, Research & Practice, 41(2), 228-236.

Stegman, M.R., Miller, P.J., Hageman, R.K., Irby, D.E., Kositzky-Klutman, A.K., & Rajek, N.J. (1987). Myocardial infarction survival: How important are patients' attitudes and adherence behaviors? American Journal of Preventive Medicine, 3(3), 147-151.

Taylor, A.H. & May, S. (1996). Threat and coping appraisal as determinants of compliance with sports injury rehabilitation: An application of Protection Motivation Theory. Journal of Sports Sciences, 14, 471-482.

Thomas, J.R. & Nelson, J.K. (Eds.). (1996). Research Methods in Physical Activity, (3rd ed.) Champaign, IL: Human Kinetics.

Udry, E. (1997). Coping and social support among injured athletes following surgery. Journal of Sport and Exercise Psychology, 19, 71-90.

Wayda, V.K., Armenth-Brothers, F., & Boyce, B.A. (1998). Goal setting: A key to injury rehabilitation. Athletic Therapy Today, 3(1), 21-25.

Webborn, A.D.J., Carbon, R.J., Miller, B.P. (1997). Injury rehabilitation programs: "What are we talking about?" Journal of Sport Rehabilitation, 6, 54-61.

Weinberg, D.M. & Gould, D. (1995). Foundations of Sport and Exercise Psychology. Champaign, Illinois: Human Kinetics.

Wiese, D.M., & Weiss, M.R. (1987). Psychology rehabilitation and physical injury: Implications for the sportsmedicine team. The Sport Psychologist, 1, 318-330.

Williams, E., Klesges, R.C., Hanson, C.L., & Eck, L.H. (1989). A prospective study of the reliability and convergent validity of three physical activity measures in a field research trial. Journal of Clinical Epidemiology, 42(12), 1161-1170.

Wing, R.R., Epstein, L.H., Nowalk, M.P., Scott, N., Koeske, R. (1985). Compliance to self-monitoring of blood glucose: A marked-item technique compared with self-report. Diabetes Care, 8(5), 456-460.

Wittig, A.F. & Schurr, K.T. (1994). Psychological characteristics of women volleyball players: Relationships with injuries, rehabilitation, and team success. Personality and Social Psychology Bulletin, 20(3), 322-330.

APPENDIX A

Letter to Therapists Requesting Permission to Obtain Subjects

Hi!

My name is Liane Bailey. I am a Master of Science student at the University of Manitoba and I am also involved in their Athletic Therapy internship program. I am currently initiating my thesis study entitled "An Intervention Strategy to Enhance Therapeutic Exercise Adherence". I will be testing the effect of keeping a daily log sheet on patients' adherence to a prescribed therapeutic home exercise program. Thus, I am asking your permission to obtain subjects from your Athletic Therapy Centre. Subjects will be asked to volunteer and will not be coerced in any way. The type of subjects that I am looking for are those who are of ages 18 to 50 and entering athletic therapy with a new injury requiring at least six weeks of therapy (**due to difficulty in getting subjects, this number was changed to three weeks, following the development of this letter**). He/she must be a recreational athlete: a person who participates in a sport no more than five times per week and for the purpose of enjoying oneself. A recreational athlete cannot be a person participating in an intercollegiate sport at a national or provincial level. A sport is defined as any activity involving physical exertion individually or with a team. It will be an activity participated in for enjoyment and one that is socially recognized as a sport. For this study, a sport will not include activities such as weight lifting, body building aerobics, jogging for fitness, hunting, or fishing. Also, if the subject's team has a team "therapist" or "trainer", he/she must not be in contact with the "therapist" or "trainer" more than twice a week. Each participant must be prescribed a personalized therapeutic home exercise program. I have enclosed an abstract of my study so that you can obtain a greater understanding of what I propose to do.

With your permission, I would like to contact you once a week to find out if you have any new patients who might fit the above description of the type of subject required. I will then come to your clinic and meet with the patient to determine if they have the above qualifications and ask if he/she would be interested in participating in my study.

At the end of my study I would like to obtain from you a record of the dates of the visits made to you by the patients for my data analyze and I would like to conduct an interview with you

at a time that you choose in order to discuss the patient's progress. I will ask you your opinions regarding his/her adherence to the therapeutic exercise program.

I would also like to ask that, in order to assist with the effectiveness of my study, that those patients participating receive a clear outline of the exercises that they are prescribed. I have enclosed a copy of the questionnaire that the subjects will receive and the daily log sheet that some of the subjects will fill out in order for you to understand some of the questions that the subjects will be asked.

If a patient were to complete therapy sooner than you expect (i.e. before my study is over) would it be possible for you ask the patient to continue with the prescribed exercises?

In order to ensure that the patient fills out the instruments honestly, I ask, as well, that you do not question the subject in regards to any aspect of the study, so that he/she will not be influenced regarding any answers that they give me. They must be ensured that confidentiality will be maintained.

I greatly appreciate your assistance in the completion of my study. I will enjoy working with you. Thank-you very much for your time.

Sincerely,

Liane Bailey (B.P.E.)

I can be reached at ***-**** if you have any questions.

APPENDIX B
Consent Form for Control Group

Consent Form

1. My participation in this study has been requested by Liane Bailey who is a University of Manitoba Graduate Student.
2. I understand that the purpose of the research is to obtain a greater understanding of adherence to therapeutic exercises prescribed by an athletic therapist. I will fill out a questionnaire about my therapeutic exercises at two times during the study.
3. My participation will involve completing a form providing background information of myself, including my name, age, injury, profession, sport, and other information of this nature. I will also be asked to rate numerous variables that may or may not influence my exercise behaviour and to complete a questionnaire about my therapeutic exercises at the beginning and end of a four-week period. At the end of the four weeks I will be interviewed by the researcher. I understand that it is important to complete the questionnaire and interview as honestly as possible in order to protect the validity of the study.
4. I understand that the researcher may have to obtain information from the athletic therapist regarding the nature of my injury, my treatment protocol, dates of my treatment, my recovery progress, or other necessary medical information. I understand that this information may be necessary for statistical analysis of the study and I give permission to the researcher to collect such information.
5. If I agree to participate in the study, I know there are no foreseeable risks or discomforts to me, aside from the time it will take me to fill out the questionnaire.
6. I understand that possible benefits include a greater understanding of adherence to my program and the possible development of a tool that a therapist may use to influence other patients' adherence.
7. Though the results of the study may be published, I understand that my name will not be revealed. Confidentiality will be maintained through the use of subject numbers. Information regarding my identity will be kept in the researcher's home where no other person will have access to her filing cabinet.
8. I have been informed that I will not be compensated for my participation.
9. I understand that any questions I may have regarding the study or my participation will be answered by Liane Bailey at ***-**** or her Thesis Advisor Dr. Wendy Dahlgren at ***-****.
10. If I have any questions regarding my rights as a participant in this study, or feel at risk, I can contact the University of Manitoba Committee on Research Involving Human Subjects.
11. I am aware that I may withdraw from this study at any time and without penalty to myself.
12. When it is not possible to fully disclose all information regarding the purpose of the study initially, I understand that participants will be fully informed upon completion of the study.

13. I have read the above information. The nature of the study and its possible benefits have been explained to me. I understand the information and in signing this consent form, know that I am not waiving any legal claims, rights, or remedies. A copy of this consent form will be given to me.

Participant's Signature _____ Date _____

Witness Signature _____ Date _____

14. I have explained the nature of the study and the possible benefits and risks associated with participation in this research study. Questions posed by the participant have been answered and I have witnessed the above signature.

15. I have provided the participant with a copy of this signed consent form.

Researcher's Signature _____ Date _____

APPENDIX C

Consent Form For Experimental Group

Consent Form

1. My participation in this study has been requested by Liane Bailey who is a University of Manitoba Graduate Student. The title of this project is "An Intervention Strategy to Enhance Therapeutic Exercise Adherence".
2. I understand that the purpose of the research is to test and observe any effects of keeping a daily log sheet on therapeutic exercise performance. Prior to, and following the completion of the daily log sheets, a questionnaire about therapeutic exercises will be completed.
3. My participation will involve completing a form providing background information on myself, including my name, age, injury, profession, sport, and other information of this nature. I will also be asked to rate variables that may or may not influence my adherence and to complete a questionnaire about my therapeutic exercises at the beginning and end of a four-week period. During the four weeks I will be asked to complete a daily log sheet, recording the number of times I perform the prescribed exercises and at the end of four weeks I will be interviewed by the researcher. I understand that it is important to complete the questionnaire, daily log sheet, and interview as honestly as possible in order to protect the validity of the study.
4. I understand that the researcher may have to obtain information from the athletic therapist regarding the nature of my injury, my treatment protocol, dates of my treatment, my recovery progress, or other necessary medical information. I understand that this information may be necessary for statistical analysis of the study and I give permission to the researcher to collect such information.
5. If I agree to participate in the study, I know there are no foreseeable risks or discomforts to me, aside from the time it will take me to fill out the daily log sheet.
6. I understand that possible benefits include a positive effect on adherence to my exercise program and the development of a tool that a therapist may use to influence other patients' adherence.
7. Though the results of the study may be published, I understand that my name will not be revealed. Confidentiality will be maintained through the use of subject numbers. Information regarding my identity will be kept in the researcher's home where no other person will have access to her filing cabinet.
8. I have been informed that I will not be compensated for my participation.
9. I understand that any questions I may have regarding the study or my participation will be answered by Liane Bailey at ***-**** or her Thesis Advisor Dr. Wendy Dahlgren at ***-****.
10. If I have any questions regarding my rights as a participant in this study, or feel at risk, I can contact the University of Manitoba Committee on Research Involving Human Subjects.
11. I am aware that I may withdraw from this study at any time and without penalty to myself.
12. When it is not possible to fully disclose all information regarding the purpose of the study initially, I understand that participants will be fully informed upon completion of the study.

13. I have read the above information. The nature of the study and its possible benefits have been explained to me. I understand the information and in signing this consent form, know that I am not waiving any legal claims, rights, or remedies. A copy of this consent form will be given to me.

Participant's Signature _____ Date _____

Witness Signature _____ Date _____

14. I have explained the nature of the study and the possible benefits and risks associated with participation in this research study. Questions posed by the participant have been answered and I have witnessed the above signature.

15. I have provided the participant with a copy of this signed consent form.

Researcher's Signature _____ Date _____

APPENDIX D

THERAPEUTIC EXERCISE ADHERENCE QUESTIONNAIRE

Therapeutic Exercise Questionnaire

A) Stretching Exercises

Please record your prescribed stretching exercise regimen in the spaces provided below.

Name of Exercise	Prescribed # of Days/Week	Prescribed # of Times/Day	Prescribed # of Repetitions	Prescribed Time to Hold Stretch
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				

Please answer each question by circling a score on a scale of 1 to 6 provided with the question. Please try to answer each question as honestly as possible.

Frequency

1) Consider the number of days per week prescribed to perform your stretching exercises. How many of the prescribed days per week do you usually perform your stretching exercises?

- | | | | | | |
|----------|------------------------------|----------|------------------------------|------------|----------------|
| 1 | 2 | 3 | 4 | 5 | 6 |
| none | less than half
prescribed | half | more than half
prescribed | almost all | all prescribed |

If you perform your stretches less days per week than prescribed, please explain why

2) Consider the number of times per day prescribed to perform your stretches. How many of the prescribed times per day do you usually perform your stretches?

- | | | | | | |
|----------|------------------------------|----------|------------------------------|------------|----------------|
| 1 | 2 | 3 | 4 | 5 | 6 |
| none | less than half
prescribed | half | more than half
prescribed | almost all | all prescribed |

If you perform your stretches less times per day than prescribed please explain why

3) Consider the number of stretches prescribed. How many of the prescribed stretches do you usually perform?

1	2	3	4	5	6
none	less than half prescribed	half	more than half prescribed	almost all	all prescribed

If you perform less than all of your prescribed stretches, please explain why

Time to Hold Stretch

1) Consider the amount of time prescribed to hold your stretches. For what portion of the prescribed time do you usually hold each stretch? (For example, I should hold my stretches for 25 seconds but I only hold them for 20. Therefore, I hold my stretches for almost all of the time prescribed.)

1	2	3	4	5	6
none	less than half prescribed	half	more than half prescribed	almost all	all prescribed

If you hold your stretches less than the prescribed amount of time, please explain why

Repetitions

1) Consider the number of repetitions prescribed for each stretch. How many of the prescribed repetitions do you usually perform?

1	2	3	4	5	6
none	less than half prescribed	half	more than half prescribed	almost all	all prescribed

If you perform less than the prescribed amount of repetitions, please explain why

B) Strengthening Exercises

Please record your prescribed strengthening exercise regimen in the spaces provided below.

Name of Exercise	Prescribed # of Days/Week	Prescribed # of Times/Day	Prescribed # of Repetitions	Prescribed # of Sets
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				

Please answer each question by circling a score on a scale of 1 to 6 provided with the question. Please try to answer each question as honestly as possible.

Frequency

1) Consider the number of days per week prescribed to perform your strengthening exercises. How many of the prescribed days per week do you usually perform your strengthening exercises?

1	2	3	4	5	6
none	less than half prescribed	half	more than half prescribed	almost all	all prescribed

If you perform your strengthening exercises less days per week than prescribed, please explain why

2) Consider the number of times per day prescribed to perform your strengthening exercises. How many of the prescribed times per day do you usually perform your strengthening exercises?

1	2	3	4	5	6
none	less than half prescribed	half	more than half prescribed	almost all	all prescribed

If you perform your strengthening exercises less times per day than prescribed, please explain

3) Consider the number of strengthening exercises prescribed. How many of the prescribed strengthening exercises do you usually perform?

1	2	3	4	5	6
none	less than half prescribed	half	more than half prescribed	almost all	all prescribed

If you perform less than the prescribed amount of strengthening exercises, please explain why

Repetitions

1) Consider the number of repetitions prescribed for each strengthening exercise. How many of the prescribed repetitions do you usually perform?

1	2	3	4	5	6
none	less than half prescribed	half	more than half prescribed	almost all	all prescribed

If you usually perform less than the prescribed number of repetitions please explain why

2) Consider the number of sets prescribed for each strengthening exercise. How many of the prescribed sets do you usually perform?

1	2	3	4	5	6
none	less than half prescribed	half	more than half prescribed	almost all	all prescribed

If you usually perform less than the prescribed number of sets, please explain why

Overall Perception

Overall, I think I followed the prescribed exercise program:

- | | | | | | |
|-------|-----------|-----------|-------|---------------|--------|
| 1 | 2 | 3 | 4 | 5 | 6 |
| never | not often | sometimes | often | almost always | always |

APPENDIX E

Daily Log Sheet

Instructions for the Daily Log Sheet

A. Daily Recording

Please fill out the daily log sheet as you perform your exercises. If you do not perform them for a day then do not record anything. Begin by naming the exercise beside Ex. Then list the target protocol given to you by your Athletic Therapist in the appropriate space. For example, if you are to hold a stretch for 25 seconds, then write 25 in the "Target" column beside "Secs. held". As you perform your exercises, record the manner in which you performed them in the appropriate boxes. If you performed them in the morning, then record under the morning column. If you performed your exercises twice in the morning, then put a slash through the box and record both numbers in one box, or you can change the name of another column.

B. Rating How You Feel

At the bottom of the sheet there is a box to rate how you felt at the end of each session on a scale of 0 to 10. Please rate how you were feeling at that time. Zero is very, very, poorly and 10 is one hundred per cent. When you complete the week, please total each of the rating scores and divide them by the number of times you recorded a rating. This will give you an average score for the week. I encourage you to carry these log sheets with you so you can be reminded to perform your exercises. Please see the example below:

	Target	SUNDAY			MONDAY			TUESDAY			WEDNESDAY		
Ex. Hams. Stretch	IIIIIIII	M	A	E	M	A	E	M	A	E	M	A	E
# of sec. held	25	20		25	15/25		25				23	20	15
# of reps. performed	5	3		5	2/5		5				4	5	1
# of sets performed													
Ex. Pelvic Tilt													
# of sec. held													
# of reps. Performed	10	10	8	8	10/5		10				10	8	9
# of sets performed	3	3	2	3	3/1		3				3	3	2
How Do I Feel on a Scale of 0 to 10?	IIIIIIIIII IIII	7	4	6	9		9				9	6	6
Total Score for Seven Days = Total Score of "How Do I Feel?" for all sessions divided by the number of times the score was recorded = 56/8 = 7													

M = Morning A = Afternoon E = Evening

Daily Log Sheet for Exercise Recording

	Target	SUNDAY			MONDAY			TUESDAY			WEDNESDAY		
Ex.		M	A	E	M	A	E	M	A	E	M	A	E
# of sec. held													
# of reps. performed													
# of sets performed													
Ex.													
# of sec held													
#of reps. Performed													
#of sets performed													
Ex.													
# of sec. held													
#of reps. Performed													
#of sets performed													
Ex.													
# of sec. held													
#of reps. Performed													
#of sets performed													
Ex.													
# of sec. held													
#of reps. Performed													
#of sets performed													
Ex.													
# of sec. held													
#of reps. Performed													
#of sets performed													
Ex.													
# of sec. held													
#of reps. Performed													
#of sets performed													
Ex.													
# of sec. held													
#of reps. Performed													
#of sets performed													
How Do I Feel on a Scale of 0 to 10?	 												

Total Score for Seven Days = Total Score of "How Do I Feel?" for all sessions divided by the number of times the score was recorded =

	Target	THURSDAY			FRIDAY			SATURDAY			COMMENTS
Ex.		M	A	E	M	A	E	M	A	E	
# of sec. held											
# of reps. performed											
# of sets performed											
Ex.											
# of sec. held											
#of reps. Performed											
#of sets performed											
Ex.											
# of sec. held											
#of reps. Performed											
#of sets performed											
Ex.											
# of sec. held											
#of reps. Performed											
#of sets performed											
Ex.											
# of sec. held											
#of reps. Performed											
#of sets performed											
Ex.											
# of sec. held											
#of reps. Performed											
#of sets performed											
Ex.											
# of sec. held											
#of reps. Performed											
#of sets performed											
How Do I Feel on a Scale of 0 to 10?	 										
Total Score for Seven Days = Total Score of "How Do I Feel?" for all sessions divided by the number of times the score was recorded =											

APPENDIX F

Variable Rating Sheet

Variables That Affect Patients' Adherence

Please rate each of the following variables on their effect on your adherence. One is no effect at all, and 6 is a very large effect.

	No Effect				Large Effect	
	1	2	3	4	5	6
Support from Significant Others	1	2	3	4	5	6
Interaction with the Athletic Therapist	1	2	3	4	5	6
Respect for the Athletic Therapist	1	2	3	4	5	6
Setting Your Own Goals	1	2	3	4	5	6
Knowledge about Your Injury and Therapy	1	2	3	4	5	6
Filling Out a Daily Log Sheet	1	2	3	4	5	6
Self-Motivation	1	2	3	4	5	6
Your Beliefs About the Importance of Therapy	1	2	3	4	5	6
Others (Please Name)	1	2	3	4	5	6
_____	1	2	3	4	5	6
_____	1	2	3	4	5	6
_____	1	2	3	4	5	6
_____	1	2	3	4	5	6

Additional Comments:

APPENDIX G

Background Information Sheet

**Patient Information
(Confidential)**

Name: _____

Address: _____

Phone Number: _____

Sex (Please circle): Male or Female

Injury (you can get your Athletic Therapist to help you with this if necessary):

Method of payment for treatment services (i.e. autopac, insurance company, student accident plan, my own pocket):

Age: _____

Employment (If applicable):

Student (Please circle) YES NO

Sport(s) participating in presently (or would be participating in if you were not injured):

Have you ever been injured previously? YES NO

If yes:

a) What was the nature of your injury(ies)?

b) Did you receive athletic therapy and when?

c) Where did you seek athletic therapy?

d) How long did your previous injury(ies) last?

Please note that the above information will remain confidential.

APPENDIX H

Interview Questions

Interview Questions for the Control Group

1) Do you feel that you **always** adhered to your prescribed therapeutic home exercise program? Please rate your overall level of adherence on a scale of 1 to 6.

2) When you did perform your exercises, did you usually perform all or part of your prescribed program?

3) Do you feel that your level of adherence changed throughout the last four weeks?

4) If yes, then:

a) How did it change?

b) When did it change? Is there a point in time when you stopped adhering or increased your adherence?

c) Why did it change? Are there specific reasons for the change?

5) In general, what factors do you think would contribute to a) adherence and b) non-adherence?

6) Can you suggest some methods that might help you increase your level of adherence?

7) Are you normally the type of person that likes to keep lists to ensure that you get certain tasks completed? Do you normally keep daily log sheets to complete your exercises?

8) Do you have any suggestions for future research?

Interview Questions for the Experimental Group

- 1) Do you feel that you always adhered to your prescribed therapeutic home exercise program? Please rate your overall level of adherence on a scale of 1 to 6.

- 2) When you did perform your exercises, did you usually perform all or part of your prescribed program?

- 3) Do you feel that your level of adherence changed throughout the last four weeks?

- 4) If yes, then:
 - a) How did it change?
 - b) When did it change? Is there a point in time when you stopped adhering or increased your adherence?
 - c) Why did it change? Are there specific reasons for the change?

- 5) In general, what factors do you think would contribute to a) adherence and b) non-adherence?

- 6) How do you feel about the daily log sheets that you kept? Do you feel that they assisted you in adhering to your prescribed therapeutic home exercise program?

- 7) Do you have any suggestions to improve this log sheet?

- 8) Can you suggest some other methods that might help you to adhere to your program?

9) Are you normally the type of person that likes to keep lists to ensure that you get certain tasks completed? Do you normally keep daily log sheets to complete your exercises?

10) Do you have any suggestions for future research?

APPENDIX I

Questions for the Athletic Therapist

Questions for the Athletic Therapist

- 1) When considering the progress of your patient and using your experience, do you think your patient had full adherence to the therapeutic home exercise program that you prescribed?

- 2) Do you think that your patient adhered in some manner if not fully? Can you describe the manner in which you feel your patient adhered? For example, do you feel he/she adhered to all of the exercises but didn't perform them as often as prescribed or perhaps, he/she performed exercises often, but not all that were prescribed?

- 3) Can you rate your patient's adherence on a scale of 1 to 6? One means that the patient never performed his/her exercises and 6 means that your patient always performed his/her exercises.

- 4) Could you give me a record of the days that your patient came in for therapy?

APPENDIX J

**Raw Data from Therapeutic Exercise Questionnaire:
Question Regarding Adherence to the Number of Prescribed Stretches**

**Questionnaire Scores for the Question About Adherence to Stretching Frequency:
Number of Stretches Performed**

Subject Number	Score on Questionnaire #1	Score on Questionnaire #2	Outcome (increased or decreased)	Initial Score (3 and below or above)
<u>Non - Treatment Group</u>				
S2	6	5	d	a
S4	6	6	m	a
S6	6	6	m	a
S8	6	6	m	a
S10	6	5	d	a
S12	5	6	m	a
S14	6	5	d	a
S16	6	3	d	a
S18	4	4	m	a
S20	6	6	m	a
S22	6	6	m	a
S26	5	6	m	a
S28	6	6	m	a
S30	6	1	d	a
S34	6	5	d	a
S38	5	5	m	a
S40	6	5	d	a
S42	?	6		
<u>Treatment Group</u>				
S3	5	5	m	a
S5	6	6	m	a
S7	6	5	d	a
S9	5	6	m	a
S13	6	6	m	a
S15	6	5	d	a
S17	6	6	m	a
S19	6	5	d	a
S21	5	5	m	a
S27	6	3	d	a
S29	6	6	m	a
S33	6	6	m	a
S35	6	5	d	a
S37	5	2	d	a
S39	6	6	m	a

m = maintained/increased d = decreased a = above b = below

APPENDIX K

**Raw Data from Therapeutic Exercise Questionnaire:
Question Regarding Adherence to the Prescribed Time to Hold Stretches**

Questionnaire Scores for the Question About Adherence to Stretching Time

Subject Number	Score on Questionnaire #1	Score on Questionnaire #2	Outcome (increased or decreased)	Initial Score (3 and below or above)
<u>Non - Treatment Group</u>				
S2	6	6	m	a
S4	5	6	m	a
S6	6	6	m	a
S8	5	5	m	a
S10	6	6	m	a
S12	6	6	m	a
S14	6	5	d	a
S16	6	5	d	a
S18	6	6	m	a
S20	6	5	d	a
S22	6	6	m	a
S26	6	6	m	a
S28	6	6	m	a
S30	6	1	d	a
S34	6	6	m	a
S38	6	6	m	a
S40	5	6	m	a
S42	?	6		
<u>Treatment Group</u>				
S3	5	5	d	a
S5	6	5	d	a
S7	6	6	m	a
S9	6	6	m	a
S13	6	6	m	a
S15	5	5	m	a
S17	6	6	m	a
S19	5	5	m	a
S21	3	3	m	a
S27	5	6	m	a
S29	5	5	m	a
S33	6	6	m	a
S35	6	6	m	a
S37	6	6	m	a
S39	6	6	m	a

m = maintained/increased d = decreased a = above b = below

APPENDIX L

**Raw Data from Therapeutic Exercise Questionnaire:
Question Regarding Adherence to the Prescribed Stretching Repetitions**

Questionnaire Scores for the Question About Adherence to Stretching Repetitions

Subject Number	Score on Questionnaire #1	Score on Questionnaire #2	Outcome (increased or decreased)	Initial Score (3 and below or above)
<u>Non - Treatment Group</u>				
S2	5	6	m	a
S4	6	6	m	a
S6	5	6	m	a
S8	6	4	d	a
S10	6	5	d	a
S12	6	6	m	a
S14	6	5	d	a
S16	6	5	d	a
S18	6	6	m	a
S20	5	6	m	a
S22	6	6	m	a
S26	5	6	m	a
S28	6	6	m	a
S30	6	1	d	a
S34	6	5	d	a
S38	6	6	m	a
S40	6	6	m	a
S42	?	5		
<u>Treatment Group</u>				
S3	5	5	m	a
S5	5	5	m	a
S7	5	6	m	a
S9	5	6	m	a
S13	6	6	m	a
S15	6	5	d	a
S17	6	6	m	a
S19	5	6	m	a
S21	5	4	d	a
S27	6	6	m	a
S29	5	5	m	a
S33	6	6	m	a
S35	6	5	d	a
S37	6	6	m	a
S39	6	6	m	a

APPENDIX M

Raw Data from Therapeutic Exercise Questionnaire: Question Regarding Adherence to the Prescribed Number of Strengthening Exercises

**Questionnaire Scores for the Question About Adherence to Strengthening Frequency:
Number of Exercises**

Subject Number	Score on Questionnaire #1	Score on Questionnaire #2	Outcome (increased or decreased)	Initial Score (3 and below or above)
<u>Non - Treatment Group</u>				
S2	5	5	m	a
S4	6	6	m	a
S6	4	4	m	a
S8	6	6	m	a
S10	6	5	d	a
S12	?	?		
S14	6	5	d	a
S16	6	5	d	a
S18	?	?		
S20	6	6	m	a
S22	6	6	m	a
S26	6	6	m	a
S28	?	?		
S30	6	1	d	a
S34	6	5	d	a
S38	6	6	m	a
S40	6	6	m	a
S42	6	6	m	a
<u>Treatment Group</u>				
S3	5	5	m	a
S5	5	5	m	a
S7	5	4	d	a
S9	5	6	m	a
S13	6	6	m	a
S15	6	4	d	a
S17	6	6	m	a
S19	6	5	d	a
S21	6	5	d	a
S27	6	3	d	a
S29	6	6	m	a
S33	6	6	m	a
S35	6	6	m	a
S37	4	2	d	a
S39	?	2		a

m = maintained/increased d = decreased a = above b = below

APPENDIX N

An Example of Little Variation In Strengthening Exercise Repetition Scores

Raw Data Indicating Little Variation in Strengthening Exercise Repetition Scores

Subject Number	Repetitions		Sets		Combined Scores	
	Time #1	Time #2	Time #1	Time #2	Time #1	Time #2
<u>Treatment Group</u>						
S3	5	5	5	5	10	10
S5	6	5	6	6	12	11
S7	5	5	5	5	10	10
S9	5	6	5	6	10	12
S13	6	6	6	6	12	12
S15	6	4	6	5	12	9
S17	4	4	?	6	?	10
S19	5	5	6	6	11	11
S21	6	5	6	5	12	10
S27	6	6	6	6	12	12
S29	6	6	6	6	12	12
S33	6	6	6	6	12	12
S35	5	5	6	5	11	10
S37	6	6	5	6	11	12
S39	?	6	?	6	?	?
<u>Non-Treatment Group</u>						
S2	6	6	6	5	12	11
S4	6	5	6	6	12	11
S6	6	6	6	6	12	12
S8	6	5	5	6	11	11
S10	6	5	6	5	12	10
S12	?	?	?	?	?	?
S14	6	5	6	5	12	10
S16	6	6	6	6	12	12
S18	?	?	?	?	?	?
S20	6	6	6	6	12	12
S22	6	6	6	6	12	12
S26	6	6	5	6	11	12
S28	?	?	?	?	?	?
S30	6	1	6	1	12	2
S34	5	5	5	5	10	10
S38	6	5	6	5	12	10
S40	5	6	6	6	11	12
S42	6	6	6	6	12	12

APPENDIX O

**Raw Data from Therapeutic Exercise Questionnaire:
Question Regarding Adherence to the Prescribed Number of Strengthening
Exercise Repetitions**

Questionnaire Scores for the Question About Adherence to Strengthening Repetitions

Subject Number	Score on Questionnaire #1	Score on Questionnaire #2	Outcome (increased or decreased)	Initial Score (6 and below or above)
<u>Non - Treatment Group</u>				
S2	12	11	d	a
S4	12	11	d	a
S6	12	12	m	a
S8	11	11	m	a
S10	12	10	d	a
S12	?	?		
S14	12	10	d	a
S16	12	12	m	a
S18	?	?		
S20	12	12	m	a
S22	12	12	m	a
S26	11	12	m	a
S28	?	?		
S30	12	2	d	a
S34	10	10	d	a
S38	12	10	d	a
S40	11	12	m	a
S42	12	12	m	a
<u>Treatment Group</u>				
S3	10	10	m	a
S5	12	11	d	a
S7	10	9.5	d	a
S9	10	12	d	a
S13	12	12	m	a
S15	12	9	d	a
S17	?	10		
S19	11	11	m	a
S21	12	10	d	a
S27	12	12	m	a
S29	12	12	m	a
S33	12	12	m	a
S35	11	10	d	a
S37	11	12	m	a
S39	?	12		

APPENDIX P

Tallies of Scores Given on the Variable Rating Sheet

**Tallies of Scores Given by the Experimental Group to Items on the Variable Rating Sheet
(ie. number of people who scored each score)**

Variable	Scores					
	1	2	3	4	5	6
Support From Significant Others	2	2	2	3	3	3
Interaction With the Therapist		1	2	3	3	6
Respect for the Athletic Therapist			3	3	3	6
Setting Goals			2	3	6	5
Knowledge About Your Injury and Therapy			3	1	6	4
Self Motivation			2	3	7	3
Your Beliefs About the Importance of Therapy			2	3	6	4
Other:						
Needing to Perform Job Responsibilities						1
Time					2	
Consistency					1	
Desire to Become Well						1
Work Place Support						1
To Try Anything to Feel Better Long Term					1	
Return to Competition					1	
Pain vs. No Pain						1
Having the Necessary Equipment					1	
Guilt					1	
Filling Out a Daily Log Sheet	2	1	1	7	3	1

Comments:

- I have found it difficult to get excessive workouts in because of my daily work schedule. Sometimes I feel I could do more
- I think the log sheet was a good reminder - it still comes back to self-motivation.
- Some people set goals, which they are unable to meet. It is important to consistently follow the plan in order to correctly follow the results.
- A patient is not just a "number", but becomes part of the whole "family" setting.
- I felt I started to do the stretching better as I went along because I could feel the results.

**Tallies of Scores Given by the Control Group to Items on the Variable Rating Sheet
(ie. number of people who scored each score)**

Variable	Scores					
	1	2	3	4	5	6
Support From Significant Others	9		4	1	1	3
Interaction With the Therapist	1	1	2	3	5	6
Respect for the Athletic Therapist	1		2	3	7	4
Setting Goals		2	1	4	6	5
Knowledge About Your Injury and Therapy		1	1	6	3	7
Self Motivation	1		1	2	10	4
Your Beliefs About the Importance of Therapy		1	3	2	7	5
Other:						
Pain					3	1
Other Activities					1	
Participating With Significant Other					1	
Time Management						2
Available Facility					1	
See Results						2
Feel Better						1
Filling Out a Daily Log Sheet	11	3	1	2		1

Comments:

- Mostly the knowledge of what exactly stretching could do for my injury was what made me adhere.

APPENDIX Q

Examples of Discrepancies Between Subjects' Perceptions of Adherence and Therapists' Perceptions

Examples of Discrepancies Between Subjects' Perception of Adherence and Therapists' Perceptions

Example 1

Therapist Response: Patient had full adherence, did all of the exercises, all of the time. Overall rating: 5 - 6 (on a scale of 1 to 6, 1 = no adherence at all, 6 = 100% adherence.)

Subject (S27) Response:

The following is a list of Subject 27's scores to each question on both the first and second questionnaire. The subject answered each question on a Likert scale from 1 (none) to 6 (all prescribed). These scores will be compared to the therapist's perception of the same subject's adherence.

(Q1 = score on first questionnaire, Q2 = score on second questionnaire)

1. Question about number of days per week that stretches were performed:	Q1 = 2, Q2 = 3
2. Question about times per day that stretches were performed:	Q1 = 3, Q2 = 2
3. Question about the number of prescribed stretches that were performed:	Q1 = 6, Q2 = 3
4. Question about the time prescribed to hold stretching exercises:	Q1 = 5, Q2 = 6
5. Question about stretching repetition:	Q1 = 6, Q2 = 6
6. Question about the number of days per week that strengthening exercises were performed:	Q1 = 6, Q2 = 3
7. Question about the times per day that strength exercises were performed:	Q1 = 6, Q2 = 5
8. Question about the number of prescribed strength exercises performed:	Q1 = 6, Q2 = 3
9. Question about the repetition prescribed for strength exercises:	Q1 = 12, Q2 = 12
10. Question about the subject's overall perception of adherence:	Q1 = 4, Q2 = 3

In Example 1, it can be seen that the therapist expected much better adherence of the

patient than what really occurred. The therapist believed that the patient had close to full adherence but if the scores are examined, it is obvious that the subject scored low on the frequency that stretches were to be performed and decreased on the number of strength exercises that were to be performed. This subject decreased in adherence over the four weeks on the number of exercises that were prescribed yet performed them well in the manner that they were prescribed (ie. time to hold stretch). The subject's score on overall perception dropped from a 4 to a 3 over the four-week period. The therapist gave this subject an overall rating of 5/6. Thus, it appears that the therapist overestimated the adherence of this subject.

Example 2

Therapist Response: No, patient did not adhere fully, did not perform all of the exercises, and did not perform them all of the time. Overall rating: 4 - 5 (on a scale of 1 to 6. 1 = no adherence at all, 6 = 100% adherence.)

Subject (S19) Response:

The following is a list of Subject 19's scores to each question on both the first and second questionnaire. The subject answered each question on a Likert scale from 1 (none) to 6 (all prescribed). These scores will be compared to the therapist's perception of the same subject's adherence.

(Q1 = score on first questionnaire, Q2 = score on second questionnaire)

- | | |
|---|-----------------------|
| 1. Question about number of days per week that stretches were performed: | Q1 = 6, Q2 = 5 |
| 2. Question about times per day that stretches were performed: | Q1 = 6, Q2 = 6 |
| 3. Question about the number of prescribed stretches that were performed: | Q1 = 6, Q2 = 5 |
| 4. Question about the time prescribed to hold stretching exercises: | Q1 = 5, Q2 = 5 |
| 5. Question about stretching repetition: | Q1 = 5, Q2 = 6 |

6. Question about the number of days per week that strengthening exercises were performed:	Q1 = 6, Q2 = 6
7. Question about the times per day that strength exercises were performed:	Q1 = 6, Q2 = 5
8. Question about the number of prescribed strength exercises performed:	Q1 = 6, Q2 = 5
9. Question about the repetition prescribed for strength exercises:	Q1 = 11, Q2 = 11
10. Question about the subject's overall perception of adherence:	Q1 = 6, Q2 = 5

In this situation the therapist was fairly accurate in describing the subject as not fully adhering to frequency or the number of exercises that were performed. It can be observed that the subject's score dropped for the frequency that stretching exercises were to be performed, and for the times per day that strengthening exercises were to be performed. As well, this subject dropped in score on the number of stretches and strength exercises that were to be performed. The subject performed the stretches in the manner that was prescribed and didn't quite adhere completely to the repetition for the strength exercises. The subject's overall perception decreased from a 6 to a 5 and the therapist rated this subject as a 4/5. In this case the therapist was relatively accurate in describing the subject's adherence. However, as the subject scored relatively high, if anything, the therapist underestimated the subject's adherence in a minor way, as can be observed by the overall perception score the subject gave him/herself, and the overall score that the therapist gave the subject.