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THE EFFECT OF TWO COGNITIVE-BEHAVIOURAL INTERVENTIONS ON PATIENT ADHERENCE TO PHYSIOTHERAPY REHABILITATION

Sandra Frances Bassett

A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy in the Department of Sport and Exercise Science, The University of Auckland, 2005.
ABSTRACT

The research in this thesis used prospective randomised controlled trials to evaluate two cognitive-behavioural interventions designed to improve adherence to physiotherapy in patients with ankle sprains. In Study 1, a DVD and written intervention grounded in Protection Motivation Theory (PMT: Rogers, 1983) and assessment tools were developed and piloted. In the pilot 31 patients were randomized into one of three treatment conditions (PMT, attention control and non-contact control). Following the intervention patients beliefs toward physiotherapy and injury were assessed. Compared to the two controls, the PMT group had significantly higher scores on severity, vulnerability and response efficacy. No differences were found for self-efficacy or intentions. Both response efficacy and self efficacy were significantly related to intentions. Based on these findings, the self-efficacy component of the PMT DVD was revised.

Study 2 (n = 71), an identical three group design, tested the PMT-based intervention’s effect on beliefs, intentions, adherence and functional outcomes. Before physiotherapy, antecedents to adherence (motivation, pain, and subjective norm) and functional outcomes were measured, then the intervention was given, and beliefs and intentions evaluated. Adherence to clinic and home physiotherapy was assessed throughout the treatment programme and functional outcomes again at the end of treatment. Compared to the two controls, the intervention group was significantly higher on all PMT beliefs barring self-efficacy. No significant group differences were found for intentions, adherence and post-physiotherapy functional outcomes. Significant relations occurred between the antecedents, PMT beliefs, intentions, adherence and functional outcomes. The lack of group differences on intention, adherence and functional outcome was attributed to most participants having previously had physiotherapy and antecedent scores that typify highly adherent patients.

Study 3 (n = 47) compared a home-based programme steeped in adherence enhancing strategies with its traditional clinic counterpart. Psychological variables (antecedents, locus of control, and anxiety) and functional outcomes were measured before and after the course of physiotherapy, and adherence during. No group differences occurred on either the psychological or functional outcome variables. Compared to the clinic group,
the home-based participants required significantly less clinic appointments, had a higher percentage of attendance and a significantly better completion rate. No group differences existed for their adherence to the physiotherapy. Significant relations occurred between psychological variables, adherence, and functional outcomes. Findings suggest home-based physiotherapy is a viable, safe treatment option.
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# TABLE OF CONTENTS

Abstract .................................................................................................................................... i 

Acknowledgements ............................................................................................................... iii 

List Of Tables ...................................................................................................................... xii 

List Of Figures ..................................................................................................................... xiv 

Introduction ............................................................................................................................. 1 

Chapter One Statement Of The Problem ................................................................................3 

The Problem Of Poor Adherence In Physiotherapy ............................................................... 3 

Justification Of The Proposed Research ................................................................................. 5 

Rationale For The Injury Of Focus ........................................................................................ 8 

Significance Of The Research ................................................................................................9 

Summary ................................................................................................................................. 9 

Chapter Two Methodological Issues In The Study Of Adherence To Physiotherapy And 
The Adherence-Functional Outcome Relationship ............................................................... 11 

Problems Of Studying Adherence ........................................................................................ 11 

Definition Of Adherence ...................................................................................................... 14 

Measurement Of Adherence ................................................................................................. 15 

Patient Attendance At Rehabilitation Sessions ................................................................... 15 

Adherence To Clinic-Based Physiotherapy ......................................................................... 16 

Measurement Of Adherence To Home-Based Rehabilitation .............................................. 18 

Relationship Between Rehabilitation Adherence And Functional Outcomes ................. 20 

Summary ............................................................................................................................... 24 

Chapter Three Antecedents Of Adherence And The Theoretical Models Used In The Study 
Of Adherence ......................................................................................................................... 26 

Antecedents Of Rehabilitation Adherence ........................................................................... 26 

Patients’ Personal Characteristics ....................................................................................... 26
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Introduction</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Development Of PMT Information</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td>Development Of The Beliefs About Ankle Sprains And Physiotherapy Scale</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td>Development Of The Intentions To Adhere To The Physiotherapy Questionnaire</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>Preliminary Testing Of The PMT-Based Intervention, The BASPS And The Intentions To Adhere Questionnaire</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>Face Validity Checks</td>
<td>64</td>
</tr>
<tr>
<td>Pilot Study</td>
<td>Hypotheses</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Method</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Participants</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Study Design</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Measures</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>Procedure</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>Data Analysis</td>
<td>68</td>
</tr>
<tr>
<td>Results</td>
<td>Group Equivalency</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>Beliefs About Sprain And Physiotherapy</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>Intentions To Adhere To Physiotherapy And Attend Clinic Appointments</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>Relations Between The PMT Variables, Intentions To Adhere And Attend, And Percentage Of Attendance</td>
<td>70</td>
</tr>
<tr>
<td>Discussion</td>
<td>Beliefs About The Sprain And Physiotherapy</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>Intentions To Attend And Adhere To The Physiotherapy</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>Relations Between Intentions To Adhere And The PMT Variables</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td>Strengths And Limitations</td>
<td>76</td>
</tr>
<tr>
<td>Chapter Seven</td>
<td>Adherence To Physiotherapy Rehabilitation For Ankle Sprains: A Test Of Protection Motivation Theory Study 2</td>
<td>78</td>
</tr>
<tr>
<td>Introduction</td>
<td></td>
<td>78</td>
</tr>
<tr>
<td>Purposes And Hypotheses</td>
<td></td>
<td>78</td>
</tr>
<tr>
<td>Methods</td>
<td></td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>Participants</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>Study Design</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>Measures</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Demographic Characteristics</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>Antecedents To Adherence</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>Adherence</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>Ankle Function</td>
<td>85</td>
</tr>
</tbody>
</table>
Procedure .......................................................................................................................... 87

Results ................................................................................................................................... 88
Group Equivalency .................................................................................................................. 88
Beliefs About Injury And Physiotherapy Group Differences .............................................. 94
Intentions To Adhere To The Physiotherapy Group Differences ....................................... 97
Attendance At Physiotherapy And Adherence Behaviours Group Differences ................... 98
Functional Outcomes ......................................................................................................... 101
Pre And Post Physiotherapy Ankle Function ..................................................................... 101
Changes In Ankle Function Over The Duration Of The Course Of Physiotherapy ............ 101
Relations Between Antecedents To Adherence, PMT-Based Beliefs, Intentions, Behaviours And Pre- And Post- Physiotherapy Ankle Function ........................................ 103
Predictors Of Beliefs About The Injury And Physiotherapy, Intentions To Adhere, Adherence Behaviours And Post-Physiotherapy Ankle Function ...................................... 110
Predicting Intention ........................................................................................................... 110
Predicting Adherence ......................................................................................................... 110
Predicting Ankle Function .................................................................................................. 110

Discussion ............................................................................................................................ 111
The Effects Of The PMT Intervention On The Beliefs About The Sprain And Physiotherapy – Hypothesis 1 ........................................................................................................... 111
Intentions To Adhere And Attend Physiotherapy – Hypothesis 2 ...................................... 113
The Effects Of The PMT-Based Intervention On Adherence Behaviours – Hypothesis 3 ................................................................................................................................. 114
Effect Of The Intervention On Ankle Function – Hypothesis 4 ........................................ 115
Relations Between The Antecedents To Adherence, PMT-Based Beliefs, Intentions To Adhere, Adherence Behaviours And Pre- And Post-Physiotherapy Ankle Function – Hypothesis 5 ......................................................................................................................... 116
Antecedents ....................................................................................................................... 116
PMT-Based Beliefs About The Ankle Sprain And Physiotherapy ..................................... 116
Intentions ............................................................................................................................. 117
Adherence ............................................................................................................................ 118
Strengths And Limitations Of The Study ........................................................................... 120
Summary .............................................................................................................................. 120

Chapter Eight Home-Based Physiotherapy With Adherence Enhancing Strategies Versus Clinic-Based Management Study 3 .................................................................................. 122

Introduction ......................................................................................................................... 122

Purposes And Hypotheses .................................................................................................... 125

Methods ............................................................................................................................... 126
Participants .......................................................................................................................... 126
Study Design ....................................................................................................................... 127
Measures ............................................................................................................................... 127
Demographic Characteristics ............................................................................................. 127
Appendix 23  Recovery Locus Of Control Scale ...............................................................208

Appendix 24  State-Trait Anxiety Inventory (STAI)............................................................209

Appendix 25 Booklet ........................................................................................................210

Appendix 26 Cue Cards .....................................................................................................233

Appendix 27 Participant Information Sheet Study 3 .........................................................235

Appendix 28 Consent Form Study 3 ..................................................................................239

References ...........................................................................................................................240
# LIST OF TABLES

Table 1. *The Three Intervention Groups' Demographic and Ankle Sprain Characteristics and Antecedents to Adherence* .............................................................................................................69

Table 2. *BASPS Descriptive Data and Analysis of Variance for PMT, Threat and Coping Appraisal Variables of the Three Intervention Groups* ..........................................................71

Table 3. *Descriptive Data and Analysis of Variance of the Groups' Intentions to Adhere to the Physiotherapy* ..................................................................................................................72

Table 4. *Correlations of the Intentions to Adhere, PMT Variables and Percentage of Recommended Clinic Appointments Attended* ........................................................................73

Table 5. *The Three Intervention Groups' Demographic Characteristics* ..........................................................90

Table 6. *Reasons for Choosing and Convenience of the Clinic, Mode of Transport to Treatment for the Three Intervention Groups* ........................................................................91

Table 7. *Characteristics of the Ankle Sprains for the Three Intervention Groups at the Beginning of the Physiotherapy Rehabilitation* ....................................................................92

Table 8. *The Three Intervention Groups' Descriptive Data for the Antecedents of Adherence* ...............................................................................................................................93

Table 9. *Antecedents of Adherence for the Three Intervention Groups* .................................................................94

Table 10. *Descriptive Data for the Three Intervention Groups' PMT Variables, Threat and Coping Appraisals and Protection Motivation* .......................................................................95

Table 11. *Analysis of Variance of the Three Intervention Groups' PMT Variables, Threat and Coping Appraisals and Protection Motivation* ..................................................................96

Table 12. *Intervention Groups' Descriptive Data for their Intentions to Attend the Clinic Appointments and Adhere to the Clinic- and Home-Based Physiotherapy* ...........................................97

Table 13. *Analysis of Variance of the Three Intervention Groups' Intentions to Attend the Clinic Appointments and Adhere to the Clinic- and Home-Based Physiotherapy* .................97

Table 14. *Descriptive Data for Attendance at Clinic Appointments and Adherence to Clinic- and Home-Based Physiotherapy* ..........................................................................................99

Table 15. *Statistical Comparison of the Three Intervention Groups' Attendance at Physiotherapy and Adherence to Clinic- and Home-Based Physiotherapy* ..................................................100

Table 16. *Descriptive Data of the Intervention Groups' Pre- and Post-Physiotherapy Ankle Function* ..........................................................................................................................102

Table 17. *Analysis of Variance of the Groups' Pre- and Post-Physiotherapy Scores on the LLTQ Subscales and the Motor Activity Scale* ..............................................................................103

Table 18. *Correlations of Antecedents to Adherence, PMT-Based Beliefs, Intentions to Adhere, Adherence Behaviours and Pre- and Post-Physiotherapy Ankle Function* .......................105

Table 19. *Correlations of PMT-Based Beliefs, Intentions to Adhere, Adherence Behaviours and Pre- and Post-Physiotherapy Ankle Function* ...........................................................................107
Table 20. Correlations of Intentions to Adhere to the Physiotherapy, Adherence Behaviours and Pre- and Post-Physiotherapy Ankle Function .................................................................108

Table 21. Correlations of Adherence Behaviours and Pre- and Post-Physiotherapy Ankle Function ........................................................................................................................109

Table 22. Demographic Characteristics of the Three Intervention Groups .................................................................137

Table 23. Reasons for Choosing and Convenience of the Clinic, Mode of Transport to Treatment for the Three Intervention Groups .................................................................................138

Table 24. Characteristics of the Ankle Sprains for the Groups at the Beginning of the Physiotherapy Rehabilitation ............................................................................................................139

Table 25. Descriptive Data for the Groups’ Clinic Appointments, Percentage of Attendance, Completion Rate and Clinic- and Home-Based Adherence Behaviours ..........................140

Table 26. One-Way Analysis of Variance for Clinic Attendance and Clinic- and Home-Based Adherence for the Two Intervention Groups ................................................................................141

Table 27. Descriptive Data for the Groups’ Pre- and Post-Physiotherapy Functional Outcome Measurements ................................................................................................................142

Table 28. Groups’ Descriptive Data for the Groups’ Pre- and Post-Physiotherapy Scores on the Psychological Measures ........................................................................................................145

Table 29. Correlations of Adherence Scores and Pre- and Post Physiotherapy Ankle Function ..........................................................................................................................147

Table 30. Correlations between Clinic- and Home-based Adherence Scores and Psychological Variables measured at the Beginning and End of the Course of Physiotherapy ..................................................................................................................149

Table 31. Correlations of Pre- and Post-Physiotherapy Psychological Variables and Ankle Function ..........................................................................................................................150
LIST OF FIGURES

Figure 1. Schematic representation of the Protection Motivation Theory (Rogers, 1983) .37
Figure 2. Design of study that investigated the effectiveness of the PMT intervention ..........81
Figure 3. Study design of traditional clinic versus home-based management of ankle sprains ..................................................................................................................................................128
Figure 4. The group x time interaction effect for the LLTQ functional activity subscale...143
INTRODUCTION

Patients with dysfunctional movement seek physiotherapy rehabilitation to alleviate their symptoms and improve their mobility, strength and functional ability. Yet in spite of wanting symptomatic relief it is quite common for them not to listen to their physiotherapists’ advice during the clinic treatment, nor undertake the prescribed physiotherapy home programme and some even fail to attend their scheduled clinic appointments. While physiotherapists do educate their patients about the importance of them adhering to the components of their physiotherapy, and also give them strategies to help remember to undertake their home-based physiotherapy and to come to their appointments, unacceptable levels of treatment adherence still persist. The blame for poor adherence is often apportioned to either the patients not bothering to take heed of the treatment information they are given or the physiotherapists not giving their patients adequate information. Then again the blame might actually be due to the paucity of proven adherence enhancing strategies available for physiotherapists to use with their patients (Sluijs, Kerssens, van der Zee, & Myers, 1998). Therefore the research in this thesis will test two adherence enhancing interventions. The first is designed to strengthen patients’ beliefs about their injury and physiotherapy, and ultimately improve their adherence behaviours and is located in the Protection Motivation Theory (Rogers, 1983). The second is aimed at overcoming the problem of poor clinic attendance by offering a physiotherapy programme that has a larger home-based content than its traditional clinic-based equivalent.

The thesis is organized and presented in nine chapters. Chapter One highlights the problem of poor adherence to physiotherapy along with its possible reasons and justifies the need to investigate the value of the two interventions, and ends with the significance of the proposed research. Chapter Two presents the problems associated with the study of adherence, the definition and measurement of adherence and the adherence-functional outcome relationship. In Chapter Three, the antecedents to adherence and the models used to study adherence are evaluated, but it should be noted that the latter is most pertinent to the Protection Motivation Theory intervention. The purpose of Chapter Four is to examine the methods of patient education and the cognitive-behavioural techniques of relevance to the proposed research. Chapter Five provides an overview of ankle sprains in terms of the aetiology, symptoms and physiotherapy for this injury. The Protection Motivation Theory
intervention is developed and tested in Chapters Six and Seven. Central to Chapter Eight is the home-based intervention, which is introduced by a review of the literature underpinning it, and then the study that tests this method of delivering physiotherapy is presented. Finally in Chapter Nine the notable findings from the research are discussed, the strengths and weaknesses common to the studies are outlined, and the recommendations for future research, the clinical implications and the conclusions drawn from the results of the study are presented.
CHAPTER ONE
STATEMENT OF THE PROBLEM

The Problem of Poor Adherence in Physiotherapy

In New Zealand with a population of approximately four million people, during the period 2003 to 2004 Accident Compensation Corporation spent $67,669,000 on new injury claims and $87,356,000 on ongoing injury claims, with the knee accounting for the highest number of claims, followed by the ankle and then the shoulder (Accident Compensation Corporation, 2004). Much of this cost was used on injury rehabilitation programmes in which physiotherapy has an integral role. A commonly held belief is that these treatment costs could be contained by higher levels of treatment adherence thereby leading to improved treatment outcomes, but the positive adherence-treatment outcomes relationship has not been proven conclusively (Brewer, 1999). Nonetheless there is evidence of rehabilitation adherence being less than desirable (Brewer, 1999; Sluijs et al., 1998). Poor adherence may take many forms, such as failing to attend clinic appointments, inadequate participation in clinic-based and home-based treatment programmes, and not heeding advice about refraining from continued participation in sport activities (Brewer, 1999; Fisher, 1990).

Thus far in spite of there being a raft of investigations into adherence to rehabilitation, only a small number have reported the incidence of adherence to the components of the programmes. Two studies have specifically investigated patient attendance rates at physiotherapy clinics. Vasey (1990) examined patient attendance at hospital physiotherapy departments in Great Britain, finding that between 5.8% and 10.7% of first appointments were not kept, and between 7.2% and 14.3% of follow up appointments were missed. Similar findings have also come from a more recent study at a Canadian hospital physiotherapy clinic where it was revealed that 6.8% of patients failed to attend their appointments, although approximately 60% of these people did notify the department within 24 hours of their appointment that they would not be attending (El-Tantawy, Di Re, & Frare, 2000). Comparable findings have also come from other research of adherence to physiotherapy rehabilitation that has included attendance as an adherence indicator. Alexandre, Nordin, Hiebert and Campello (2002) found 9% of the participants
did not attend any appointments, 42% came to less than 80%, and the remaining 49% attended over 80%. In another study only 39% of the participants came to all their appointments (Lampton, Lambert, & Yost, 1993). In studies that have measured appointment keeping as a percentage of attendance it has been in the region of 80% to 87% (Duda, Smart, & Tappe, 1989; Kolt & McEvoy, 2003; Lampton et al., 1993).

Three studies have reported the extent of adherence to the clinic-based component of rehabilitation. Duda, Smart and Tappe (1989) found an 80% completion rate of clinic-based exercise protocol, whereas Lampton, Lambert and Yost (1993) reported that the amount of effort put into exercising at the clinic was 63%. While the third study had a 39% non-adherence rate, this percentage represented a combination of clinic attendance and adherence to the clinic-based treatment (Byerly, Worrell, Gahimer, & Domholdt, 1994).

Adherence to home physiotherapy exercise programmes has been the primary indicator of home-based adherence, with it being expressed either as the percentage of participants who were adherent or the percentage of exercises completed. In a seminal study of adherence in physiotherapy, Sluijs, Kok and van der Zee (1993) reported that 24% of participants were non-adherent, 35% were highly adherent, and the remaining 41% of the sample were partially adherent. Chin, Neufeld, Feely and Skinner (1998) also reported that 35% of the participants were fully adherent. Almekinders and Almekinders (1994) only reported the rates of non-adherence, with 13% of participants not undertaking any of their prescribed home exercises. In addition to home exercises, Taylor and May (1996) also measured adherence to rest, revealing that 60% did not adhere fully to their home programme, in contrast to the remaining 40% who were classified as fully adherent. In terms of recording adherence to home-based exercises as the percentage of those undertaken, three studies had adherence percentages in the vicinity of 70% (Bassett & Petrie, 1999; Kolt & McEvoy, 2003; Lyngcoln, Taylor, Pizzari, & Baskus, 2005), whereas another study had a 90% rate (Tooth, McKenna, & Colquhoun, 1993).

It is apparent that poor adherence does exist in physiotherapy, and closer scrutiny of the research reveals that this problem has not diminished over time. Most of the research into adherence to clinic- and home-based physiotherapy has focused on exercise programmes, and with the exception of the Taylor and May (1996) study adherence to the
other physiotherapy treatments has been largely ignored. The other notable weakness of this research is the lack of uniformity in the measurement of adherence, thereby making it difficult to compare the findings across studies.

Another area of adherence research in rehabilitation that has received attention is the identification of the factors that influence adherence, which are also known as the antecedents of adherence. The antecedents that have been consistently linked with adherence are self-motivation (Brewer, Van Raalte, Cornelius et al., 2000; Duda et al., 1989; Fields, Murphey, Horodyski, & Stopka, 1995; Fisher, Domm, & Wuest, 1988), self-efficacy (Brewer et al., 2003b; Chin et al., 1998; Flynn, Lyman, & Prentice-Dunn, 1995; Hall, Fallon, Quinn, & Reeve, 2002; Taylor & May, 1996; Woodgate, Brawley, & Weston, 2005), pain tolerance (Byerly et al., 1994; Fields et al., 1995; Fisher et al., 1988), perceptions about the effectiveness of the rehabilitation (Brewer et al., 2003b; Duda et al., 1989; Flynn et al., 1995; Taylor & May, 1996), and social support (Byerly et al., 1994; Duda et al., 1989; Pizzari, McBurney, Taylor, & Feller, 2002).

Given that poor treatment adherence is acknowledged as a problem in physiotherapy and that there are factors known to consistently influence adherence it is surprising that this problem still exists. One reason for the persistence of poor adherence could be that physiotherapists are not using the research findings in their daily practice. This is a recognised problem in other health care professions with up to a 15 year delay from the time of the research until the implementation of its findings in clinical practice (Bartlett, 1982). However Sluijs et al. (1998) suggest that in physiotherapy it could also be due to the paucity of research into the effectiveness of adherence enhancing strategies.

**Justification of the Proposed Research**

It is recommended that such studies should be housed within an appropriate theoretical framework, thereby providing them with conceptual clarity and facilitating the interpretation of findings (Brewer, 1999). Three frameworks that have been employed to study the psychological aspects of adherence to sport injury rehabilitation are Theory of Personal Investment (Maehr & Braskamp, 1986), Cognitive Appraisal Theory (Weiss & Troxel, 1986), and Protection Motivation Theory (PMT: Rogers, 1983). The latter one has shown the most promise in distinguishing between the beliefs about injury and
rehabilitation of adherent and non-adherent patients. In research the variables of the threat (severity and vulnerability) and coping (response efficacy and self-efficacy) appraisals have been the most widely used components of the PMT (see Floyd, Prentice-Dunn, & Rogers, 2000; Milne, Sheeran, & Orbell, 2000). The PMT can be applied in the context of physiotherapy, because the patients’ behaviours can be feasibly explained in terms of their perceptions of the injuries’ severity, their vulnerability to further problems should they not follow the physiotherapy, the effectiveness of the treatment and their ability to cope with the treatment programme.

The first of the two prospective studies that examined the utility of the PMT was undertaken by Taylor and May (1996) with a sample of athletes who had a variety of injuries. They found patients’ threat and coping appraisals about the injury and rehabilitation did distinguish between the high and poor adherers. Specifically, in comparison to the poor adherers, high adherers considered their injury as being more serious, that they were more vulnerable to further problems from the injury, the physiotherapy was more effective in treating the symptoms and they were more able to cope with the rehabilitation. Brewer et al. (2003) replicated the Taylor and May (1996) study with improvements to the methodology, such as using a homogeneous sample with regard to injury, and reported similar results. A limitation of these two studies is that they are correlational and cannot determine cause and effect. Hence, the next logical step would be to test PMT’s efficacy as an intervention to promote rehabilitation adherence. This step is in line with the suggestion of Floyd et al. (2000) that future research using this model should target the development of interventions to assist patients to follow prescribed treatment programmes. To date I am unaware of any studies that have used the PMT as the guiding framework for an intervention to enhance adherence to physiotherapy. Therefore the purpose of the first study was to develop the intervention and pilot it; and the aim of the second study was to test the intervention’s effectiveness as an adherence enhancing strategy.

While the first two studies of this thesis were aimed at improving patients’ adherence by altering their beliefs about the injury and physiotherapy, they do not address situational factors known to affect clinic attendance. As previously outlined, the findings of two studies showed that up to approximately 15% of patients did not attend their
physiotherapy clinic appointments (El-Tantawy et al., 2000; Vasey, 1990). Some of the reasons that have been identified in the literature as being detrimental to appointment keeping are the timing of appointments (Fields et al., 1995; Fisher et al., 1988; Vasey, 1990), the patients’ work and child-care commitments (El-Tantawy et al., 2000; Vasey, 1990) and treatment costs (Meichenbaum & Turk, 1987). All of these factors are of concern to physiotherapists in New Zealand particularly with the changes in employment patterns that have been contingent with the advent of more children being put into child care so as their parents can work, and the increase in trading hours, leading to many businesses being open long hours each day of the week. In this regard some people now find it difficult to attend physiotherapy, because the clinics are not always open at times that are conducive to their work and child care arrangements.

Also the cost of physiotherapy treatment in New Zealand has become an issue over recent times. Accident Compensation Corporation (ACC), a government accident insurance corporation provides cover to the majority of New Zealand residents, and therefore this organisation pays the cost of injury rehabilitation, but only to accredited treatment providers. The current payments made by ACC to physiotherapy providers do not adequately cover the cost of treatment and the short fall has been passed onto the patients in the form of a treatment surcharge. As some people cannot afford to pay the surcharge they either do not attend all their appointments or they do not seek physiotherapy as a form of treatment (New Zealand Society of Physiotherapists (Inc.), 2004). Hence people who cannot attend physiotherapy on a regular basis might benefit from a treatment programme that has fewer clinic appointments, but makes up for the lack of clinic-based treatment by having a larger home-based management component. Such programmes have been used successfully in other areas of health care and with either chronic disorders or post-operatively (Alexanderson, Stenstrom, & Lundberg, 1999; Cherkin et al., 2001; De Carlo & Sell, 1997; Grace, McDonald, Fishman, & Caruso, 2005; Roddey, Olson, Gartsman, Hanten, & Cook, 2002; Symons, Rowsell, Bhowal, & Dias, 2001). I am unaware of any studies that have investigated the value of home-based physiotherapy for acute injuries as a means of providing treatment for people who are unable to attend all their scheduled clinic appointments. Therefore the aim of the third study was to compare effectiveness of a
traditional clinic-based physiotherapy programme with a home-based programme steeped in adherence enhancing adjuncts and requiring a minimal number of clinic appointments.

As outlined earlier in this chapter it is traditionally thought that if patients adhere to the prescribed rehabilitation programme, not only would they have optimal treatment outcomes, but also the treatment costs would be contained. To date the evidence supporting the notion of a positive relationship between adherence and treatment outcomes is limited and not conclusively proven (Brewer, 1999). Studies that have had the most success in supplying proof of a positive adherence-treatment outcome relationship have taken a multifaceted approach to the measurement of adherence and the treatment or functional outcomes and have focused on one injury or body site (Alexandre et al., 2002; Brewer, Van Raalte, Cornelius et al., 2000; Groth, Wilder, & Young, 1994; Kolt & McEvoy, 2003). Additional support for this approach to investigating the adherence-functional outcomes relationship comes from a recent study of hand therapy for patients with fractures of the distal end of the radius (Lyngcoln et al., 2005). However the adherence-functional outcome relationship is not that simplistic and can be confounded by psychological characteristics (Brewer, Van Raalte, Cornelius et al., 2000). Therefore as the second and third studies are measuring antecedents to adherence, a further aim of these two studies is to investigate the relationships between these variables, adherence and functional outcomes.

**Rationale for the Injury of Focus**

In line with the recommendations for undertaking methodologically sound investigations into adherence issues, only one injury, ankle sprains, was used in the three studies in this thesis. Brewer (1999) explained that the use of one injury reduces any variability that could be caused by the demands of the rehabilitation programmes for different injuries. The reason for choosing ankle sprains in preference to other injuries is that physiotherapy is the primary method of treatment for this injury (Larmer, Robb, Hing, Reid, & McNair, 2002). Under normal circumstances, there is very little if any input from other health professionals (Accident Compensation Corporation, 2002b), and therefore little danger of the physiotherapy based information being contaminated by the views of other health professionals. A final reason for including only one injury was that it ensured the
interventions integral in the research were specific to the injury and the rehabilitation programme, which is a basic tenet of effective patient education (Ley, 1988).

**Significance of the Research**

Should both interventions prove to be successful, then they offer physiotherapists with methods of overcoming the potential problems of poor adherence. If the PMT-based intervention significantly improves the beliefs about the injury and physiotherapy, adherence to physiotherapy and ankle function of those participants who are exposed to it, then this framework would offer physiotherapists with a feasible template for the organisation and provision of patient information about injuries and disorders and the treatments. If the home-based physiotherapy programme steeped in adherence enhancing strategies proved to be as effective and safe as the traditional clinic-based programme, then it offers a viable option for patients who are unable to attend physiotherapy on a regular basis.

The significance of a positive adherence-functional outcomes relationship would provide further support to the notion that favourable recovery is dependent to some extent upon patients adhering to their prescribed treatment programme. In turn this could lead to a reduction of unnecessary health care expenditure in cases where it is proven that poor recovery is attributable to inadequate adherence to the prescribed treatment programme.

**Summary**

There is evidence of adherence to physiotherapy being less than desirable in terms of attending all scheduled clinic appointments, and following the clinic- and home-based physiotherapy, and having the potential to incur unnecessary treatment costs. However the focus of the investigations into the clinic- and home-based physiotherapy has been on adherence to exercises and it needs to be broadened to include the other treatment modalities. There is concern that while there are factors known to influence adherence the problem of poor adherence still persists. This problem can be overcome by exploring interventions designed to improve adherence. Two such interventions, one located within the Protection Motivation Theory and the second a home-based physiotherapy programme utilising adherence enhancing strategies, have been proposed and justified and will form the
basis of this research. Further as the two of the intervention studies will follow the participants through their course of physiotherapy, it is opportune to investigate the notion that poor adherence leads to poor functional outcomes. If the interventions prove effective they will offer physiotherapists with ways of presenting information and delivering the treatment that should either avert or overcome the problem of poor adherence.
CHAPTER TWO
METHODOLOGICAL ISSUES IN THE STUDY OF ADHERENCE TO PHYSIOTHERAPY AND THE ADHERENCE-FUNCTIONAL OUTCOME RELATIONSHIP

Problems of Studying Adherence

Some of the problems that Sackett identified in the medical adherence research in 1979 still exist within the context of adherence research in rehabilitation that involves physiotherapy. These problems are the definition, measurement, analysis and reporting of the rates of adherence, study designs, selection of participants, and ethical considerations of clinical research. Each of these will be discussed in turn.

First, the definition of adherence needs to be precise, stem from the research question, and match the demands of the treatment programme and the behaviours necessary to implement the programme (Brewer, 1999; Sackett, 1979; Vitolins, Rand, Rapp, Ribisl, & Sevick, 2000). As rehabilitation, of which physiotherapy is a part, encompasses a range of treatment techniques, a one fits all definition of adherence in this context is not possible (Brewer, 1999), and therefore adherence needs to be defined specifically for the treatment programmes under investigation.

Second, problems occurring with the measurement of adherence have been the use of inappropriate indicators and measures that do not have proven reliability and validity, and participant response bias (Brewer, 1999). Clinic attendance has been used as the sole of indicator of adherence to the clinic-based component of the rehabilitation with no evidence of the participants’ level of adherence during the actual treatment session being provided (see Di Fabio, Mackey, & Holte, 1995). As rehabilitation programmes consist of clinic- and home-based treatment components for which patients have to adopt different behaviours, such as attending clinic appointments and undertaking home programmes, a multidimensional approach to its measurement is advocated (Brewer, 1999). Taylor and May (1996) successfully employed this approach in the measurement of adherence to home-based physiotherapy by having the patients rate their adherence to each of the different treatments separately.
The use of measures of adherence of unproven reliability and validity appears to have arisen because no other suitable measures have been available for the particular rehabilitation programmes under investigation (as in the research undertaken by Alexandre et al., 2002; Ettinger et al., 1997; Lord, Ward, Williams, & Strudwick, 1995; Reid et al., 1995; van Gool et al., 2005). In defence of these measures it should be noted that no one rehabilitation programme is the same, and furthermore no one treatment programme stays the same throughout its entire duration (see Accident Compensation Corporation, 2000 for the diverse range of rehabilitation programmes and different techniques that can be used in each of them).

Participant response bias is a frequently reported problem in adherence research, with participants giving what they believe is a desired response (Gahimer & Domholdt, 1996; Sluijs et al., 1998). Treatment diaries in particular have been found to be altered to give the appearance of compliance (Rand & Wise, 1994). Inaccurate reporting of adherence has occurred when participants perceive the tool as being onerous and time consuming, as has been shown with diaries (Rand & Wise, 1994).

Third, the lack of uniformity in the analysis and subsequent reporting of the adherence data has caused difficulty in comparing adherence rates across studies. Adherence is frequently operationalised as a dichotomous variable when in reality it is continuous (Vitolins et al., 2000). Also as outlined in Chapter One rates of adherence have been reported in different ways, with some research calculating the percentage of adherence for the sample (see Bassett & Petrie, 1999; Chin et al., 1998; Terpstra, de Witte, & Diederiks, 1992; Tooth et al., 1993), whereas other studies have given the percentage of participants who were either fully, partially or completely non-adherent (such as Almekinders & Almekinders, 1994; Sluijs, Kok et al., 1993).

Fourth, the research design has been held responsible for some of the inconsistencies in the study of adherence (Brewer, 1999). Retrospective studies have relied on medical records and patient recall to obtain an indication of adherence (Almekinders & Almekinders, 1994; Campbell et al., 2001; Derschied & Feiring, 1987). For example, Almekinders and Almekinders (1994) surveyed their participants by telephone on average 27 months after they had undergone the rehabilitation. Campbell et al. (2001) obtained an
indication of the patients’ adherence from their physiotherapists once their rehabilitation programmes had ceased. These ways of measuring adherence could well have led to poor recall and response bias. Cross-sectional studies have investigated adherence measuring it at only one time point (see Daly, Brewer, Van Raalte, Petitpas, & Sklar, 1995; Sluijs, Kok et al., 1993; Taylor & May, 1996), which does not allow for the possibility that it can change over the duration of the rehabilitation, with it commonly being poorer by the end of the treatment programme (Meichenbaum & Turk, 1987) or when there are fewer clinic appointments (Sluijs & Knibbe, 1991).

Fifth, studies that have recruited participants with a range of injuries (for example Almekinders & Almekinders, 1994; Duda et al., 1989; Fields et al., 1995; Fisher et al., 1988; Lampton et al., 1993; Sluijs, Kok et al., 1993; Taylor & May, 1996) have been criticized on the basis of the differing influences that the treatment programmes could have on adherence (Brewer, 1999). A sample that is homogeneous in terms of the injury is deemed to reduce the variation of the behavioural demands associated with the different rehabilitation programmes (Brewer, 1999).

Sixth, the ethical considerations of clinical research pose two problems in the study of adherence. The first is that prior to committing to take part in any research the potential participants must be fully informed of the reasons for the research and their anticipated role. If carried out to the extreme the expected outcome could be divulged, which may change the participants’ usual adherence behaviours and bias the results (Gordis, 1979; Sackett, 1979). The second problem occurs when participants withdraw from the study. In accordance with the ethical guidelines participants can withdraw from research at any time without giving any reasons (Health Research Council of New Zealand, 2002). Debate has arisen over how these people should be classified in terms of their level of adherence, with it being suggested that they are best categorised as failing to complete their treatment (Martin Ginis & Hicks, 2004). Also in the context of research evaluating adherence enhancing strategies, the reasons for dropping could be of immense value as characteristics of the intervention could be at fault, but breaching the participants’ right not to give any reasons for their withdrawal could be viewed as undermining their autonomy (Rand & Sevick, 2000).
In summary most of the problems encountered in the study of adherence can be overcome by judicious planning and implementation of research. To allow for the dynamic nature of adherence the studies should be prospective in design with adherence being measured over the duration of the rehabilitation programme. By restricting the sample to one injury, not only are the treatment programmes more uniform, but also the definition and measurement of adherence can be tailored to the injury and the requirements of its rehabilitation programme. In addition, the requirement of fully informing participants about the reasons for the research can still be achieved without divulging the anticipated outcomes and hypotheses. However out of respect of the participants’ autonomy it might not be so easy to establish why people withdraw from investigations into adherence.

Definition of Adherence

As outlined earlier in this chapter any definition of adherence needs to stem directly from the research question and match the demands of the treatment programme. In the studies to be undertaken in this thesis patients will be undertaking physiotherapy rehabilitation that involves attending clinic appointments during which they will be treated by physiotherapists, who will then give the patients treatment activities to undertake at home. Both the clinic- and home-based physiotherapy rehabilitation programmes involve a range of diverse treatments, such as refraining from activity deemed detrimental to their recovery, mobilising and strengthening exercises, strapping, electrotherapy and cryotherapy, and hence patients need a repertoire of behaviours to be adherent to the treatment requirements. Therefore the definition of adherence to be used in this research has been adapted from that posited by Meichenbaum and Turk (1987) and is ‘the extent to which participants attend their physiotherapy clinic appointments, and follow the advice and clinic- and home-based physiotherapy programme recommended by their physiotherapists.’ While the philosophical debate surrounding the use of adherence and compliance, with the latter implying that the patient behaves in a blind obedient manner (Meichenbaum & Turk, 1987) is acknowledged, it is outside the realms of this thesis and will not be discussed further.
Measurement of Adherence

To accommodate the array of treatments and treatment behaviours demanded by physiotherapy rehabilitation programmes the measurement of adherence needs to be multifaceted, but the methods must be appropriate for components of treatment (Brewer, 1998). For example, the measurement of adherence to rehabilitation programmes of which physiotherapy is a part, needs to include attendance, and adherence to clinic- and home-based physiotherapy (Brewer, 1998). A number of different methods of measuring attendance and adherence to clinic- and home-based treatments exist, and each of these will be briefly discussed in turn.

Patient attendance at rehabilitation sessions

Attendance is a common index of adherence when a large component of the rehabilitation consists of clinic-based treatment, and most reliable way of measurement is to calculate either a percentage or ratio of clinic appointments attended to the number scheduled (Brewer, 1999). Either of these ways of expressing attendance have been used in a number of studies, for example Brewer, Van Raalte, Cornelius, et al. (2000), Byerly, Worrell, Gahimer, and Domholdt, (1994), Daly, Brewer, Van Raalte, Petitpas and Sklar (1995); Duda, Smart and Tappe, (1989), Fields, Murphey, Horodyski and Stopka (1995), Kolt and McEvoy (2003), Lampton, Lambert and Yost (1993), Laubach, Brewer, Van Raalte, and Petitpas (1996), and Lyngcoln, Taylor, Pizzari and Baskus (2005). Vasey (1990) split clinic attendance into two categories, attendance at (1) all treatments and (2) at the final scheduled treatments. The latter category was considered to be indicative of whether or not patients completed their physiotherapy programmes, which in turn supplies physiotherapists with a marker of the success of the treatment programme. With regard to the ratio or percentage of attendance, reliability studies have shown it to have a weak relationship with clinic-based adherence, suggesting that each form of adherence provides different information about adherence, justifying the measurement of both forms of adherence (Brewer, Van Raalte, Petitpas et al., 2000).
**Adherence to clinic-based physiotherapy**

A number of methods of assessing clinic-based adherence have been developed, with most relying on the clinicians’ observations during the treatment time. The focus of these measures has been on the evaluation of exercise intensity and proficiency, the willingness to follow instructions and the progress made (for example Brewer et al., 2002; Brewer, Van Raalte, Petitpas et al., 2000; Codori, Nannis, & Pack, 1992; Duda et al., 1989; Evans & Hardy, 2002; Friedrich, Cermak, & Maderbacher, 1996). The most widely documented methods will be outlined in this section.

The Sport Injury Rehabilitation Adherence Scale (SIRAS) was developed by Brewer et al. (1995) for measuring clinic-based adherence behaviours. It is a three-item instrument that uses a five-point scale to assess the intensity with which patients complete their exercises, the extent to which they follow their practitioners’ advice and instructions during the treatment, and the patients’ receptiveness to changes made during the rehabilitation session. The reliability and validity of the SIRAS has been tested in a series of studies. Brewer et al. (2000) evaluated the SIRAS, showing it to have high internal consistency (α = .82), high test-retest reliability (ICC$_{2,1}$ = .77), moderate inter-rater reliability (ICC = .57), and that the three items loaded onto a single factor, namely adherence. Further support for the SIRAS’s ability to measure adherence to the clinic-based component of rehabilitation came from a study undertaken by Brewer et al. (2002) in which it was shown to have high interrater reliability (.87), and construct validity as evident by the discrepancies in the scoring of the low, moderate and high levels of adherence. In addition, low but significant correlations have been found between the SIRAS and clinic attendance ($r = .21, p < .05$: Brewer, Van Raalte, Petitpas et al., 2000) and home exercises and cryotherapy ($r = .20$ and .19, $p < .05$, respectively: Brewer, Van Raalte, Cornelius et al., 2000). Brewer and colleagues (2000, 2002) interpreted these correlations to be indicative of the three measures tapping into common aspects of adherence, while also capturing different dimensions of adherence. The SIRAS has successfully discriminated between adherent and nonadherent patients undergoing rehabilitation for low back pain (Kolt & McEvoy, 2003), following knee surgery (Brewer et al., 2003b; Brewer, Van Raalte, Cornelius et al., 2000) and more recently hand therapy for distal radius fractures (Lyngcoln et al., 2005).
Another measure of adherence that has been developed is an exercise proficiency scale designed primarily for patients undergoing rehabilitation for hand injuries (Codori et al., 1992). This scale has a three point scoring system (from 0 = inappropriate to 2 = appropriate) to evaluate the four dimensions of exercise proficiency, (1) the adequacy of the plane of motion through which the joint was moved, (2) the number of repetitions performed, (3) the adequacy of the stabilisation provided by the uninvolved hand and (4) the adequacy and location of the force applied. Codori et al. (1992) reported that the exercise proficiency scale was significantly correlated to patients’ self-reports of their home exercise adherence ($r = .35, p < .01$), and had acceptable inter-rater reliability agreement of .61.

Another exercise proficiency scale was used as an adherence indicator by both Friedrich, Cermak and Mauderbacher (1996) and Schoo, Morris and Bui (2005). Proficiency was graded according to the correctness of the exercise performance using a similar scoring system to that of Codori et al. (1992). The data from both studies was negatively skewed, which Schoo, Morris and Bui (2005) interpreted as an indication of the measure lacking sensitivity. Further Codori et al. (1992) warn that exercise proficiency may not be a measure of adherence as some patients will be able to perform an exercise correctly without having practised it. Within the context of a typical physiotherapy programme, the measurement of exercise proficiency is limited as it only capable of evaluating exercises and not other techniques patients are expected to implement, such as refraining from activity detrimental to their recovery.

Other ways of measuring adherence have been developed primarily for research and tend to rely on a combination of observations of patients’ behaviours during the clinic session and progress throughout the rehabilitation programme. The exercise behaviours that have been observed are energy expenditure (Lampton et al., 1993; Murphy, Foreman, Simpson, Molloy, & Molloy, 1999), intensity (Duda et al., 1989), completion (Byerly et al., 1994; Duda et al., 1989), and time spent doing them (Murphy et al., 1999; Taylor & May, 1996). In addition the therapists have been asked to rate the patients’ progress over the duration of the rehabilitation (Evans & Hardy, 2002; Fisher et al., 1988; Lampton et al., 1993), and indicate symptom relief (Evans & Hardy, 2002). While the physiotherapist in the Taylor and May (1996) study observed the patients doing their exercises during the
clinic session, she was required to use her observations to make inferences about the extent to which she thought the patients had adhered to their home-based management. Unlike the SIRAS, these other observational measures of clinic-based adherence do not have any reported reliability and validity (for example Byerly et al., 1994; Duda et al., 1989; Fields et al., 1995; Friedrich et al., 1996; Lampton et al., 1993; Murphy et al., 1999), and in some cases they have not been described in enough detail (such as those used by Duda et al., 1989; Evans & Hardy, 2002; Lampton et al., 1993; Murphy et al., 1999) to be able to replicate.

**Measurement of adherence to home-based rehabilitation**

Three common forms of assessment of adherence to home-based physiotherapy that will be briefly discussed are self-reports, diaries and electronic devices. Self-report questionnaires require patients to indicate the extent to which they have followed their prescribed physiotherapy programme since their last clinic appointment. Several studies have used scales that measure adherence from ‘not at all’ to ‘fully’ adherent. Sluijs, Kok and van der Zee (1993) used a four-point scale (1, ‘not at all’; 2, ‘a little’; 3, ‘rather regularly’; and 4, ‘very regularly’) for measuring participants’ exercise completion over the previous week. In the Taylor and May (1996) study participants completed two five-point scales (1 = none, to 5 = all) to record adherence with the prescribed modalities and rest from sporting activity, as well as estimating the time they spent exercising at home. Brewer, Van Raalte, Cornelius, et al. (2000) used a 10-point scale (1 = none to 10 = all) for participants to rate their degree of completion of the prescribed exercises and cryotherapy. Two other studies used a slightly different approach to recording adherence by asking the patients to indicate either the number of exercise sessions they had completed daily (Codori et al., 1992) or over the past week (McEvoy, 1999), and then comparing the patients’ reports with the physiotherapists’ recommendations. The participant self–report questionnaires that have been reviewed do not have reported reliability and validity (Brewer, Van Raalte, Cornelius, et al. 2000; Sluijs et al., 1993; Taylor & May, 1996), making it difficult to establish their accuracy.

Diaries have been used to record the number of repetitions for each exercise (Bassett & Petrie, 1999; Belisle, Roskies, & Levesque, 1987; Lyngcoln et al., 2005), the
frequency of exercising (Bassett & Petrie, 1999; Brewer et al., 2004; Evans & Hardy, 2002; Lyngcoln et al., 2005), the time spent exercising (Friedrich, Gittler, Halberstadt, Cermak, & Heiller, 1998; Preisinger et al., 1996; Rejeski, Brawley, Ettinger, Morgan, & Thompson, 1997) and the frequency and duration of practising relaxation (Hoelscher, Lichstein, & Rosenthal, 1984). The usual method of scoring adherence from the diary recordings is to compare them with the physiotherapists’ treatment recommendations, and then convert this ratio into a percentage. Hoelscher et al. (1984) were cautious about the value of their relaxation diaries, because they found a mismatch between the patients’ diarising and the recordings of an electronic timer that had been sealed into a video player used for the relaxation tapes, with the patients overestimating of the time they spent practising the home-based relaxation by 126%. Treatment diaries have also been criticised for acting more as an adherence enhancing strategy than a measure of adherence, being time consuming and prone to inaccuracies and response bias (Rand & Wise, 1994). Both diaries and retrospective self-reports are known to be prone to inaccurate recall, and biased toward an over-estimation of participant adherence (Myers & Midence, 1998). However the strengths of self-reports that possibly makes them preferable to diaries are that they are convenient and simple to use (Meichenbaum & Turk, 1987).

Electronic devices such as electromyographic feedback, timing devices activated by video players, and pedometers have also been used to obtain an objective measurement of adherence. Electromyographic biofeedback connected to a portable computer has been used to count the number of times people do their exercises at home (Brewer, 1999). Pedometers, movement sensors, and accelerometers have also been used for recording the adherence to walking programmes (Vitolins et al., 2000). Nonetheless, while the devices are expected to count or measure distance accurately, Vitolins et al. (2000) warn that these devices have the potential to be unreliable because of mechanical wear and tear.

As previously outlined Hoelscher et al. (1984) used electronic timers that were sealed into video-players, and were automatically activated and deactivated by the video-player being started and stopped respectively. The timers were tested against an independent stopwatch, with 100% agreement between them. Similarly, Brewer et al. (2004) secreted electronic counters into exercise videotapes, and found that the counters’ recordings correlated significantly with the patients’ daily reports of the number of times
they exercised with the videotape. Despite the mean daily difference between the two sets of recordings being small, the findings of this study were similar to those of Hoelscher et al. (1984) in that participants’ self reports of the number of sessions they exercised with the videotape were significantly greater than the number of times the videotape was played. While electronic counters appear to be a viable way of checking the reliability of participant self-reports, there is conflicting evidence about their reliability (Hoelscher et al., 1984; Vitolins et al., 2000), which suggests further research is required before they become an established method of measuring adherence. The use of electronic devices can only be justified if equipment is used in the treatment programme and if counting devices can be surreptitiously inserted into the equipment.

**Relationship between Rehabilitation Adherence and Functional Outcomes**

It is commonly assumed that patients who are highly adherent to the requirements of their rehabilitation will have better outcomes as opposed to poor adherers, but to date the findings of investigations into the adherence-functional outcome relationship have not been conclusive and in some instances contradictory. Studies that have taken a multifaceted approach to measurement of adherence and functional outcomes appear to have had more success in detecting relationships between high levels of adherence and positive functional or treatment outcomes. Those that have had significant results have investigated the rehabilitation of patients with back pain (Alexandre et al., 2002; Kolt & McEvoy, 2003), hand and wrist injuries (Groth et al., 1994; Lyngcoln et al., 2005), osteoarthritis of the knee joint (Ettinger et al., 1997; van Gool et al., 2005), osteoporosis (Preisinger et al., 1996), balance problems in the elderly (Lord et al., 1995), and following surgical repair of the torn ACL (Brewer et al., 2004; Brewer, Van Raalte, Cornelius et al., 2000).

However, a few studies that have found a positive adherence-functional outcome relationship have not used a multidimensional approach to the measurement of adherence. O’Reilly et al. (1999) investigated the effectiveness of a home-based rehabilitation programme for osteoarthritis of the knees and quite justifiably used only the participants’ report of the number of exercises performed each day as the adherence measure. O’Reilly and colleagues (1999) found positive relationships between adherence and the six-minute
walk test, stair climbing and quadriceps strength. In a study of a clinic-based programme for back pain, Di Fabio et al. (1995) used only one measure of adherence, percentage of attendance and found that in comparison to the low adherers, those who attended 80% or more of their appointments had a greater reduction in reported disability and increases in trunk flexion and static lifting.

There are a smaller number of studies that have either not produced any evidence of the existence of a relationship or have found unexpected relationships. Lichtenstein et al. (1989) found no significant difference in the outcomes of the high and low adherers to an exercise programme designed to improve balance in the elderly. Two studies discovered an adherence-functional outcome relationship contrary to what would be expected clinically. The first came from a study of long-term exercise for osteoarthritis of the knee, in which Rejeski et al. (1997) found that in comparison to the high and low levels of adherence the moderate levels produced the best outcomes for pain and functional activities. Rejeski and colleagues (1997) rationalised these results as an illustration of a dose response, whereby high levels of adherence to strenuous exercises are detrimental to osteoarthritic knee joints, and lesser levels of activity are of more benefit. The second unexpected relationship was found by Brewer et al. (2004), with a negative relationship between high levels of adherence and laxity of the knee joint. Like Rejeski et al. (1997) they thought it might also be a dose-response, with some patients not responding well to the rapid progression of the rehabilitation activities.

Studies using multiple measures of adherence and function also have produced mixed results. For example, O’Reilly et al. (1999) found support for three out of the four relationships they investigated, with there being no significant association between decreases in pain over the duration of the treatment and adherence. Similarly Preisinger et al. (1996) did not find that the adherent participants had significantly better scores on all the outcomes, with fractures due to the osteoporosis still being a problem of similar magnitude irrespective of the level of adherence. Brewer, Van Raalte, Cornelius et al. (2000) showed that attendance, clinic-based adherence and adherence to home-based application of ice were significant predictors of one-leg hop test, but did not identify any significant relations between the outcome measures of knee joint laxity and the participant self-reports of symptoms and any of the adherence measures. Whereas Brewer et al. (2004)
only found that fewer self-reported symptoms and greater knee joint laxity were associated with higher levels of attendance and clinic-based adherence from amongst all the adherence-functional outcome relationships they examined.

Furthermore despite using the same methods of measuring functional outcome, conflicting relationships have been identified. This occurred in two of the studies of osteoarthritis of the knee. O’Reilly (1999) and van Gool et al. (2005) both used the same method of measuring knee joint pain, but while O’Reilly (1999) found that it increased with higher levels of adherence, van Gool et al. (2005) found that it decreased with higher adherence.

The inconsistencies in nature of the relationships identified may be due to methodological problems in this area of research. The measurement of both adherence and the treatment or functional outcomes must be consistent with the components of the rehabilitation programme and its predicted outcomes. First the reliability and validity of the adherence measures is important, and it needs to be appropriate for the requirements of the programme, which generally requires a multifaceted approach, but this is not always the case, for example, if the focus is on a home programme then home-based adherence is the measurement of choice (Brewer, 1999). Also attendance is frequently employed as the sole indicator of clinic-based adherence which is inappropriate as it does not provide an insight into the patients’ behaviours during the treatment session (Brewer, Van Raalte, Petitpas et al., 2000).

Only Brewer et al. (2004, 2000), Kolt and McEvoy (2003), Lyngcoln et al. (2005) and Groth et al. (1994) used adherence measures that had proven reliability and validity, which may account for the significant relationships they found. In contrast, Di Fabio et al. (1995) and Preisinger et al. (1996) used measures of adherence that did not fully reflect the adherence behaviours demanded by the treatment programme. Di Fabio et al. (1995) only used the percentage of attendance in their study of clinic-based physiotherapy for back pain, and failed to assess the participants’ behaviours during the treatment session. Whereas, in a clinic- and home-based exercise programme Preisinger et al. (1996) only used the participants’ self-reports of the number of exercise sessions and did not include
attendance or clinic-based treatment behaviours. These omissions may have posed a threat to the studies’ reliability, and external and construct validity.

Another concern is the lack of consistent methods of measuring adherence, with many being developed just for one study and not having any reported reliability and validity (for example Alexandre et al., 2002; Di Fabio et al., 1995; Ettinger et al., 1997; Lord et al., 1995; Reid et al., 1995; van Gool et al., 2005). Further some studies (such as Alexandre et al., 2002; Ettinger et al., 1997) have used participant diaries for recording the home exercise adherence, which is known to be prone to response bias and be more of a prompt rather than measure of adherence (Myers & Midence, 1998; Rand & Wise, 1994).

Second like adherence the measurement of functional outcomes should be multidimensional. Rothstein (1989) recommends patients’ perceptions of their level of disability should be an integral part of outcome assessments as they provide just as valuable information as objective measures, such as range of motion, and muscle strength. Also the outcome measures need to have reputed reliability, validity and responsiveness to change over time (Bailey, 1997; Guyatt, Walter, & Normal, 1987; Kirshner & Guyatt, 1985).

Some research has not had a mix of subjective and objective measures. In a study of physiotherapy for back pain, Kolt and McEvoy (2003) used the participants’ and the physiotherapists’ ratings of the percentage of perceived improvement during the rehabilitation as treatment outcome indicators, and did not have any objective measures of pain and its contributing factors. While the two ratings showed improvement and there was evidence of a positive adherence-functional outcome relationship, without an objective measure it is difficult to know whether the results are a true indication of improvement in function, or an artifact of response bias.

The measurement of treatment outcomes has been rather limited in some research. Lichtenstein et al. (1989) used only body sway to measure balance objectively in the elderly and did not take into account muscle strength, reaction times, and neuromuscular control all of which are known to be integral in the control of balance (Lord et al., 1995). The use of only one outcome measure may have limited the Lichtenstein et al. (1989) study’s ability to show a relationship between adherence and functional outcome, given that
in a similar study Lord et al. (1995) employed several outcome measures and found a number of positive adherence-functional outcome relationships.

It is sometimes difficult to compare the results of studies of the same injury or disorder because they have used different outcome measures. Despite the four studies of osteoarthritis of the knee (Ettinger et al., 1997; O'Reilly et al., 1999; Rejeski et al., 1997; van Gool et al., 2005) all having significant relationships between high levels of adherence and greater self-reported functional activity, their measures of functional activity differed. O’Reilly et al. (1999) and van Gool et al. (2005) used the Western Ontario and McMaster Universities Osteoarthritis Index function (WOMAC), whereas Ettinger et al. (1997) and Rejeski et al. (1997) used the same specially designed instrument for their studies. These two forms of assessment evaluate similar and dissimilar aspects of function (see O'Reilly et al., 1999; Rejeski et al., 1997).

Finally, pertinent physical and psychological characteristics of the participants have been shown to have an effect on the adherence-functional outcome relationship. Obesity was shown to play a role in adherence to an exercise programme for people with osteoarthritis of the knee, with the more obese people having lower adherence levels and poorer functional outcomes (Rejeski et al., 1997). By including the most consistently reported antecedents of adherence as measures in their study, Brewer, Van Raalte, Cornelius et al. (2000) revealed that motivation was a significant predictor of adherence to the home exercise programme and that there was a trend towards social support being a significant predictor of clinic-based adherence. In addition they showed that psychological distress and athletic identity were significant predictors of knee joint laxity.

Summary

It is evident that the problems that have been encountered in the study of adherence are not insurmountable, with possibly the exception of the participants’ right to not give any reason for withdrawing from clinical research. Similarly if the definition and measurement of adherence are tailored to accommodate the array of treatments, then the subsequent behaviours necessary to fulfill the requirements of the physiotherapy treatment can be measured appropriately. The measurement of adherence during physiotherapy programmes must be multifaceted to capture both clinic- and home-based components as
shown by the work of Brewer and colleagues (2002; 2000). Taking into account the findings of this review, the appropriate adherence measures for physiotherapy rehabilitation programmes that do not involve the use of electronic devices are a percentage or ratio of attendance, the SIRAS for the clinic-based physiotherapy and patient self-reports of home-based management.

The evidence in support of the notion that high levels of adherence are associated with positive functional or treatment outcomes outweighs that which has shown the relationship to be either non-existent or in an unexpected direction. However irrespective of whether the research has found the presence of a relationship or not, consideration needs to be given to whether the measures of adherence and the functional outcomes match the desired adherence behaviours and the anticipated outcomes of the treatment programme, and if any recognised physical and psychological characteristics of the participants have been taken into account in the measurement of the relationship. In short the adherence-functional outcome relationship is not as simplistic as it appears.
CHAPTER THREE
ANTECEDENTS OF ADHERENCE AND THE THEORETICAL MODELS USED IN THE STUDY OF ADHERENCE

Antecedents of Rehabilitation Adherence

In health care in general over 200 antecedents of adherence have been identified (Meichenbaum & Turk, 1987), however a smaller number of factors have been found to affect adherence to rehabilitation programmes (Brewer, 1999). Some of these factors have been consistently identified as antecedents of adherence, such as social support and motivation, which is indicative of them being investigated more often than other factors, such as a sense of control over the treatment and recovery. Further an analysis of this body of research has identified some methodological issues that warrant consideration because of their possible effect on the findings of the studies.

This section of the chapter will briefly discuss the antecedents of adherence to rehabilitation, using the categories developed by Meichenbaum and Turk (1987), namely the patients’ personal characteristics, disease or injury variables, treatment or environmental variables and the interaction between the patient and the physiotherapist. Then it will examine some of the methodological issues in this body of research that are of relevance to this thesis.

Patients’ personal characteristics

A range of personal characteristics have been associated with adherence, in particular socio-demographic variables, level of participation in sport, motivation, previous adherence behaviours and social support. The outcomes of studies investigating the role of socio-demographic variables have been conflicting. Middle-aged highly educated women were reported to be the least adherent to physiotherapy home exercise programmes (Sluijs, Kok et al., 1993), whereas males and married people were shown to be the most adherent, with educational attainment having no bearing on adherence to short term physiotherapy for back pain (Alexandre et al., 2002). In another study, older people, who were highly motivated and perceived they had a high level of social support were shown to be significantly more likely to adhere, but when athletic identity was taken into account
younger people were significantly more adherent (Brewer et al., 2003a). It should be noted that in the Brewer et al. (2003a) study age was treated as a continuous variable with the ages ranging from 14 to 47 years, and hence the older participants were not that old in real terms. Two other studies of home exercise programmes did not produce evidence of relationships between adherence and age, gender and educational attainment (Chin et al., 1998; Hartigan, Rainville, Sobel, & Hipona, 2000).

Social factors associated with not being able to find child care (Chin et al., 1998; Vasey, 1990) and transport to and from treatment (El-Tantawy et al., 2000) have been found to be detrimental to clinic attendance. Contrary to expectations the level of involvement in sport (competitive or recreational) was not found to influence clinic attendance (Daly et al., 1995).

Self-motivation, or the extent to which patients persist with their rehabilitation in the face of barriers and obstacles has been positively associated with treatment adherence (Brewer, Van Raalte, Cornelius et al., 2000; Campbell et al., 2001; Duda et al., 1989; Fields et al., 1995; Fisher et al., 1988; Pizzari et al., 2002). Likewise positive emotional adjustment to injury and high levels of adherence have been correlated (Hall et al., 2002; Laubach et al., 1996; Murphy et al., 1999).

Previous adherence behaviours have proven to be predictors of current and future adherence to exercise programmes for osteoarthritis of the knee (Rejeski et al., 1997; Woodgate et al., 2005). Social support that encourages patients to continue with their rehabilitation has been linked to high levels of adherence (Brewer et al., 2003a; Brewer, Van Raalte, Cornelius et al., 2000; Byerly et al., 1994; Duda et al., 1989; Terpstra et al., 1992), although Udry (1997) did not find any associations between these variables.

**Disease or injury variables**

Disease and injury related variables, such as patients’ perceptions of their symptoms and the chronicity of the disorder have been shown to have a bearing on adherence. Debate surrounds the effect of patients’ pain tolerance on their adherence to physiotherapy. Injured people with a high pain tolerance are significantly more likely to be adherent to the programme requirements as opposed to those with a poor tolerance (Brewer, Van Raalte, Cornelius et al., 2000; Byerly et al., 1994; Fields et al., 1995; Fisher et al., 1988). However,
other research has been unable to show a significant difference between the pain experiences of adherent and non-adherent physiotherapy patients (Sluijs, Kok et al., 1993). Pizzari et al. (2002) found that pain was not a continual problem throughout the entire programme, with its effects fluctuating at different stages during the recovery.

Patients are more adherent to their rehabilitation when they perceive their injury as being serious (Taylor & May, 1996) and that they are vulnerable to further problems related to the injury as a consequence of not undertaking the prescribed rehabilitation activities (Brewer et al., 2003b; Taylor & May, 1996). Conversely Flynn, Lyman and Prentice-Dunn (1995) did not find any significant associations between severity and vulnerability and parental adherence to the treatment programme for their children with muscular dystrophy. Adherence to treatment programmes for chronic diseases or injuries can be problematic, particularly during times of remission when the symptoms are absent as patients lack relevant cues to maintain their treatment (Sluijs & Knibbe, 1991).

**Treatment variables**

Adherence has been related to the timing of the treatment appointments, the clinic environment, the content of the treatment programme and patients’ attitudes to the treatment. Patients are less likely to keep clinic appointments when these are scheduled at times they consider inconvenient (Fields et al., 1995; Fisher et al., 1988; Vasey, 1990), and if they are made too far in advance (Vasey, 1990). The clinic environment has been found to be of importance, with higher levels of adherence being reported among patients who feel the clinic has a comfortable atmosphere (Fields et al., 1995; Fisher et al., 1988; White, Mavoa, & Bassett, 1999).

Complex, intrusive, long-term programmes that require assistance from other people for their successful implementation have been associated with poor rates of adherence (Flynn et al., 1995; Muszynski-Kwan, Perlman, & Rivington-Law, 1988). The success of physiotherapy rehabilitation programmes that consist primarily of exercises is dependent upon patients taking an active role in them (Sluijs et al., 1998). Patients frequently find difficulty in maintaining exercise behaviours over the long-term, because of the problems encountered in making them part of their daily routines and overcoming the high number of perceived and real barriers to them (Sluijs & Knibbe, 1991). Perceived
barriers to undertaking home exercise programmes that have been identified are lack of
time to exercise, an inability to fit exercises into a daily routine and forgetting to exercise
(Sluijs, Kok et al., 1993). Low levels of adherence have also been linked to negative beliefs
about the value of the exercises (Pizzari et al., 2002; Sluijs, Kok et al., 1993).

Patients’ beliefs about their treatment, their ability to cope with it and their sense of
control over it have been linked with adherence. The amount of effort or exertion patients
put into their rehabilitation activities have been positively associated with adherence (Duda
et al., 1989; Murphy et al., 1999). High levels of adherence have been related to beliefs
about the rehabilitation being effective (Brewer et al., 2003b; Duda et al., 1989; Flynn et
al., 1995; Taylor & May, 1996) and the patients’ self-efficacy or perceptions about their
ability to cope with the treatment requirements (Brewer et al., 2003b; Chin et al., 1998;
Flynn et al., 1995; Hall et al., 2002; Taylor & May, 1996; Woodgate et al., 2005). In
contrast Pizzari et al. (2002) did not find self-efficacy had such an obvious influence on
adherence. A strong sense of control over the treatment (Chin et al., 1998; Duda et al.,
1989) and control over the recovery from injury (Laubach et al., 1996; Murphy et al., 1999)
have been positively linked to adherence.

Patient-physiotherapist interaction

Communication between the patient and the clinician is considered to be central to
establishing effective patient rapport (Pizzari et al., 2002; Purtilo & Haddad, 1996).
Patients who had a positive relationship with their physiotherapists felt more inclined to
attend their clinic appointments and complete their rehabilitation activities during these
sessions (Hall et al., 2002; Pizzari et al., 2002). Adherence to physiotherapy exercise
programmes has been shown to be significantly greater when physiotherapists gave patients
positive feedback, asked them for feedback about their progress and treatment, regularly
monitored their exercise performance and frequently motivated them to do their home
exercises (Sluijs, Kok et al., 1993). Conversely, physiotherapists can be responsible for
poor levels of adherence if they give patients too much information and if that information
is not specific to their needs and disorder (Sluijs, 1991).

Patients, too, may have problems in communication, and are not always truthful
about their adherence to their home-based activities. For instance in a study of patient self-
reports about their home exercises, in response to the physiotherapist’s question “how about your exercises?” one patient stated “no problems”, when in reality he was prevented from exercising because his job required him to drive for ten hours per day (Sluijs et al., 1998, p.372).

**Methodological issues in the antecedents to adherence research**

The diverse range of antecedents of rehabilitation adherence could be due in part methodological issues related to the designs of the studies, the participants, and the measurement of the antecedents and clinic- based adherence. Each of these issues will be discussed in turn.

By and large the studies have been either cross sectional or prospective in design, with the antecedents being measured at the beginning of the treatment programme and adherence either at one or two time points (for example Taylor & May, 1996) or continuously throughout the treatment programme (Brewer, Van Raalte, Cornelius et al., 2000; Byerly et al., 1994; Duda et al., 1989; Fields et al., 1995; Fisher et al., 1988). Only one study used a short-term longitudinal design, and measured the antecedents at five different time points throughout the rehabilitation programme (Udry, 1997). A few studies have taken a qualitative approach, interviewing the participants using open-end questions, and then linking their findings to the participants’ level of adherence (Campbell et al., 2001; Pizzari et al., 2002).

In addition to cross-sectional and qualitative designs the treatment and patient-physiotherapist interaction related antecedents have also been investigated using survey and observational methods, such as audiotape recordings (Sluijs, Kok et al., 1993). With exception of the Udry (1997) study, the investigations have treated the antecedents as being static entities that tend to operate in isolation. However they are known to operate in different ways at different time points throughout a treatment programme, and therefore should be measured throughout the trial or treatment programme (Martin, Bowen, Dunbar-Jacob, & Perri, 2000; Meichenbaum & Turk, 1987).

The participants in much of the research have been injured sports people from universities and colleges (for example Byerly et al., 1994; Duda et al., 1989; Fields et al., 1995; Fisher et al., 1988; Taylor & May, 1996), which poses difficulties in generalising the
findings to the wider population of people who are treated by physiotherapy. In the earlier studies the participants had a wide range of injuries (for example Byerly et al., 1994; Fields et al., 1995; Fisher et al., 1988; Lampton et al., 1993; Murphy et al., 1999), which increases the variability of responses to the injury and the rehabilitation (Brewer, 1999). Nonetheless investigations that have restricted their sample to people with the same or similar injuries have not necessarily had consistent findings (cf. Brewer, Van Raalte, Cornelius et al., 2000; Duda et al., 1989; Udry, 1997)

A variety of measures have been used to identify the antecedents, many of which have reported reliability and validity, but are not specific to rehabilitation, such as the Social Support Inventory (SSI: Brown, Alpert, Lent, Hunt, & Brady, 1988), Self-Motivation Inventory (Dishman & Ickles, 1981) and the Multidimensional Health Locus of Control (Wallston, Wallston, & DeVellis, 1978). The problems of using non-specific measures was highlighted by Udry (1997), who held the lack of specificity of the SSI responsible for the non-significant effect of social support on rehabilitation adherence.

Two questionnaires that have been developed specifically for rehabilitation patients, the Rehabilitation Adherence Questionnaire (RAQ: Fisher et al., 1988) and the Sport Injury Rehabilitation Beliefs Survey (SIRBS: Taylor & May, 1993) have had mixed success. The RAQ consists of six subscales that measure perceived exertion, pain tolerance, self-motivation, support from significant others, scheduling of rehabilitation and environmental conditions. While the RAQ has shown some promise discriminating between the high and low adherers (Byerly et al., 1994; Fields et al., 1995; Fisher et al., 1988), it has been criticised for lacking internal consistency and criterion-related validity (Brewer, Daly, Van Raalte, Petitpas, & Sklar, 1999). The other questionnaire, SIRBS was constructed to measure four Protection Motivation Theory (PMT: Rogers, 1975; Rogers, 1983) based antecedents of adherence, namely severity, vulnerability, response efficacy and self-efficacy. It has also been able to distinguish between high and low adherers to rehabilitation, and with the exception of the severity scale, the other three have acceptable internal consistency (Brewer et al., 2003b; Taylor & May, 1996).

Investigations into the effects of the patient-physiotherapist interaction on adherence have frequently collected the data by way of observations (audiotape recordings)
and interviews, and then the behaviours and responses have been categorised for the purposes of analysis (Campbell et al., 2001; Pizzari et al., 2002; Sluijs, van der Zee, & Kok, 1993). As a consequence of using different measuring tools, constructs have been operationalised differently, which may in turn have led to the range of antecedents and their variants being identified, for example social support has been conceptualised include support from sports team personnel, clinicians and or family and friends (cf. Brewer et al., 2003a; Brewer, Van Raalte, Cornelius et al., 2000; Fisher et al., 1988; Terpstra et al., 1992).

Finally the measurement of clinic-based adherence raises two particular concerns. First attendance has been used either as the sole indicator for this form of adherence (Alexandre et al., 2002; Udry, 1997) or as a major contributor to a clinic-based adherence score (Byerly et al., 1994; Duda et al., 1989; Fisher et al., 1988). As previously reported attendance does not capture the treatment behaviours (Brewer, Van Raalte, Petitpas et al., 2000). Secondly in the absence of any validated measures of clinic-based adherence the earlier research designed their own indicators, which evaluated a range of treatment behaviours, such as perceived exertion or effort (Fields et al., 1995; Lampton et al., 1993), overall progress (Lampton et al., 1993), and exercise intensity and completion (Duda et al., 1989). As different treatment behaviours have been assessed it is difficult to make valid comparisons of the adherence-antecedent relationship found in the studies. However since the development and validation of the SIRAS (Brewer et al., 1995), recent research has been able to measure clinic-based adherence in a reliable and valid manner (see Brewer et al., 2003a, 2003b; Brewer, Van Raalte, Cornelius et al., 2000; Daly et al., 1995; Laubach et al., 1996).

**Summary**

In spite of the diversity in research and its findings, some factors have been consistently identified as influencing adherence, such as motivation to undertake the physiotherapy, perceptions about social support being encouraging, the ability to tolerate pain, self-efficacy, the convenience of clinic appointments and the role of effective patient-physiotherapist interaction. The conflicting evidence about the effect that the socio-demographic variables have on adherence highlights the complex nature of these variables
and the manner in which interact with each other. Also to some extent the antecedents that have been identified have been determined by the way in which they have been conceptualised and measured in the investigations. While the earlier investigations had limitations in the sample selection and measurement of the antecedents and adherence, the more recent research has overcome some of these weaknesses by recruiting participants with the same injuries, and developing reliable and valid measures of the antecedents and adherence to rehabilitation. Nonetheless these steps have not guaranteed that the findings are consistent.

**Theoretical Models Used to Study Adherence**

It is evident from the review of the literature of the antecedents of adherence that the range of factors linked to adherence is due in part to focus of the research, the raft of questionnaires used and the atheoretical nature of much of the research. Using theoretical frameworks or models provides research with conceptual clarity and facilitates the interpretation of their findings (Brewer, 1999). A small number of studies that have investigated the psychological factors related to adherence to rehabilitation have used theoretical frameworks. The three frameworks that have been employed are the Personal Investment Theory (Maehr & Braskamp, 1986), the Cognitive Appraisal Theory (Andersen & Williams, 1988; Udry, 1997; Wiese-Bjornstal, Smith, & LaMott, 1995), and the Protection Motivation Theory (PMT: Rogers, 1975, 1983). Each of these and the manner in which they have been applied in the context of rehabilitation will be discussed in turn.

**Personal Investment Theory**

The Personal Investment Theory (Maehr & Braskamp, 1986) consists of three components, which explain the personal and situational factors that determine motivational behaviour within a given setting. The first component consists of the personal incentives, such as goals that motivate the individual to act. The second is personal beliefs about one’s ability to undertake the behaviour. The third component takes into account the other behavioural options that are available and suitable for the individual and the situation.

Using a prospective design Duda et al. (1989) investigated the utility of this model in the context of sport injury. Forty injured college athletes took part and at the beginning
of their rehabilitation they completed questionnaires pertinent to the physical, psychological and situational variables embodied in the Personal Investment Theory. Throughout their rehabilitation the participants’ adherence was measured by their percentage of attendance, completion of the exercise protocol and their intensity of exercising, all of which were combined to give an overall adherence score. The best predictors of overall adherence were a belief in the treatment efficacy, high perceived social support for the rehabilitation, high self-motivation, and task involvement in sport. The results of this study demonstrate that the Personal Investment Theory can be used to predict adherence to injury rehabilitation. A limitation of this model in the context of rehabilitation is that to measure all its facets a large number of questionnaires have to be completed, and given the nature of their treatment programme answering them may be too time consuming for prospective participants.

**Cognitive Appraisal Model**

The cognitive appraisal model takes the perspective of the injury being a stressor, the behavioural and psychological coping mechanisms are therefore seen as stress responses, and dependent upon the continual cognitive appraisal of the situation, personal resources and the emotional responses to the injury (Andersen & Williams, 1988; Udry, 1997; Wiese-Bjornstal et al., 1995). Two studies (Daly et al., 1995; Udry, 1997) have used the cognitive appraisal model to investigate adherence to rehabilitation.

Daly et al. (1995) investigated the effect of the cognitive appraisal of the injury on the emotional adjustment and adherence behaviours with 31 people undergoing rehabilitation following knee surgery. Participants’ cognitive appraisal of their coping ability was measured on one item, ‘my injury will be difficult to deal with’, and their emotional adjustment to their injury tested by Profile of Mood States (D. M. McNair, Lorr, & Droppleman, 1971). Adherence was evaluated by the percentage of attendance and one administration of the SIRAS (Brewer et al., 1995) a week after the questionnaires. Low levels of perceived ability to cope with injury were directly associated with high levels of mood disturbance, and inversely related to attendance. Daly et al. (1995) reported the one item cognitive appraisal scale was a limitation of this study.
Udry (1997) modified the model to include social support, hypothesising that there would be a relationship between personal coping strategies, social support and rehabilitation adherence. Twenty-five college athletes, about to undergo knee surgery took part. Pre- and post-operative measurements were taken of the personal coping strategies using the shortened version of the Profile of Mood States (Shacham, 1983) and the Coping with Health and Injury Problems (Endler & Parker, 1992), which evaluates instrumental, negative emotion, distraction and palliative coping; and SSI (Brown et al., 1988). Adherence was measured by an attendance ratio. Instrumental coping was shown to be a positive predictor of attendance, whereas palliative coping was a negative predictor and social support played no role. In addition the coping strategies were shown to change over time with a significant decrease in negative emotion and palliative coping over the duration of the rehabilitation. Udry (1997) reported that a limitation was the measurement of social support using the SSI as this is a global measure of social support, and not specific to rehabilitation.

While the Cognitive Appraisal Model has been shown to have some ability to discriminate between high and low adherers, both studies were limited by the small number of participants and measurement of adherence that did not match the components of the programme. Further these studies used slightly different versions of the Cognitive Appraisal Model which makes it difficult to establish this model’s suitability in the context of rehabilitation adherence.

**Protection Motivation Theory**

The PMT originally developed by Rogers in 1975, is a fear appeal model based on the premise that fear is triggered in a situation believed dangerous and as a result some form protective action will be taken (Rogers, 1975). In 1983, Rogers modified the model such that it now consists of three phases; sources of information, cognitive mediating processes and the modes of coping (see Figure 1). It is the central portion of the model, the cognitive mediating processes and its effect on the coping modes that has been the focus of research.

The basis of the cognitive mediating processes are the maladaptive and adaptive responses, which are evaluated by the threat and coping appraisals respectively. Increases
in both these appraisals leads onto an enhanced protection motivation (behavioural intentions). The threat appraisal is strengthened by a reduction in the maladaptive response, which occurs when the threat is seen as severe (severity) and the individual feels vulnerable to further harm if no action is taken (vulnerability). These variables can be further enhanced by the indirect action of fear. An increase in the coping appraisal occurs when the adaptive response is heightened by the coping response being viewed as effective (response efficacy) and the individual feeling he/she can cope with the response (self-efficacy). The threat and coping appraisals occur in parallel, and combine to form the protection motivation, which is assessed as behavioural intentions (Rogers, 1983). Finally, it is anticipated that the intentions will translate into behaviours, known as the protective behaviours (Boer & Seydel, 1995).

The most frequently measured variables of the PMT are severity, vulnerability, response efficacy and self-efficacy, and the model has been used in research as either the basis of interventions aimed at changing beliefs and behaviours or as an investigative tool to establish whether PMT based beliefs have a bearing on intentions and behaviours (Boer & Seydel, 1995).

Figure 1. Schematic representation of the Protection Motivation Theory (Rogers, 1983)


Intervention studies

The PMT has been used as an intervention to improve intentions to undertake health promoting behaviours and the implementation of the actual behaviour. Typically factorial designs have been employed in these studies, with the PMT variables being manipulated at two levels, high and low/absent. To ensure that the levels of information were substantially different, many of the studies used fabricated information that exaggerated the effects of the health problems and the ease with which the interventions could be implemented. Participants in these studies have primarily been either high school or university students. They have been given PMT-based information to read that has been mostly essays, but pamphlets and newspaper articles have been used less frequently. Then the participants’ PMT beliefs, intentions and/or potential behaviours have been tested by questionnaires derived from the intervention content (Courneya & Hellsten, 2001; Fruin, Pratt, & Owen, 1991; Maddux & Rogers, 1983; Rippetoe & Rogers, 1987; Wurtele, 1988; Wurtele & Maddux, 1987; Yzer, Fisher, Bakker, Siero, & Misovich, 1998). A range of intentions to perform health behaviours have been investigated in this manner, for example breast self-examination (Rippetoe & Rogers, 1987), use of AIDS preventative behaviours (Yzer et al., 1998), the adoption of regular exercise to reduce the likelihood of colon cancer (Courneya & Hellsten, 2001) and cardiovascular disease (Fruin et al., 1991; Wurtele & Maddux, 1987), increasing calcium intake as a preventative measure against osteoporosis (Wurtele, 1988), and quitting cigarette smoking (Maddux & Rogers, 1983).

Except for the Courneya and Hellsten (2001) study, the others successfully manipulated the PMT variables, with significant differences occurring between the high and low/absent levels of information. Courneya and Hellsten (2001) failed to successfully manipulate vulnerability which they thought could be due to the students in the strong vulnerability group being optimistic about not developing colon cancer. In all of the cited studies the interventions strengthened the intentions to implement the recommended behaviours, with either all or some of the PMT variables being responsible for the successful manipulation. For the most part self-efficacy either acting alone or in conjunction with other variables was the major contributor to strengthening the intentions (Courneya & Hellsten, 2001; Fruin et al., 1991; Maddux & Rogers, 1983; Rippetoe & Rogers, 1987; Wurtele, 1988; Wurtele & Maddux, 1987; Yzer et al., 1998).
The two studies that investigated the effect of the intervention on the adoption of the behaviours had contrasting findings. Wurtele and Maddux (1987) found that vulnerability was the only variable to act alone to significantly increase the desired behaviour, but a combination of self-efficacy and severity also had a similar effect on behaviour. In the other study (Wurtele, 1988) the high and low levels of the intervention information did not have significantly different effects on behaviour, although in comparison to the control group significantly more participants in the intervention group who were exposed to the high vulnerability condition undertook the behaviour.

Interventions that manipulated the PMT variables strengthened beliefs and had an effect on intentions and behaviours. The evidence points to self-efficacy having the greatest effect on intentions and vulnerability having a similar role with behaviours. However these outcomes need to be interpreted with some caution as they were achieved in part by the use of fabricated information. Also with the exception of the study that used students who were cigarette smokers (Maddux & Rogers, 1983), the others had participants who did not have the disease under enquiry, and hence for them the consequences were somewhat remote and idealistic.

Investigative studies of the effect of PMT-based beliefs on intentions and behaviours

Five studies have used the variables of the PMT (Rogers, 1983) to predict the intentions to undertake and adhere to the recommended treatment amongst patients and or their carers. The diseases or injuries studied were renal transplantation (Rudman, Gonzales, & Borgida, 1999), myocardial infarction (Plotnikoff & Higginbotham, 1998), muscular dystrophy (Flynn et al., 1995), sports injuries (Taylor & May, 1996) and surgical repair of anterior cruciate ligament (Brewer et al., 2003b). The first two studies are not of direct relevance to physiotherapy rehabilitation, but it is worth noting their findings. Plotnikoff and Higginbotham (1998) found significant correlations between self-efficacy and the intentions to adhere to exercise and low fat diet, and vulnerability and dietary adherence. Whereas in the Rudman et al. (1999) study the significant predictors of intentions to adhere to the treatment were low response costs, high self-efficacy, severity and vulnerability, and non-adherence behaviours were predicted by low self-efficacy and threat appraisal. The remaining three studies (Brewer et al., 2003b; Flynn et al., 1995; Taylor & May, 1996) are
of particular interest in this thesis as they have applied the PMT within the context of rehabilitation involving physiotherapy, and therefore will now be addressed in some detail.

Flynn et al. (1995) also used a cross-sectional design to investigate the degree to which parents followed the medical regimens (including physiotherapy) for their children with muscular dystrophy. Ninety-nine parents completed a mail out questionnaire measuring six components of the PMT (severity, vulnerability, self-efficacy, response efficacy, response costs, and maladaptive response rewards). A strong significant positive correlation was found between parental non-implementation of the treatment and the response costs in terms of the time and energy of undertaking home-based treatment. Parental self-efficacy and their perception of the treatment being effective were significant indicators of their intentions to adhere with treatment requirements. As the threat appraisal variables were not found to be a reliable predictor of the intentions and adherence behaviours, Flynn et al. (1995) questioned the feasibility of including these variables in any future investigations of medical populations. A strength of this study is the sample size which was large given the rarity of muscular dystrophy.

Taylor and May (1996) used a prospective design to examine the effects of the four main PMT variables (severity, vulnerability, response efficacy and self-efficacy) on the rehabilitation adherence of 62 injured student athletes. The SIRBS (Taylor & May, 1993) evaluating the four main PMT variables was completed by the participants at the treatment prior to their home-based adherence being measured. Adherence to the home-based components of the rehabilitation was assessed by participant self-reports and the physiotherapist established the extent to which she thought the participants had adhered to the home programme by way of her observations of their relevant verbal and non-verbal behaviours. The PMT variables were found to discriminate between high and low adherers. However this study was limited methodologically by the sample being people with a diverse range of injuries, only measuring home-based adherence and not including clinic-based adherence, and the method of measuring adherence, which was considered to be weakened by the physiotherapist being required to make judgments based on observations of the participants’ clinic behaviours.
Brewer et al. (2003b) replicated the Taylor and May (1996) study, but improved the design by overcoming the methodological weaknesses. Eighty-five people who had undergone surgical repair of their anterior cruciate ligament were recruited five weeks post-operative. At this time they answered the SIRBS (Taylor & May, 1993), and from that time on their adherence was measured by the SIRAS (Brewer et al., 1995) for the clinic-based behaviours, participant self-reports of home-based behaviours, and percentage of attendance. The findings were similar to those of Taylor and May (1996), with stronger perceptions of vulnerability, treatment efficacy and self-efficacy being significantly associated with high levels of clinic- and home-based adherence. However severity was not significantly correlated to any of the adherence measures, and likewise clinic attendance was not significantly related to any of the PMT variables.

In summary three of the five studies investigated the effect of PMT based beliefs on intentions (see Flynn et al., 1995; Plotnikoff & Higginbotham, 1998; Rudman et al., 1999), and all of them have examined adherence behaviours. While self-efficacy was the most consistent predictor intentions to adhere, it was not so clear cut with the adherence behaviours. Only Taylor and May (1996) showed that the four main variables successfully discriminated between high and low adherers. Despite this body of research demonstrating that the PMT is useful in the context of medical care and rehabilitation, it is limited as it has only established correlations and not cause and effect.

Summary

The three theoretical frameworks reviewed have demonstrated utility in being able to discriminate between high and low adherers to rehabilitation programmes. To date the Personal Investment Theory and the Cognitive Appraisal Model have only been used in an investigative manner in a small number of studies and their ability to act as the basis of interventions has yet to be established. In comparison the PMT has been used more extensively in investigative and intervention studies. The intervention studies have demonstrated that PMT-based information can strengthen people’s health based beliefs, intentions and behaviours. As the PMT has not been tested as an intervention with rehabilitation patients, no comment can be made about its effectiveness in this context.
CHAPTER FOUR
PATIENT EDUCATION AND COGNITIVE-BEHAVIOURAL TECHNIQUES

This chapter will evaluate the methods of patient education and cognitive-behavioural techniques of direct relevance to the research in this thesis. The three categories of patient education that will be addressed are verbal, written and visual or video, and cues and treatment goals are the cognitive-behavioural techniques that will be briefly discussed as they are frequently used in conjunction with written patient education packages.

Patient Education Techniques

Effective patient education is considered to be one way in which patients’ understanding, satisfaction and adherence to their treatment programme is improved (Ley, 1988). There is some dispute in the literature over what actually constitutes patient education. Bartlett (1982) developed a definition of patient education that considered it to be ‘a planned learning experience using a combination of methods such as teaching, counseling and modification techniques which influence patients’ knowledge and health behavior’ (p. 323). Meichenbaum and Turk (1987) made a distinction between patient education and behaviour modification (cognitive-behavioural) techniques. They consider education techniques to be ways of providing patients with information about their illness and treatment to increase understanding, whereas cognitive-behavioural techniques as being methods of changing patients’ behaviours to enable them to adhere to the treatment and its requirements. In this thesis patient education will refer to the methods used to impart the information.

Patient education is of importance in physiotherapy treatments, and is valued by physiotherapists, with upwards of 90% of them using it in their daily practice (Chase, Elkins, Readinger, & Shepard, 1993; May, 1983; Sotosky, 1984). Physiotherapists who took part in the Chase et al. (1993) study reported teaching 80 to 100% of their patients about the rationale behind the treatment, home programmes, and mobilising and strengthening exercises. The most popular educational methods used by the
physiotherapists were verbal discussion, demonstration of the exercises and the use of patient specific instruction sheets that included sketches. They also believed that the education was enhanced by the development of a trusting relationship with the patients and setting concrete treatment goals that related to the patients’ perceptions and needs. In contrast Sluijs et al. (1993) found that some physiotherapists placed more importance on their technical skills during the patients’ treatments than they did on educating them.

**Verbal information**

Most information sharing between patients and their clinicians is done verbally (Meichenbaum & Turk, 1987). For patients to be able to use the treatment advice, it needs to be given in a manner that enables them to easily recall what they have been told (Ley, 1988). Recalling information can be improved by simplifying it, explicit categorisation, repetition and specific advice (Ley, 1988). Further adherence to the treatment requirements is considered to be improved if only small amounts of verbal information are given at each treatment session (Feinberg, 1988; Green, 1979; Rastall et al., 1999; Schneider, Zusman, & Singer, 1998).

Simplifying information by the clinicians’ use of shorter sentences and shorter words has been found to improve patient recall from 27% to 40% (Ley, 1988). Simplification of information is a communication problem physiotherapists report having. In particular they find it difficult to translate medical terminology into everyday language (Sluijs, van der Zee et al., 1993). Explicit categorisation, or giving patients prior warning about the categories of information to be presented prepares the patient in advance of it being given (Falvo, 1985; Green, 1979; Ley, 1988). In a study about the effects of treatment goals on adherence, physiotherapists were observed routinely using explicit categorisation, which was thought to be one reasons for the participants’ relatively high adherence levels (Bassett, 1996). Also the order of the information influences the patients’ recall, and it is recommended that the most important should be given first (Feinberg, 1988; Green, 1979; Ley, 1988). When clinicians repeat information during the treatment sessions, patients have recalled 83% of it as opposed to only 62% being remembered by patients when repetition was not used (Ley, 1988).
Providing information that is specific to the patients’ illness or injury, treatment and daily activities is considered to improve its recall and encourage adherence (Clopton & McMahon, 1992; Ley, 1988). With regard to physiotherapy exercise programmes Sluijs et al. (1993) suggest that adherence can be improved if the exercises are tailored to suit the patients’ individual situations and integrated into their daily activities. The amount of information given at each treatment session has been shown to influence how much is remembered (Feinberg, 1988; Green, 1979; Rastall et al., 1999). Rastall et al. (1999) found that irrespective of age more exercises were forgotten and performed incorrectly from a list of ten as opposed to a list of five exercises. Similarly Schneiders, Zusman and Singer (1998) reported high adherence levels when patients were given four exercises to do at home.

Another way to reduce the amount of information given at each session is to, where possible, spread it over the duration of the course of treatment (Feinberg, 1988; Green, 1979). The results of two observational studies of patient education in physiotherapy indicate that physiotherapists did not spread the information across the entire physiotherapy programme (Gahimer & Domholdt, 1996; Sluijs, 1991). From the analysis of the audio-taped treatment sessions in these two studies, the greatest amount of information was given in the first two treatment sessions, with a significant decrease over the remainder of the treatment programme. At the last treatments there was an increase in advice and information given in comparison to the previous treatments, and surprisingly this information was focused on the patients’ current complaints, and not on their future self-management. Nonetheless Sluijs et al. (1993) did identify a group of physiotherapists, who routinely advised, informed and taught their patients at each treatment session and also had a systematic plan for educating their patients. Sluijs et al. (1993) also found significant positive correlations between the amount of exercise instructions given over the course of the physiotherapy programme and the physiotherapists’ estimates of their patients’ long- and short-term adherence.

In summary verbal information can improve patients’ understanding and treatment adherence if it is not too detailed, presented in simple everyday language, given in small amounts spread out over the duration of the treatment programme and specific to the patients’ needs. However the research findings indicate that physiotherapists do have
difficulty in presenting information in lay people’s terms and spreading it over the entire treatment programme.

**Written information**

Patients’ understanding of medical information and adherence to their treatment regimens is reputedly improved by written information (Ley, 1988), but it is of no use if patients cannot understand it (Estey, Musseau, & Keehn, 1991). When written information is being developed attention needs to be given the content, its mode of delivery, design and layout (Ley, 1988; Raynor, 1998).

For the content to be understood it must be written in simple language, which Ley and Morris (1984) report can be achieved by using short words and short sentences, and writing the information in the active tense. Sentence construction has found to be a reason for poor patient understanding, Reid et al. (1995) found 40 out of the 73 sentences in one text were poorly constructed and sometimes appeared illogical. The reading age of the target audience is another important consideration in the development of written information. Estey et al. (1991) found there is no relationship between educational attainment and the understanding of written medical information, with the most accurate comprehension occurring when the text is written for a grade five (10 year olds) reading level. The use of simple language and targeting the reading age to that of a grade five level was credited by Meade, McKinney and Barnas (1994) as being a prime reason for the content of the written information being understood just as well by the participants regardless of their level of educational attainment.

Another way in which improved readability can be achieved is by the omission of technical jargon and specialized information (Estey et al., 1991; Reid et al., 1995). Text that contains a lot of technical details, for example pathological changes, may impress patients, but as Reid at al. (1995) discovered while 59% of the patients reported it was easy to read, when asked to recall the information, only 7% of them could do so correctly. Also written information that is either specific to the patients’ needs or personalised is known to improve their understanding and treatment adherence (Ley, 1988; Ley & Morris, 1984; Raynor, 1998; Schneiders et al., 1998). Sometimes this means that it has to generated specifically for them (Bassett, 1996; Schneiders et al., 1998). Studies that have investigated
the effect of framing patient treatment information in terms of either the associated costs (loss frame) or benefits (gain frame) have found support for the use of the gain frame mode in terms of intending to take up the treatment options (Rothman & Salovey, 1997).

The way in which patients are given written information is important as it can influence their perceptions of its relevance and value (Raynor, 1998). Written information should not just be handed to patients without any verbal input from their clinicians (Raynor, 1998). Research has shown that when patients are given information booklets their understanding of its content and their treatment adherence is enhanced when their clinician verbally outlines the information and highlights the important points (Schneiders et al., 1998; Schoo et al., 2005; Swinburn, Walter, Arroll, Tilyard, & Russell, 1998). Further Little et al. (2001) found that if the clinicians’ information does not coincide with or reinforce that in a booklet, patients report being dissatisfied with the information and have poor treatment outcomes. Similar findings have been reported in studies that have investigated the effect of giving out booklets with little or no supplementary information being provided by the clinicians (Burton, Waddell, Tillotson, & Summerton, 1999; Friedrich et al., 1996). However if patients are left to their own devices for seeking out information, Hammond (1998) found that they usually resort to booklets and leaflets about their disorder and its treatment.

The design and layout of written information influence the amount of attention patients pay to it (Ley & Morris, 1984; Raynor, 1998). The characteristics of well organised easy to read information are headings particularly in the form of questions, text that is sparse, bullet pointed lists, readable font size of at least 12 point and bold type face for emphasis of information (Ley & Morris, 1984; Raynor, 1998). These principles underpinned the presentation of the information in the booklet compiled by Meade et al. (1994), and was thought to be another reason for the participants, irrespective of their reading level, being able to comprehend the content without difficulty.

Conflict has arisen over the use of pictures and diagrams, Ley and Morris (1984) report that they must be of direct relevance to the content of the text, otherwise they detract from the central message. When they are supportive of the text they are effective in improving understanding and adherence as evidenced by Schneiders at al. (1998). In their
study, patients had significantly higher adherence levels if they were given written information about their home exercises that was supplemented by simple computer generated diagrams than those who did not receive this information.

Like information presented verbally, written information is an effective way of educating patients so long as it is not too detailed, presented in simple easy to understand language, framed so the treatments’ beneficial effects are highlighted and is set out in sections. Further it appears to be of most value when clinicians verbally clarify the content.

**Video information**

Video interventions have included educational programmes and advice for surgical and non-surgical treatment options for back disorders (Deyo et al., 2000), rehabilitation programmes for ankylosing spondylitis (Sweeney, Taylor, & Calin, 2002), knee joint arthroplasty (Lin, Lin, & Lin, 1997), hip joint replacement (Yeh, Chen, & Liu, 2005) and shoulder rotator cuff repair (Roddey et al., 2002), colon cancer, its symptoms and methods of detection (Meade et al., 1994), chronic obstructive pulmonary disease (COPD: Ng, Tam, Yew, & Lam, 1999), and issues relating to child birth (Weston, Hannah, & Downes, 1997). Videos are thought to be a more powerful educational medium for patients than either written or verbal methods, because they utilise both the visual and auditory senses simultaneously (Breckon, Harvey, & Lancaster, 1998). Also two other strengths of video cited by these authors are the information is standardised so that everyone sees and receives the same, and that complex abstract concepts can be simplified by the use of examples from everyday life. To make the most of these strengths health professionals should enlist the help of specialist video production teams and expert narrators, so that the information is presented in a professional and credible manner (O'Dell, 1991).

Videos are most effective if they are produced in accordance with the guidelines recommended for written and verbal patient education, such as using short sentences, short words, non-technical jargon and the active voice, and having the content organised into coherent sections in a logical sequence (Meade, 1996; Meade et al., 1994). In addition there are strategies applicable primarily to videos, for example, they should not be long, the audio and visual elements of the message match so that information is consistent and where appropriate allowing pictures to tell the story (Meade, 1996; O'Dell, 1991).
Four studies that reported using these principles to underpin the production of the videos showed improvements in the participants’ understanding of their disorder and treatment (Deyo et al., 2000; Lin et al., 1997; Meade et al., 1994; Weston et al., 1997), but in only two the differences were significantly greater in the video group as opposed to the controls (Lin et al., 1997; Weston et al., 1997). Deyo et al. (2000) found that largest gains in understanding were made by those participants in the video group who had the lowest pre-intervention knowledge levels. Proof of the value of using very simple language in videos comes from the study undertaken by Meade et al. (1994). They compared video group participants on the basis of their educational attainment and found that there were no significant differences between the high and low achievers when it came to their understanding of the content. Another method of keeping language simple and to a minimum is to use the pictures to tell the story, which reduces the need for dense verbal information, holds the viewers’ attention and enhances their learning (Meade, 1996; O'Dell, 1991). Research has shown support for this strategy by the participants’ learning being boosted (see Deyo et al., 2000; Lin et al., 1997; Roddey et al., 2002; Yeh et al., 2005). However Nielsen and Sheppard (1988) stress that the best understanding of information will only occur if the video is used as an adjunct to the clinicians’ advice and if the two sets of information are congruent.

One way in which the duration of the videos has been kept to a minimum is to structure them so that the patients can select the parts of most value and relevance to them (Deyo et al., 2000; Yeh et al., 2005). In comparison to the control group, the video group in the Yeh et al. (2005) study scored significantly higher on self-efficacy and functional ability, and had a significantly shorter hospital stay, which was attributed to the patients being able to tailor the intervention to their needs. To enable patients to make an informed decision about their treatment, Deyo et al. (2000) used age and diagnosis to tailor the video content. Evidence for this method’s effectiveness came from significantly more patients in the video group as opposed to the control group electing not to have surgery. This was considered to be the right decision because at the one-year follow-up both groups had significant functional and symptomatic improvement, but their respective improvements were not significantly different (Deyo et al., 2000).
The inclusion of role models in videos are thought to bring a sense of realism to the information, thereby assisting the viewers to identify with the content (Meade, 1996; O'Dell, 1991), although the findings of the research do not fully support this notion. In the video that Sweeney et al. (2002) used, the benefits and barriers to regularly adhering to a home exercise programme were highlighted by the different perspectives provided by a rheumatologist, physiotherapist, health psychologist and patient. The intervention group was significantly superior to the control group on the time spent exercising and their exercise self-efficacy. Ng et al. (1999) used a patient with COPD, who was proficient at undertaking the prescribed activities as a role model in their video. They found that the video and control groups’ self-efficacy and exercise performance improved significantly over the duration of the programme, without any significant differences between them. The reason given for the lack of group differences was that both groups had input from the clinician at each exercise session. Similar results were obtained by Meade et al. (1994) and Roddey et al. (2002), which may have been due to the videos being visual replicas of the control information. The video used by Meade et al. (1994) was a visual version of the written information, and that used by Roddey et al. (2002) was a film version of a patient being taught the exercises by a physiotherapist. Also the video and control groups in the Roddey et al. (2002) study both had access to their physiotherapists on a need-be-basis over the duration of their rehabilitation, which may have further clouded the effect of the video.

When compared to evidence that is supportive of the effectiveness of written and verbal educational methods, the findings of investigations into the use of videos as a patient education tool are not as convincing. Despite the participants making significant improvements on the measures used to gauge the videos’ effectiveness, most of the gains have not been any better than those made by the control groups (see Deyo et al., 2000; Meade et al., 1994; Ng et al., 1999; Roddey et al., 2002; Sweeney et al., 2002; Yeh et al., 2005). A possibility for the lack of group differences could be that the video is often part of a larger educational package and not administered in isolation. For instance Deyo et al. (2000), Lin et al. (1997), Meade et al. (1994), Sweeney et al. (2002) and Yeh et al (2005) used a combination of written, verbal and video information, whereas Ng et al. (1999) and Roddey et al. (2002) had a combination of verbal and video information.
Only the Sweeney et al. (2002) study did not have any clinician contact with the participants, they mailed out the educational package to their participants. However their participants had a long history of ankylosing spondylitis and were familiar with the treatment regimen, which Sweeney et al. (2002) gave as reasons for the video not being any more superior than the other educational methods in their study. Also in the video studies when clinicians verbally explained the information they tailored it to meet the participants’ requirements, which is known to enhance understanding and adherence (Ley, 1988). Thus it is difficult to establish exactly what the contribution is that videos make to improving patient outcomes. It may not be possible to overcome the contamination of the other educational methods, particularly verbal input, because for ethical and pragmatic reasons clinicians cannot treat their patients without some form of personal communication with them (Purtilo & Haddad, 1996). While the research points to videos being a successful medium for patient education, this form of media does have a potential limitation in that not all people have access to video players or their successors, DVD players and computers, and therefore consideration needs to be given incorporating their use into the clinic-based treatment sessions.

Cognitive-Behavioural Techniques

This section will focus on two cognitive-behavioural techniques, cues and treatment that are frequently incorporated into educational packages to assist patients with the integration of the recommended treatment behaviours into their daily lives.

Cues

Cues are objects or events present in peoples’ daily lives that can act as meaningful triggers to remind them to undertake a particular activity (Sluijs et al., 1998; Sluijs & Knibbe, 1991). In the acute stages of an injury or illness the symptoms can act as cues to remind the patient to adhere to their treatment, but when they subside other triggers need to be found (Sluijs et al., 1998). For cues to be valuable the patient needs to be involved in determining what these should be. The most commonly suggested cues are placing stickers in noticeable places around the home, or associating daily activities such as going to the bathroom with the need to undertake exercises (Sluijs, 1991). Cues are a popular adherence promoting device used in physiotherapy, but there is very little research to back up their
effectiveness. One study has used exercise reminder stickers as cues but these were only one small part of a larger educational package that also included a video, booklet and exercise wall chart (Sweeney et al., 2002). While the results of this study were promising, with the intervention group having significantly higher exercise self-efficacy and greater duration of exercise per week, it is not possible to determine the exact contribution the exercise stickers made to these outcomes.

**Treatment goals**

Treatment goals are used as a motivational device designed to give the patients a sense of purpose over the duration of their treatment programme (Payton, Nelson, & St. Clair Hobbs, 1998; Worrell, 1992). The hallmarks of effective treatment goals are that they are challenging, achievable, specific to the patients’ needs, meaningful, measurable and predict a time for evaluation (Meichenbaum & Turk, 1987; Payton et al., 1998; Worrell, 1992). Treatment goals are divided into short-term and long-term goals, with the former being up-graded on either a daily, weekly or monthly basis and the latter possibly being the global goal for the entire treatment programme (Daly et al., 1995). To achieve a long-term goal, a series of sequential short-term goals are used, thereby providing a sense of meaning to the daily exercises and other rehabilitation activities that may otherwise seem purposeless to the patients (DePalma & DePalma, 1989; Payton et al., 1998; Worrell, 1992).

Ievleva and Orlick (1991) surveyed patients use of psychological skills during their recovery from injury. They found that fast recovery was significantly associated with goal setting, and that those patients who had a quick recovery were significantly more likely to employ the use of treatment goals than those who had a slow recovery. Scherzer et al. (2001) extended the work of Ievleva and Orlick (1991) by also measuring the participants’ clinic- and home-based adherence. Treatment goal setting was positively associated with adherence to the clinic-based treatment and home exercises, as well as being a significant predictor of both these forms of adherence.

Six studies that primarily investigated the effect of short-term and long-term treatment goal setting on home-based treatment adherence, exercise self-efficacy, ability to perform the exercises and satisfaction with that performance have had encouraging
outcomes (see Bassett & Petrie, 1999; Duncan & Pozehl, 2002; Evans & Hardy, 2002; Stenstrom, 1994; Theodorakis, Beneca, Malliou, & Goudas, 1997; Theodorakis, Malliou, Papaioannou, Beneca, & Filactakidou, 1996). All the studies tailored the goals to the participants’ needs and rehabilitation requirements, with them being reviewed at each treatment session or at regular intervals, such as weekly. Duncan and Pozehl (2002) studied the effect of goal setting amongst a group of people with heart failure, finding that goal group undertook a significantly greater number of home exercise sessions and exercised for a significantly longer duration than the no goals control. Stenstrom (1994) implemented patient-physiotherapist collaboratively set goals in a group of patients with rheumatoid arthritis with 77% of those in goal group increasing their exercise load as opposed to only 20% in no goals group. There were three levels of treatment goals, physiotherapist-patient collaborative, therapist mandated and no formally set goals in the Bassett and Petrie (1999), with those in the latter group having the highest adherence levels followed by the collaborative group. Also both the no formally set goals and collaborative goal groups had significantly higher levels of adherence than the therapist mandated group. While the goal group in the Evans and Hardy (2002) study had significantly higher levels of adherence to the home-based rehabilitation, they did not differ from the control groups on their clinic-based adherence. Furthermore in this study the goal group’s exercise self-efficacy increased significantly over the duration of the rehabilitation in comparison to that of the controls. Treatment goals have also been found to be positively associated with the ability to perform the exercises (Theodorakis et al., 1997; Theodorakis et al., 1996) and increasing satisfaction with that performance (Theodorakis et al., 1997).

Summary

Patient education is an important aspect of physiotherapy treatment programmes, and is an effective way of improving patients’ understanding of their disorder and treatment regimen and their adherence to treatment. However the three methods of imparting information, namely verbal, written and video are most effective if they are developed in accordance with similar principles, namely that the language used is simple, easy to understand and does not contain complex technical jargon. The research findings indicate that when educating patients no one method should be given in isolation, but they should be used in conjunction with each other, for instance written information is more effective if it
is given along with either explanations from the clinician and/or a video. In terms of choosing the educational media, consideration needs to be given to where it is to be used, and in fairness to all patients videos are possibly best restricted to the clinic, whereas written and verbal information can be used both at the clinic and home. Finally the inclusion of cues and treatment goals in an educational package appear to further strengthen the patients’ adherence to the treatment.
CHAPTER FIVE
ANKLE SPRAINS AND THE PHYSIOTHERAPY MANAGEMENT OF ANKLE SPRAINS

Introduction

For reasons outlined in Chapter One, ankle sprains are the injury of focus in this thesis, and hence the purpose of this chapter is provide the reader with an insight into ankle sprains from the perspective of the ligamentous structure of the ankle, aetiology of injury, classification of sprains and the symptoms, physiotherapy management, the prognosis.

Soft tissue injuries around the ankle are very common, with approximately 85% of these injuries being sprains (Nyanzi, Langridge, & Heyworth, 1999). In New Zealand during 2003/2004 soft tissue injuries around the ankle were the second most common injury and accounted for approximately $12,839,000 in claims (Accident Compensation Corporation, 2004). Internationally, it has been reported that ankle sprains make up 15 to 20% of all sporting injuries, with up to 40% of sprains developing long-standing symptoms of instability, some degree of disability, and ultimately recurrence of the injury (Accident Compensation Corporation, 2002b; Ogilvie-Harris & Choi, 2000).

Ligamentous Structures of the Ankle

The two main ligaments of the ankle joint are the lateral and medial ligaments, which respectively join the fibula and tibia to both the calcaneum and talus (hind foot bones). The lateral ligament is the most commonly injured of the two, and accounts for about 85% of all ankle sprains (Zoch, Fialka-Moser, & Quittan, 2003). This ligament consists of three bands, anterior talo-fibular ligament (ATFL), the calcaneo-fibular ligament (CFL) and the posterior talo-fibular ligament (PTFL) (Safran, Benedetti, Bartolozzi, & Mandelbaum, 1999). As the medial ligament is much stronger than the lateral ligament it is less likely to be sprained. Only about 10% of ankle sprains are due to injury of the medial ligament, with other ligaments in the vicinity of the ankle accounting for the remaining 5% (Clanton & Porter, 1997). As lateral ligament sprains are far more common than those occurring at the medial ligament, the remainder of this chapter will focus on the lateral ligament of the ankle.
Aetiology

Sprains are defined as a stretching and tearing of ligamentous fibres (Safran, Benedetti et al., 1999). Ankle sprains commonly occur during sports, such as netball, basketball, soccer and rugby, and in other activities like ballet, tramping and walking over uneven ground (Accident Compensation Corporation, 2002a; Clanton & Porter, 1997; Robbins & Waked, 1998). Lateral ligament sprains most commonly occur when the foot makes contact with ground, such as landing from a jump or at the end of the swing phase of the lower limb during running and walking (Lassiter, Malone, & Garrett, 1989), causing the foot to turn inwards and downwards or more precisely plantarflex and invert (Accident Compensation Corporation, 2002b; Safran, Benedetti et al., 1999). The longer the inversion force is sustained, the more severe the injury and all three bands of the ligament are torn with the ATFL being damaged first, followed by the CFL and lastly the PTFL (Ogilvie-Harris & Choi, 2000; Safran, Benedetti et al., 1999). However not all bands are always ruptured and approximately 86% of all lateral ligament sprains involve only the ATFL which is usually damaged in its midsubstance (Safran, Benedetti et al., 1999).

Classification and Symptoms of Ankle Sprains

The extent of symptoms is dependent upon the severity of the sprain, and a grading system is used as a diagnostic tool to describe the injury’s severity. The gold standard grading system first described by O’Donoghue in 1976 is still the most used method of classification. This system consists of three grades, Grade I or mild, Grade II or moderate and Grade III or severe. In a Grade I sprain only a few ligamentous fibres are torn and there is minimal haemorrhage in the area. Patients present with no ligamentous laxity or residual instability, have full function and strength, and usually resume their usual recreational activities within two weeks following the injury. Grade II sprains are an incomplete tear of the ligament, with mild ankle laxity and instability, a slight reduction in ankle function, decreased strength of the muscles around the ankle, the potential for loss of proprioception, and full resumption of recreational activities takes up to six weeks. Grade III sprains are a complete tear of the ligament, and are characterised by gross ankle laxity and instability, complete loss of strength and proprioception and recovery may take up to six months or longer (Safran, Benedetti et al., 1999).
At the time of the injury most patients report a popping or tearing sensation accompanied by pain and localised oedema, which may be more widespread if two or three of the ligamentous bands have been torn. In addition, ligamentous pain can be elicited by active and passive movement of the foot and ankle through plantarflexion and inversion and is aggravated by overpressure applied at the end of the range of movement (Clanton & Porter, 1997).

The rate of decrease of the symptoms depends upon the grade of the sprain (O'Donoghue, 1976). In the acute phase the symptoms at the ankle are oedema; a haematoma which manifests as a bruise in more severe injuries; local warmth; pain at rest, on movement, weight bearing and on palpation over the damaged ligamentous band(s). These symptoms usually decrease over the first 36 to 48 hours, but limited ankle movement and difficulties with weight bearing may persist for long as six weeks in the more severe sprains (Safran, Benedetti et al., 1999). In the later phases of recovery, pain is elicited at the end of the range of movement; patients can walk unaided with minimal pain during the weight-bearing phase of gait; and there is marked muscle weakness. Complete recovery is indicated by pain free full range ankle movements, and normal or near to normal muscle strength (Safran, Zachazewski, Benedetti, Bartolozzi, & Mandelbaum, 1999).

**Physiotherapy Management**

The aims of the physiotherapy rehabilitation of ankle sprains are to relieve pain, increase range of movement and muscle strength and restore ankle function (Ogilvie-Harris & Choi, 2000). The rehabilitation commences with the rest, ice, compression and elevation (RICE) regimen, and then is progressed to mobilising, strengthening, and coordination activities (Safran, Zachazewski et al., 1999). A variety of methods of physiotherapy, such as short wave diathermy, ultrasound, interferential therapy and transcutaneous electrical nerve stimulation have been investigated and found wanting; but the RICE regimen, followed up by mobilising, strengthening, coordination and weight-bearing exercises have proven to be the most effective forms of treatment (Accident Compensation Corporation, 2002b) and are used the most extensively (Larmer et al., 2002). Also for the first three days following injury, non-steroidal anti-inflammatory drugs (NSAID) may be required to assist with pain relief (Accident Compensation Corporation, 2000).
The RICE regimen is commenced as soon as possible after the injury occurring and is aimed at relieving the oedema and pain. It is continued while the symptoms remain acute, and during this time patients are advised to refrain from any unnecessary weight bearing, with some non-weight bearing on crutches for up to five days following the injury. Ice packs are applied every two hours with the ankle positioned in elevation. Compression is maintained by either tubigrip or an elastic bandage applied from the base of the toes extending up to the upper third of the leg, along with the ankle being strapped with orthopaedic tape to hold it in dorsiflexion and eversion. Patients are encouraged to rest as much as possible with their ankle elevated and to do free active movements within the limits of the pain (Accident Compensation Corporation, 2000, 2002b; Safran, Zachazewski et al., 1999).

Once the pain and oedema decrease the aim of treatment is to increase the range of movement of the ankle and the strength of the muscles controlling the ankle. Ankle exercises are progressed from free active mobilising to resisted with the emphasis on dorsiflexion and eversion. The usual methods of increasing the resistance is to use stronger grades of theraband and introduce weight bearing activities such as standing on the injured limb and the wobble or balance board (Accident Compensation Corporation, 2000; Madras & Barr, 2003). The wobble board is also used to improve coordination, proprioception, and ultimately balance. During the later stages of rehabilitation and when first returning to sport patients are recommended to strap their ankle as a way of preventing further injury (Accident Compensation Corporation, 2000, 2002b; Safran, Zachazewski et al., 1999).

**Assessment of Ankle Function in Patients with Ankle Sprains**

A reliable and valid patient assessment is an indicator of whether the aims of the treatment have been achieved (Kirshner & Guyatt, 1985), and in patients with ankle sprains this is the return to their normal functional ability as shown by a combination of their range of movement and muscle strength (Ogilvie-Harris & Choi, 2000). For ankle sprains the treatment/functional outcomes most commonly used are range of ankle movement (Elveru, Rothstein, & Lamb, 1988), motor activity that emphasises ankle function (Wilson et al., 1998), and the patients’ perceptions of their recovery (Kaikkonen, Kannus, & Jarvinen, 1994; P. McNair, Prapavessis, & Kerr, 2003). However goniometry, a popular method of
measuring joint range of movement, has been shown to have poor inter-rater reliability, with intraclass correlation coefficients in the vicinity of .22 to .30 for orthopaedic disorders (Elveru et al., 1988; Youdas, Bogard, & Suman, 1993). It has also been shown not to be able detect change in ankle movement in sprains where there has been minimal loss of movement (Wilson et al., 1998).

Functional activity, which integrates the measurement of mobility and strength, can be effectively assessed by a combination of objective motor activity tests and patient self-report questionnaires (Kaikkonen et al., 1994). An objective motor activity test, the Motor Activity Scale was evaluated by Wilson et al. (1998) on a sample of ankle sprain patients and found to be internally consistent (.90) and responsive to change over a seven day period in 62% of the participants ($p = .0015$). It also has the advantage of using a two point scoring system, whereby patients can either complete or not complete each activity. Patient self-report questionnaires are able to capture their performance on everyday activities not easily measured objectively in clinical context. The Lower Limb Task Questionnaire (LLTQ), a patient self-report questionnaire, developed by McNair et al. (2003), consists of 18 items divided into two subscales, namely the recreational and functional activity subscales. Both subscales have high internal consistency and test-retest reliability as indicated by Cronbach alphas (recreational activity $\alpha = .96$, functional activity $\alpha = .89$) and intraclass coefficients (recreational activity .99, functional activity .98) respectively.

**Prognosis**

Early mobilisation and rehabilitation are seen as the key to optimal functional recovery in patients with Grade I and II ankle sprains (Zoch et al., 2003) so long as the requirements of the rehabilitation programme are followed (Bassewitz & Shapiro, 1997; Fong & Brunet, 1999). If a patient fails to respond to physiotherapy after 14 appointments, they should be referred onto an orthopaedic specialist for assessment and treatment (Accident Compensation Corporation, 2000). The recovery from Grade III sprains is not so predictable, and if a period of immobilisation followed by active rehabilitation fails to facilitate recovery, then surgical repair is advocated (Bassewitz & Shapiro, 1997). The most common complication of ankle sprains is chronic ankle instability caused by the ligament healing in the lengthened position, weakened ligamentous scar tissue, weakness of the
peroneal muscles and loss of proprioception (Safran, Benedetti et al., 1999) and poor rehabilitation following the initial sprain (Bassewitz & Shapiro, 1997; Fong & Brunet, 1999). Repeated ankle sprains may also lead to ankle stiffness and ultimately arthritis of the ankle joint (Yeung, Chan, So, & Yuan, 1994).

**Summary**

Ankle sprains are a common soft tissue injury, which are treated primarily by physiotherapy. RICE, mobilising and strengthening activities have proven effectiveness and form the cornerstone of the physiotherapy rehabilitation. Patients with Grade I and II sprains should return to their normal functional ability if the physiotherapy is instigated early, and they adhere to the requirements of the programme. Measures of functional activity, such as the Motor Activity Scale (Wilson et al., 1998) and the LLTQ (P. McNair et al., 2003) have the capacity to show whether the patients’ ankle function has improved and returned to its normal status.
CHAPTER SIX
DEVELOPMENT OF INTERVENTION AND ASSESSMENT TOOLS
STUDY 1

Introduction

The literature review has demonstrated that adherence to physiotherapy treatments is still less than optimal, and these rates have persisted in spite of a number educational and cognitive-behavioural techniques being developed. In physiotherapy research, these techniques have tended to target the process by which the messages are delivered, such as repetition, and simple short everyday words, whereas framing and targeting of the message has not been subjected to the same level of scrutiny. One way to structure messages is to locate them within a conceptual framework (Courneya & Hellsten, 2001; Fruin et al., 1991; Maddux & Rogers, 1983; McCall & Martin Ginis, 2004; Rippetoe & Rogers, 1987; Wurtele, 1988; Wurtele & Maddux, 1987; Yzer et al., 1998), and then tailor them to match the sample characteristics thereby targeting the audience (see Schneider et al., 2001). Given its previous history as a successful framework for persuasive messages (see Chapter Three), the Protection Motivation Theory (PMT: Rogers, 1983) would seem suitable for framing information targeting physiotherapy patients. Further the four main PMT variables can be framed in a manner that appear suitable for the needs of physiotherapy patients, namely your injury is serious (severity), you could get further problems or complications if you do not follow the advice (vulnerability), physiotherapy is known to relieve the type of symptoms you have (response efficacy), and if you follow the advice on how best to implement your clinic- and home-based physiotherapy you will find it easy to do (self-efficacy).

To date, I am unaware of any literature that has used PMT as a framework to successfully manipulate patients’ beliefs about their injury and physiotherapy and then examined the effects of this manipulation on intentions to adhere to the physiotherapy and adherence behaviours. Evidence is needed that beliefs and intentions can be altered before researchers start conducting laborious PMT adherence behaviour intervention studies. However in preparation for such research an intervention has to be developed and the effectiveness of its content to change beliefs evaluated. Therefore the purpose of this
research was to develop and test the effectiveness of an intervention grounded in Protection Motivation Theory (PMT: Rogers, 1983) to modify patients’ (a) beliefs to their ankle sprain and physiotherapy and (b) intentions to adhere to physiotherapy. For reasons outlined in Chapter Five, ankle sprains are the injury of focus for the research in this thesis and hence the information in the interventions is pertinent to ankle sprains and the physiotherapy.

Development of PMT Information

A video was the main medium for the intervention information (Appendix 1, file 1), with it being supplemented with a succinct written and pictorial summary (Appendix 2). Video was chosen as the primary way of conveying the information, because it is a popular form of media, targets people with a broad range of literacy skills, and ensures the content is standardised for the participants (Meade, 1996). Unlike previous PMT based intervention that has contained fabricated information (see Courneya & Hellsten, 2001; Wurtele & Maddux, 1987), this intervention could only contain factual information to enable it to comply with the code of ethical principles for physiotherapists practising in New Zealand (New Zealand Society of Physiotherapists (Inc.), 2003). Compliance with this code requires physiotherapists provide patients with sufficient information about their disorder and the proposed treatment so as they can make an informed choice about their care and ultimately give informed consent for their physiotherapy. The content for the video and the written intervention was drawn from scientific literature, journals, books and health providers’ web pages, and focused on the etiology, causes and mechanisms of the injury, stages of recovery, complications, long-term effects, and the physiotherapy and medical treatment of ankle sprains.

Patients and physiotherapists took part in the making of the videos, by providing advice about the content, and being filmed. A reputable sports physiotherapist discussed the typical physiotherapy treatment programme and stressed the importance of the patients taking responsibility for their physiotherapy. As this person had recently been a physiotherapist with the New Zealand Commonwealth Games, he was introduced in this manner. A former physiotherapy patient talked about her experience of sustaining the sprain, the symptoms, the physiotherapy treatment, and the complications she encountered as a consequence of neglecting to seek expert advice in the early stages of the injury. She
was also filmed having physiotherapy treatment and undertaking the home-based physiotherapy activities. The video began with a film clip of a New Zealand representative netball player spraining her ankle during a national competition game. The sports physiotherapist, patient and film clip were considered to be convincing expert sources of information, which Gleitman et al. (1999) assert bring credibility to persuasive communications thereby enhancing knowledge and attitudinal changes.

In accordance with the guidelines for effective patient education (Ley, 1988) the content of the visual and written information was organized into coherent categories that reflected the four main PMT variables, and were titled seriousness of ankle sprains (severity), vulnerability to re-injury (vulnerability), the efficacy of physiotherapy (response efficacy), and the role and responsibility of the patient in the rehabilitation (self-efficacy). Each section of the video and written information was heralded with its title, thus alerting the participants to the change in content. The information was presented in persuasive manner using short sentences containing short everyday words, and was specific to ankle sprains. The video was approximately eight minutes long. The written information was a succinct summary of the video content that included illustrations intended to refresh the participants’ memory of the video, and was four pages long. To give the written information a professional appearance it was printed in colour and the sheets were laminated.

Another video (Appendix 1, file 2) along with written information (Appendix 3) were created as an attention control condition. The content was considered to be of educational value to the participants, with it focusing on the cost of injuries in New Zealand, causes of ankle sprains, and structure of the lateral ligament of the ankle (the most commonly sprained ligament of the ankle). It was presented in a neutral non-persuasive manner. The video was approximately three minutes in duration, which while shorter than the PMT intervention was considered to convey a meaningful message. Had the attention-control video been any longer it would have become repetitive and lost its impact as an educational tool. Like the PMT present condition, the video preceded the three-page written information, and was presented in the same manner.
Development of the Beliefs about Ankle Sprains and Physiotherapy Scale

The Beliefs about Ankle Sprains and Physiotherapy Scale (BASPS) consists of 20 items and was constructed specifically to test the effect of the PMT-based information on the participants’ beliefs about their sprain and physiotherapy and adherence behaviours (see Appendix 4). The items were derived from the content of the PMT-based intervention and previous research, and evaluated the four main variables of the PMT, severity, vulnerability, response efficacy and self-efficacy. Basing the content of the scale items on the information contained in the intervention is in line with other studies that have tested PMT interventions (see, Bennett, Rowe, & Katz, 1998; Courneya & Hellsten, 2001; Flynn et al., 1995; Maddux & Rogers, 1983; Norman, Searle, Harrad, & Vedhara, 2003; Plotnikoff & Higginbotham, 1998; Wurtele, 1988).

The possibility of using the Sport Injury Rehabilitation Scale (SIRBS: Taylor & May, 1993) in the present research was explored, but it was found to contain statements that did not reflect the content of the intervention in this study and were in this regard too general. This is understandable as the SIRBS was originally designed to measure beliefs about a diverse range of sports injuries and their treatment. Further statements such as ‘this injury is too serious to not follow medical advice’ (Taylor & May, 1996, p.475) bore no relevance to the content of the PMT intervention as the focus was on the physiotherapy treatment for sprained ankles with no mention of medical advice.

The wording of the BASPS statements was drawn from questionnaires used in previous research where the variables had been successfully manipulated. For instance the severity statement ‘I feel my ankle sprain is a serious injury’ aped ‘I feel colon cancer would be a very serious illness for me to develop’(Courneya & Hellsten, 2001, p.61). The wording of the statements was kept simple and did not use any medical jargon which is in keeping with the principles of effective patient communication (Ley, 1988) and fitting with the manner in which the information was presented in the intervention. Negatively and positively worded items were included in the BASPS as a check for biased responding. Some of the positive statements had negative replicas.
The BASPS items are scored on a seven-point response Likert scale (1 = very strongly disagree to 7 = very strongly agree), with severity being measured by items 1 to 4, vulnerability items 5 to 9, response/treatment efficacy items 10 to 13, and self-efficacy (items 14 to 20). Both task and self-regulatory (i.e. barrier) efficacious beliefs were assessed because of the different contributions they potentially may make on explaining adherence (McAuley & Mihalko, 1998)

**Development of the Intentions to Adhere to the Physiotherapy Questionnaire**

Goal intentions to adhere to the clinic- and home-based components of physiotherapy and attend clinic appointments were measured using a nine-item seven point Likert Scale questionnaire and was based on the behavioural beliefs component of the Theory of Planned Behaviour (Ajzen, 1991). There were three versions of statements for the intentions to undertake each of the three adherence behaviours, specifically clinic attendance, participation in the clinic- and home-based treatment components (see Appendix 5).

**Preliminary Testing of the PMT-Based Intervention, the BASPS and the Intentions to Adhere Questionnaire**

**Face validity checks**

Prior to undertaking the pilot study the PMT intervention and the attention-control videos, the BASPS and intentions to adhere to the physiotherapy statements were subjected to face validity checks by two independent panels of judges, one of health psychology researchers and the other of physiotherapists. This exercise checked for authenticity and consistency of the information, and the ease of understanding. Also the panels were asked to examine the correspondence between the intervention information and the BASPS items. The panels watched the videos and read the PMT-based information, then each member answered the BASPS and provided feedback about the intervention information and the wording of the BASPS. Finally they watched and read the attention-control information and gave feedback about its appropriateness to ankle sprains and its neutrality with regard to the PMT. They were also asked to evaluate the intentions to adhere statements. As a
consequence of the feedback from the panels the PMT-based and attention-control written information was shortened and some of the BASPS item wording was altered so as to better reflect the intervention information.

**Pilot Study**

**Hypotheses**

It was hypothesised that in comparison to participants in the two control groups, those exposed to the PMT intervention would have stronger beliefs about the sprain and its treatment, and greater intentions to adhere to the physiotherapy. It also was hypothesized that significant relations would be found between the PMT constructs and intentions to adhere to physiotherapy.

**Method**

**Participants**

Thirty-one people, who had sustained an ankle sprain for the first time and were about to begin a course of physiotherapy took part. They were recruited from private physiotherapy clinics. The sample comprised of 20 females and 11 males, whose ages ranged from 14 to 64 years (mean = 34.26, ±15.07). Other relevant demographic and ankle sprain characteristics are presented in Table 1. People, who had previously sustained ankle sprains, were excluded because it was considered that their prior experience and knowledge of the injury could bias their responses to the BASPS and intentions to adhere questionnaire.

**Study design**

This study was a controlled randomised, experimental design in which participants were randomly allocated to a treatment condition based on the level of PMT information given. There were three levels of information, PMT present, neutral information or attention control, and no information, with the latter two groups being the controls. The attention control group checked for the possibility that the giving of the intervention may have caused the changes in beliefs and intentions to adhere and not the content of the information. A post-test only design was used to test the effects of the intervention on the beliefs about the injury and the physiotherapy. This design eliminates the possible
carryover effects caused by pre- and post-intervention questionnaires about the same beliefs being given in such close succession (Cohen, Manion, & Morrison, 2000).

Measures

**Demographic and sprain characteristics.** These characteristics were measured by self-report questionnaires that required both closed- and open-ended answers. The personal demographic characteristics collected were age, gender, cultural affiliation, occupation, level of sport involvement and physical activity (competitive, recreational or no regular activity), and previous history of injury and physiotherapy treatment. The characteristics of the sprain recorded were the date it occurred, whether it occurred during sport or other physical activity (Appendix 6).

In addition participants rated the level of pain caused by the sprain on an 11 point box plot that required them to circle a number between zero (no pain) and ten (worst possible pain) that best represents his/her level of pain (Sarafino, 1998). A box plot was considered to be the more accurate than the VAS, because the participants had to circle a whole number for their pain rating as opposed to putting a mark somewhere along the VAS line, which has the potential to cause inaccuracies in the conversion of participants’ responses into numerical values (Appendix 6). The physiotherapists graded the sprain using O’Donoghue’s (1976) method of grading ankle sprains, Grade I = mild, Grade II = moderate, and Grade III = severe (Appendix 7).

**Beliefs about Ankle Sprains and Physiotherapy Scale.** As previously explained the BASPS was constructed specifically for this research to evaluate the four PMT variables manipulated in the intervention (see Appendix 4). In this study the Cronbach alphas for these variables were severity (items 1 to 4; $\alpha = .73$), vulnerability (items 5 to 9; $\alpha = .67$), response/treatment efficacy (items 10 to 13; $\alpha = .75$), and self-efficacy task (items 14 to 16; $\alpha = .60$) and self-efficacy barrier (items 17 to 20; $\alpha = .54$). As the alpha levels of the two separate self-efficacy scales were low the items were combined into one scale (items 14 to 20; $\alpha = .70$). This move is in line with other rehabilitation research where self-efficacy has been conceptualized into a unidimensional scale (see Brewer et al., 2003b; Chin et al., 1998; Flynn et al., 1995; Hall et al., 2002; Rudman et al., 1999; Woodgate et al., 2005).
**Intentions to adhere to the physiotherapy questionnaire.** As previously outlined the goal intentions to adhere to the clinic- and home-based components of physiotherapy and attend clinic appointments were measured by a nine-item seven point Likert Scale questionnaire and was based on the behavioural beliefs component of the Theory of Planned Behaviour (Ajzen, 1991). In this study the Cronbach alphas for each of the intentions to adhere sub-scales were clinic attendance .95, adhere to clinic-based physiotherapy .89, and adhere to home-based physiotherapy .80 (Appendix 5).

**Procedure**

Ethical approval was obtained from the Ministry of Health Auckland Ethics Committee X (approval number AKX/02/00/126). When patients who had sustained an ankle sprain and fitted the inclusion criteria made their first physiotherapy treatment appointment, a clinic staff member briefed them about the study. Then those patients who expressed an interest in taking part were contacted by the researcher, and a meeting was arranged prior to the commencement of their physiotherapy rehabilitation. At this meeting the researcher provided them with more detailed information about the study and their expected role (Appendix 8), obtained informed consent (Appendix 9) and undertook the assessment. Participants completed the demographic questionnaire and were randomly allocated to one of three intervention groups, PMT present (n = 11), neutral (attention-control; n = 10) or none (control; n = 10). Next those in the two intervention groups watched the videos and read the written information prior to answering the BASPS, whereas participants in the no information group only answered the BASPS. For the purposes of the research, the participants were only seen once.

Then the participants’ course of physiotherapy started and was not compromised in any way because of their participation in the study. At the first treatment, the physiotherapists graded the ankle sprain using the O’Donoghue (1976) method of classification.
Data analysis

Data were analysed by SPSS (10.1 for Windows). Chi-square tests and one-way ANOVA determined group equivalence on socio-demographic characteristics and ankle sprain grading. One way ANOVA also tested for differences between the three groups’ (PMT present, neutral information, and control) scores on BASPS, and their intentions to adhere to physiotherapy. Eta squared was used to evaluate the magnitude (effect size) of the differences between the groups on BASPS and intention scores. Where significant differences were found planned comparisons were used to establish the extent to which the PMT present group differed from the two control groups. As the intention scores were negatively skewed, square root reflect transformations were used to normalise the data. Pearson correlations were used to examine the relationships between the PMT constructs, and intentions to adhere to physiotherapy.

Results

Group equivalency

The analysis of the groups’ demographic and ankle sprain characteristics are presented in Table 1. As can be seen the groups were equivalent across these variables. The mean age of the PMT present group was higher than the two control groups. Irrespective of their grouping the majority of participants were New Zealand European, with lesser numbers of Maori, Pacific Island and other nationalities. All participants undertook some form of regular sporting activity; most had been treated by physiotherapy before and had a history of previous injuries. More of the ankle sprains were Grade II, with lesser numbers being either Grade I or Grade III. The three groups’ ankle pain scores were similar and moderate.
Table 1. *The Three Intervention Groups’ Demographic and Ankle Sprain Characteristics and Antecedents to Adherence*

<table>
<thead>
<tr>
<th>Variable</th>
<th>PMT n = 11</th>
<th>Neutral n = 10</th>
<th>Control n = 10</th>
<th>Statistic</th>
<th>p-level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>40.36</td>
<td>31.90</td>
<td>29.90</td>
<td><em>F</em>(2,28) = 1.49</td>
<td>.24</td>
</tr>
<tr>
<td></td>
<td>(±19.84)</td>
<td>(±8.90)</td>
<td>(±13.71)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>European</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maori</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pacific Island</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level of sport participation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recreational</td>
<td>10</td>
<td>7</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Competitive</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of previous injury</td>
<td>11</td>
<td>9</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous physiotherapy</td>
<td>11</td>
<td>9</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade of sprain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade I</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade II</td>
<td>7</td>
<td>6</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade III</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ankle pain</td>
<td>5.64</td>
<td>5.20</td>
<td>6.20</td>
<td><em>F</em>(2,28) = 0.58</td>
<td>.58</td>
</tr>
<tr>
<td></td>
<td>(±1.91)</td>
<td>(±2.30)</td>
<td>(±2.04)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Beliefs about sprain and physiotherapy**

Descriptive data and ANOVA results for beliefs about ankle sprain and physiotherapy between treatment groups are presented in Table 2. After watching the video and reading the written information the PMT present group was significantly higher on protection motivation than the other two groups. A similar pattern was seen when the results were broken down into the two appraisals. The PMT present group scored significantly higher than the other two groups on threat appraisal, which was carried through to vulnerability and severity. With regard to the coping appraisal the PMT present group’s scores was significantly higher than the two control groups, which was carried through to response efficacy but not self-efficacy.

**Intentions to adhere to physiotherapy and attend clinic appointments**

Descriptive data and ANOVA results of the intervention groups’ intentions to adhere to physiotherapy are presented in Table 3. The comparison of the three groups’ intentions scores following the presentation of the video and written information did not reveal any significant differences.

**Relations between the PMT variables, intentions to adhere and attend, and percentage of attendance**

The correlations between the PMT variable and the intentions to adhere are presented in Table 4. Response efficacy and self-efficacy were both significantly correlated to the intentions to adhere to the clinic- and home-base physiotherapy. Self-efficacy was also significantly related to the intention to attend all clinic appointments. Significant positive relations amongst the PMT variables occurred between severity and vulnerability, response efficacy and vulnerability, and response efficacy and self-efficacy.
Table 2.
BASPS Descriptive Data and Analysis of Variance for PMT, Threat and Coping Appraisal Variables of the Three Intervention Groups

<table>
<thead>
<tr>
<th>BASPS</th>
<th>PMT</th>
<th>Neutral</th>
<th>Control</th>
<th>$F$ ($df = 2, 28$)</th>
<th>Significance ($p$ level)</th>
<th>Effect size ($\eta^2$)</th>
<th>Observed power</th>
<th>Planned comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 11</td>
<td>n = 10</td>
<td>n = 10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severity</td>
<td>21.55 (±4.46)</td>
<td>18.50 (±3.84)</td>
<td>17.00 (±2.45)</td>
<td>4.12</td>
<td>.027</td>
<td>.23</td>
<td>.68</td>
<td>PMT &gt; Neutral &amp; Control ($p &lt; .02$)</td>
</tr>
<tr>
<td>Vulnerability</td>
<td>28.27 (±3.98)</td>
<td>21.80 (±2.57)</td>
<td>21.50 (±3.87)</td>
<td>12.39</td>
<td>.001</td>
<td>.47</td>
<td>.99</td>
<td>PMT &gt; Neutral &amp; Control ($p &lt; .001$)</td>
</tr>
<tr>
<td>Threat appraisal$^1$</td>
<td>49.82 (±7.11)</td>
<td>40.30 (±4.60)</td>
<td>38.50 (±5.38)</td>
<td>11.52</td>
<td>.001</td>
<td>.45</td>
<td>.99</td>
<td>PMT &gt; Neutral &amp; Control ($p &lt; .001$)</td>
</tr>
<tr>
<td>Response efficacy</td>
<td>26.27 (±2.41)</td>
<td>23.90 (±2.38)</td>
<td>23.00 (±2.54)</td>
<td>5.08</td>
<td>.013</td>
<td>.27</td>
<td>.78</td>
<td>PMT &gt; Neutral &amp; Control ($p &lt; .005$)</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>36.09 (±4.01)</td>
<td>33.50 (±4.84)</td>
<td>33.50 (±3.24)</td>
<td>1.43</td>
<td>.256</td>
<td>.09</td>
<td>.28</td>
<td></td>
</tr>
<tr>
<td>Coping appraisal$^2$</td>
<td>62.36 (±5.82)</td>
<td>57.40 (±6.60)</td>
<td>56.50 (±3.75)</td>
<td>3.46</td>
<td>.045</td>
<td>.20</td>
<td>.60</td>
<td>PMT &gt; Neutral &amp; Control ($p &lt; .015$)</td>
</tr>
<tr>
<td>Protection motivation$^3$</td>
<td>112.18 (±10.78)</td>
<td>97.70 (±8.41)</td>
<td>95.00 (±6.11)</td>
<td>11.91</td>
<td>.0001</td>
<td>.46</td>
<td>.99</td>
<td>PMT &gt; Neutral &amp; Control ($p &lt; .0001$)</td>
</tr>
</tbody>
</table>

$^1$ Threat appraisal = severity + vulnerability, $^2$ Coping appraisal = response efficacy + self-efficacy, $^3$ Protection motivation = threat appraisal + coping appraisal.
Table 3. *Descriptive Data and Analysis of Variance of the Groups' Intentions to Adhere to the Physiotherapy*

<table>
<thead>
<tr>
<th>Intention</th>
<th>PMT n =11</th>
<th>Neutral n = 10</th>
<th>Control n = 10</th>
<th>F(df = 2,28)</th>
<th>Significance (p level)</th>
<th>Effect size</th>
<th>Observed power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinic attendance</td>
<td>19.50 (±2.01)</td>
<td>18.60 (±2.37)</td>
<td>18.15 (±3.77)</td>
<td>.64</td>
<td>.54</td>
<td>.04</td>
<td>.15</td>
</tr>
<tr>
<td>Clinic-based adherence</td>
<td>18.68 (±2.63)</td>
<td>17.40 (±2.76)</td>
<td>19.65 (±2.06)</td>
<td>2.03</td>
<td>.15</td>
<td>.13</td>
<td>.38</td>
</tr>
<tr>
<td>Home-based adherence</td>
<td>19.23 (±2.58)</td>
<td>18.60 (±1.90)</td>
<td>18.15 (±3.35)</td>
<td>.43</td>
<td>.65</td>
<td>.03</td>
<td>.11</td>
</tr>
</tbody>
</table>
Table 4.  
Correlations of the Intentions to Adhere, PMT Variables and Percentage of Recommended Clinic Appointments Attended

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Severity</td>
<td>.50**</td>
<td>.33</td>
<td>.25</td>
<td>.02</td>
<td>.17</td>
<td>.08</td>
<td></td>
</tr>
<tr>
<td>2. Vulnerability</td>
<td></td>
<td>.64**</td>
<td>.14</td>
<td>.24</td>
<td>.10</td>
<td>.22</td>
<td></td>
</tr>
<tr>
<td>3. Response efficacy</td>
<td></td>
<td></td>
<td>.48**</td>
<td>.32</td>
<td>.37*</td>
<td>.43**</td>
<td></td>
</tr>
<tr>
<td>4. Self-efficacy</td>
<td></td>
<td></td>
<td></td>
<td>.38*</td>
<td>.60**</td>
<td>.57**</td>
<td></td>
</tr>
<tr>
<td>5. Intention to attend clinic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.32</td>
<td>.20</td>
<td></td>
</tr>
<tr>
<td>6. Intention to adhere to clinic physiotherapy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.42*</td>
</tr>
<tr>
<td>7. Intention to adhere to home physiotherapy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Discussion

The prediction that the persuasive information ground in PMT would strengthen peoples’ beliefs to their injury and physiotherapy was for the most part supported. The results showed that beliefs about the severity of the injury, vulnerability to re-injury and the efficacy of the physiotherapy were bolstered, which in turn lead to the threat and coping appraisals and overall protection motivation being increased. However the intervention was not able to strengthen self-efficacy and the intentions to adhere to the components of the physiotherapy. The discussion will focus on the factors thought to underpin the findings, outline the strengths and limitations, and make recommendations for the use of the findings in clinical practice.

Beliefs about the sprain and physiotherapy

First, previous research that has investigated the effect on PMT based information on intentions to undertake health behaviours has traditionally used factorial designs, with the information being manipulated at high and low levels (see, Brouwers & Sorrentino, 1993; Courneya & Hellsten, 2001; Maddux & Rogers, 1983; Wurtele & Maddux, 1987). Some of the information about the health threat and coping methods in these studies was fabricated, which was permissible given that the participants were healthy young adults and not in any foreseeable danger of developing the disease of focus. Further self-efficacy has been heightened in previous research by making it appear easy to implement the recommended behavioural changes, such as giving up cigarette smoking is not difficult (Maddux & Rogers, 1983) or that only a small amount of regular exercise per week is needed to prevent colon cancer (Courneya & Hellsten, 2001). However, in the current study, for ethical and pragmatic reasons the use of a factorial design with fabrication of content was unacceptable, as the participants had an existent injury (ankle sprain), had sought physiotherapy for it and were entitled to be given truthful information about the imminent treatment. Therefore factually correct information was given in both the PMT present and neutral (attention control) conditions, and this was only possible by manipulating the four PMT variables at two levels either all present or all absent.

Second, the non-significant findings for the group self-efficacy scores may have been due to the video information not adequately addressing strategies the participants
could use to enhance their efficacious beliefs about following the components of their physiotherapy programme. A review of the PMT-present video indicated that there is room for improvement in terms of manipulating self-efficacy. Information presented by the physiotherapist was found to be indicative of response efficacy rather than self-efficacy. As a consequence the emphasis in this segment of the video is now directed towards the restructuring of beliefs about the potential difficulties of undertaking the physiotherapy activities and the use of effective ways of mastering these difficulties, and it is presented in an authoritative manner.

Third, most of the participants had a history of being injured and being treated by physiotherapy. It would seem that these past experiences equipped the participants with an understanding of physiotherapy treatments and their expected role, which may account for all groups having similar self-efficacy scores.

**Intentions to attend and adhere to the physiotherapy**

PMT based information did not cause any differentiation between the groups’ intentions to adhere to the home- and clinic-based components of their physiotherapy and attend all clinic appointments, which is contrary to what was expected and the findings of previous research (see Wurtele & Maddux, 1987; Yzer et al., 1998). There are four possibilities as to why this may have occurred. First, the failure to strongly manipulate self-efficacy was unfortunate because it had the strongest relationship with intention and, thus, the greatest potential to produce an effect.

Second, in contrast to previous work where the participants did not have the disease under study, those in the present study all had ankle sprains and by virtue of seeking physiotherapy saw the need to follow the treatment requirements to obtain relief. In addition many participants were not novice physiotherapy patients and therefore knew that to obtain symptomatic relief they would have to adhere to the treatment, which was likely expressed through their scoring on the intention items.

Third, the possibility of response bias causing the high undifferentiated intention to adhere scores cannot be overlooked. Participants could well have wanted to be seen in a positive light. Similarly, the intention items may have prompted the participants, especially those in the control groups, to think about aspects of their physiotherapy, such as adherence
to the clinic- and home-based components that they had not considered previously. Instead of the items eliciting a true representation of the participants’ knowledge, they may have been informative value thereby changing their intentional beliefs (Ogden, 2003).

Fourth, in spite of having been to physiotherapy before, the participants completed the questionnaires prior to commencing their physiotherapy, at which time they may have been well intentioned with regard to carrying out the physiotherapy, but when faced with the reality of the treatment requirements it may have proved not to be as easy as originally thought.

**Relations between intentions to adhere and the PMT variables**

Significant relationships were found between response efficacy and intentions to adhere to the clinic- and home-based physiotherapy, and even stronger associations between self-efficacy and the three intentions to adhere to physiotherapy. These findings are consistent with those of two recent meta-analyses of protection motivation theory and intentions to undertake health behaviours (Floyd et al., 2000; Milne et al., 2000).

**Strengths and limitations**

While the findings of this study are promising there are some limitations. First it is not known if the belief differences shown between treatment conditions persisted throughout the participants’ course of physiotherapy. Second, as both the sample size (31) and the number of items on the BASPS (20) were small, undertaking a factor analysis of the BASPS was deemed inappropriate in light of the general consensus of opinion that for factors with loadings less than .80, a sample of size of approximately 150 is required (J. Stevens, 2002). Third, there was no measure of actual adherence behavior and hence it is still unknown as to whether a PMT-based intervention can strengthen adherence to the clinic- and home-based components of physiotherapy. Fourth, in spite of excluding people who had sustained ankle sprains before, many of the participants had a history of injury and being treated by physiotherapy suggesting that they knew what physiotherapy involved and what would be expected of them, thereby diluting the strength of the self-efficacy components of the intervention. Notwithstanding these limitations, the results of this study do indicate that persuasive information grounded in PMT does have the power to heighten
people’s beliefs about their injury and physiotherapy, and it appears to be a viable framework for physiotherapists to use for patient education.
CHAPTER SEVEN
ADHERENCE TO PHYSIOTHERAPY REHABILITATION FOR ANKLE SPRAINS: A TEST OF PROTECTION MOTIVATION THEORY
STUDY 2

Introduction

The results of the pilot study showed that for the most part the PMT-based intervention successfully manipulated the variables of severity, vulnerability and response efficacy, but it did not alter self-efficacy. One reason thought to contribute to self-efficacy not being changed was that its component in the video needed to be more explicit with respect to strategies patients can use to overcome the barriers and perceived difficulties of undertaking their clinic and home-based physiotherapy. The subsequent changes were made to the self-efficacy component (Patients’ roles and responsibilities) are outlined in the discussion of the Pilot Study (see Appendix 1, file 3). As this advice was already part of the written information, there was no need for any adjustments to be made.

The pilot study never intended to test the effects of the intervention on adherence. However, the full value of the PMT in the context of physiotherapy will only be realized when its effects on adherence and treatment behaviour are known. Therefore this investigation will take the next logical step and fully evaluate the effects of the intervention on the people’s beliefs about their ankle sprain and physiotherapy, their intentions to adhere, their treatment adherence behaviours and their functional outcomes.

Purposes and Hypotheses

The primary purpose of this study was to examine the effects of an intervention grounded in Protection Motivation Theory (PMT: Rogers, 1983) on beliefs about the ankle sprain and physiotherapy, intentions to adhere, adherence to the clinic- and home-based components of the physiotherapy rehabilitation of patients with ankle sprains and the post-physiotherapy functional outcomes. More specifically the four hypotheses stemming from this purpose were:
1. Manipulating the PMT constructs (i.e., perceived threat = vulnerability and severity, and coping appraisal = self-efficacy and treatment efficacy) using persuasive communications would result in participants exposed to the intervention having significantly stronger beliefs about the injury and treatment of the sprain in comparison to those not exposed to it.

2. Participants exposed to the intervention would show significantly greater intentions to adhere to the components of the physiotherapy programme than those not exposed to it.

3. Participants exposed to the intervention would be significantly more adherent to the clinic- and home based components of their physiotherapy programme, including clinic attendance than those not exposed to it.

4. Participants exposed to the intervention would have a significantly better rate of recovery as measured by the functional outcomes (Lower Limb Task Questionnaire and Motor Activity Scale) than those not exposed to it.

5. Significant positive relations would be found between the antecedents of adherence, the PMT constructs, intentions to adhere to the rehabilitation, adherence behaviours, and functional outcomes.

**Methods**

**Participants**

Seventy-one people, who had sustained an ankle sprain (first time or recurrent) and about to begin a course of physiotherapy were recruited for the study by their physiotherapists. As part of the legal informed consent process, participants were required to be 16 years or older, and those younger than 16 years, who expressed an interest in taking part obtained signed parental consent before being enrolled. The sole exclusion criterion was a poor command of the English language that could impede understanding of the intervention information and the questionnaires.

The sample consisted of 40 females and 31 males, whose ages ranged from 12 to 74 years (mean = 35.23, ±12.76). Forty participants sustained a moderate sprain, with 20 experiencing a mild sprain and nine a severe sprain, of these 42 were first time injuries and
27 recurrent sprains. The number of physiotherapy clinic appointments attended ranged from one to 20 appointments (mean = 7.11, ±3.83), with the recommended number of treatments being from two to 20 (mean = 7.85, ±3.60). One participant withdrew from the study before her first physiotherapy treatment because of being diagnosed with a fractured fibula. Of the 70 who completed the study sixty-one participants made an uneventful recovery, eight had an incomplete recovery that required referral onto a medical specialist for other treatment, and one unknown as she could not be contacted. There were 11 participants, who did not attend their final physiotherapy appointments, and all but one was able to be contacted by the researcher and they completed post-physiotherapy measures. These participants gave a number of reasons for not finishing their physiotherapy, such as the financial cost, planned to return but could not find time and believed they had got better, but forgot to cancel their appointment. A more detailed description of the characteristics of the sample is presented in the results sub-section titled group equivalency.

**Study design**

This study was a controlled randomised, repeated measures experimental design in which participants were followed through their physiotherapy programme (Figure 2). Participants were randomly allocated to an intervention group based on the level of PMT information they received. There were three levels of information, PMT present, neutral information or attention control, and the no PMT based information control. The attention control group controlled for the possibility that the giving of the intervention may have caused the changes in beliefs and behaviours and not the content of the information. An intention to treat analysis was followed, with participants being kept in the groups to which they were originally allocated, irrespective of whether or not they attended all their scheduled physiotherapy treatments (see Hollis & Campbell, 1999).
Figure 2. Design of study that investigated the effectiveness of the PMT intervention
Measures

Demographic characteristics

The participants’ age, gender, cultural affiliation, occupation, level of sport involvement and physical activity (competitive, recreational or no regular activity), and previous history of injury and physiotherapy treatment were recorded (Appendix 10).

In addition the accessibility of the physiotherapy and the reasons for choosing the clinic were documented. With regard to accessibility, participants were asked how far the clinic is from their home and their workplace; whether the clinic was on their usual route between home and places that they go to on a regular basis, and what type of transport they used to get to their physiotherapy appointment. An open ended question was used for participants to give reasons for their choice of physiotherapy clinic (Appendix 10).

Finally the date the sprain occurred, the cause and whether it occurred during sport or other physical activity were noted. The severity of the ankle sprain was assessed using O’Donoghue’s (1976) method of grading ankle sprains, Grade I = mild, Grade II = moderate, and Grade III = severe (Appendix 7). Participants rated their ankle pain at the time of the injury on an 11 point box plot, which is detailed in the measurement of pain section (Appendix 12).

Antecedents to adherence

As motivation, pain and normative beliefs have been found to be prime antecedents to adherence, it was decided it would be prudent to include these variables in the pre-physiotherapy assessment of the participants.

Motivation to start the physiotherapy rehabilitation. The Situational Motivational Scale (Guay, Vallerand, & Blanchard, 2000) was used to assess the participants’ motivation towards undertaking the physiotherapy. While this 16-item scale has been used in sport settings, it was developed for use across a range of settings. Participants rated each of the sixteen items in response to the question ‘Why are you starting physiotherapy?’ using a seven point Likert Scale ranging from 1 corresponds not at all through to 7 corresponds exactly. The questionnaire consists of the four behavioural subscales, intrinsic motivation (items 1, 5, 9, 13), identified regulation (items 2, 6, 10, 14),
external regulation (items 3, 7, 11, 15) and amotivation (items 4, 8, 12, 16) derived from the self-determination theory (Deci & Ryan, 1985). Intrinsically motivated behaviours are undertaken because of the pleasure obtained from them; external regulation occurs when behaviour leads to the avoidance of negative consequences and there is frequently a sense of compulsion; identified regulation occurs when the chosen behaviour in itself is valued; and amotivation is a sense of purposelessness and the required behaviour being of no value. Guay et al. (2000) reported that the SIMS was reliable, with Cronbach alphas for the subscales being intrinsic motivation = .95, identified regulation = .80, external regulation = .86, and amotivation = .77. In the present study the Cronbach alphas of the four subscales of the SIMS were intrinsic motivation = .72, identified regulation = .58, external regulation = .79 and amotivation = .79. By deleting one of the items from the identified regulation sub-scale the alpha improved to .66, and the three item version of the subscale was used in remaining analyses (Appendix 11).

**Pain.** Two aspects of pain were measured, (1) how the participants coped with pain, discomfort and fatigue in their normal daily lives and (2) the amount of pain they experienced at the time of their injury. The manner in which the participants cope with pain and discomfort under normal circumstances in their daily lives was measured by two items from the three item perseverance/persistence scale of the Self-Motivation Inventory (SMI: Dishman & Ickles, 1981). The third item on the SMI subscale ‘I can persist in spite of failure’ was deemed inappropriate in the context of this study as it did not appear to have a direct bearing on pain. The SMI is a 40 item scale divided into 10 subscales, and has a high internal reliability of $\alpha = .91$ (Dishman & Ickles, 1981). In the present study the Cronbach alpha of the two-item coping with pain and discomfort scale was .82.

The level of pain experienced at the time of sustaining the injury was measured on an 11 point box plot in preference to a visual analog scale (VAS). The box plot method of rating pain requires an individual to circle a number between zero (no pain) and ten (worst possible pain) that best represents his/her level of pain (Sarafino, 1998). A box plot was considered to be more accurate than the VAS, because the participants had to circle a whole number for their pain rating as opposed to putting a mark somewhere along the VAS line, which could lead to the researcher not being exact in the recording the pain score in the data entry phase of the study (Appendix 12).
**Normative Beliefs.** A three-item seven-point Likert Scale questionnaire evaluated the participants’ level of normative beliefs with regard to following their physiotherapy (1 = very strongly disagree to 7 = very strongly agree). This questionnaire was based on the subjective norm component of the Theory of Planned Behaviour (Ajzen, 1991), which asserts that perceived social pressure motivates people to adopt suggested behaviours. The items were summed to give a total normative belief score, and the internal consistency for the items was .64 (Appendix 13).

**Beliefs about Ankle Sprains and Physiotherapy**

The Beliefs about Ankle Sprains and Physiotherapy Scale (BASPS) is a modification of that used in Study 1, which was necessary because of the changes made in the video. This questionnaire was the primary manipulation check for the current study. It is a 22-item questionnaire, with a seven point response scale (1 = very strongly disagree to 7 = very strongly agree), and like its predecessor was designed to evaluate the four PMT variables, severity (items 1 to 5; $\alpha = .64$), vulnerability (items 6 to 9, $\alpha = .71$), response efficacy (items 10 and 11, $\alpha = .66$), and self-efficacy (items 12 to 22, $\alpha = .66$). Initially it was planned to split self-efficacy into self-efficacy barrier ($\alpha = .49$) and self-efficacy task ($\alpha = .49$), but as can be seen the alpha levels of the two separate efficacy scales were low and hence combined (see Appendix 14). For reasons explained in the strengths and limitations section of the pilot study a factor analysis was not conducted on the items of this questionnaire nor its post-physiotherapy counterpart (see Tabachnick & Fidell, 1989).

**Intentions to adhere to the physiotherapy**

Goal intentions to adhere to the clinic- and home-based components of physiotherapy and attend clinic appointments were measured using a six-item seven point Likert scale questionnaire and was based on the behavioural beliefs component of the Theory of Planned Behaviour (Ajzen, 1991). The intentions to undertake each of the three adherence behaviours, namely clinic attendance, participation in the clinic- and home-based treatment components were each measured by two statements (see Appendix 15). The Cronbach alpha values for each intention scale were clinic attendance = .84, clinic-based adherence = .65 and home-based adherence = .60.
Adherence

Treatment adherence was measured throughout the course of physiotherapy in three ways, clinic attendance and adherence to the clinic- and home-based. Clinic attendance was measured in two ways. First the percentage of scheduled clinic-based rehabilitation sessions the participants attended was calculated by comparing the number of sessions participants attended with the number of appointments scheduled or recommended by the physiotherapists, and then multiplying this ratio by 100 (see Appendix 6). Second a record was kept of the completion rate of the course of physiotherapy. For this measure there were two categories, completed the course of physiotherapy and did not the course of physiotherapy. The percentage of attendance differed from the completion rate in that it took into account attendance at all the appointments and not just the final treatments.

The SIRAS (Brewer et al., 1995) measured the participants’ adherence during each of their rehabilitation sessions, and was completed by the physiotherapist at the end of each treatment session. It is a three-item instrument that uses a five-point scale to assess the intensity with which patients complete their exercises, the extent to which they follow their practitioners’ advice and instructions during the treatment, and the patients’ receptiveness to changes made during the rehabilitation session (see Appendix 16). This measure has acceptable internal consistency (Cronbach’s alpha = 0.82), a test-retest intraclass reliability of 0.77, and an interrater intraclass correlation coefficient of 0.57 (Brewer, Van Raalte, Petitpas et al., 2000). In the present study the SIRAS was found to have a Cronbach alpha of .91.

Participant self-reports of adherence to the components of the home-based rehabilitation were completed at the beginning of each treatment session for the time since the last clinic appointment. The self-report questionnaire was based on that used by Taylor and May (1996), with participants indicating on separate five-point scales (1 = none, to 5 = all) the extent to which they followed their physiotherapists’ advice with regard to that particular component of their home-based rehabilitation (see Appendix 17). The components measured were exercises, ice therapy, refraining from undertaking the sporting and daily activities that the physiotherapist advised against, bandaging, and or strapping or bracing of the ankle, and resting with the ankle in elevation. If participants were not requested to undertake one of the listed components they were instructed not to complete
that part of the questionnaire. The internal consistency for participant self-report measure was $\alpha = .63$.

**Ankle function**

Ankle function was measured in two ways. First the participants’ perceptions of their ankle function was assessed by the Lower Limb Task Questionnaire (P. McNair et al., 2003). The LLTQ consists of 18 items scored on a five-point scale ($0 = \text{no difficulty}$, $1 = \text{mild difficulty}$, $2 = \text{moderate difficulty}$, $3 = \text{severe difficulty}$, and $4 = \text{unable}$). Participants rated how well they were able to perform each activity over the past 24 hours. If they did not have an opportunity to undertake an activity they estimated how well they thought they could have coped with it. Factor analysis produced two coherent and interpretable subscales, recreational activities (10 items, 1 to 10 inclusive) and functional daily activities (8 items, 11 to 18 inclusive). Respective items can be summed to give a score for each subscale (see Appendix 18).

McNair et al. (2003) reported Cronbach alphas for each of the subscales were .96 for the recreational activity and .89 for the functional daily activities with a sample of 93 people. In the present study participants rated their ability to undertake each of the activities prior to commencing the physiotherapy (time 1), and at its completion (time 2). At times 1 and 2 the Cronbach alphas for the subscales were .95 and .85 respectively for the functional activities, and .94 for the recreational activities at both time points.

Second, the Motor Activity Scale (Wilson et al., 1998) was used to measure the participants’ motor performance. This scale consists of six physical activities, 40-metre walk, 40-metre run, figure-8 run over a distance of 12 metres, single leg hop for a distance of six metres, single leg cross over hop over 15cm wide marker for a distance of six metres, and hopping up and down a flight of 14 steps (each step was approximately 20cm high). The three single leg hopping activities were performed on the leg of the injured ankle, and the foot had to clear the ground for the movement to be classed as a hop. A dichotomous scoring system is used for each task ($0 = \text{task was not attempted or not completed successfully}$, $1 = \text{task was successfully completed}$), and the scores of the individual tasks were summed to give a total motor activity score (see Appendix 19).
Wilson et al. (1988) reported that the Motor Activity Scale had high internal consistency ($\alpha = .90$), and was shown to be responsive to change over a seven day period in 62% of the participants ($p = .001$). As with the LLTQ, the scores for the activities on Motor Activity Scale (Wilson et al., 1998) were summed so that each participant had two Motor Activity Scores, time 1 and time 2. The internal consistency for the Motor Activity Scale in the present study was $\alpha = .70$ at time 1 and $\alpha = .83$ at time 2.

**Procedure**

Ethical approval for the study was obtained from the Auckland Ethics Committee X (approval number AKX/03/06/154). One rural and six metropolitan private physiotherapy clinics agreed to take part and provide access to potential participants. Clinic staff was provided with information for prospective participants, and the best method for the clinic to facilitate contact between the researcher and the new participants was established. The physiotherapists who were to treat the patients were given information about the O’Donoghue (1976) system of grading the ankle sprains, as well as information and training in the use of the SIRAS and participant self-report of their adherence to the home-based physiotherapy. Before data collection started six randomisation lists were created for the participating clinics, five clinics each had their own list and the two clinics shared a list, because of anticipated recruitment problems. The researcher undertook regular informal inter-rater reliability checks of the use of the SIRAS with the physiotherapists.

When patients who had sustained an ankle sprain and fitted the inclusion criteria made their first physiotherapy appointment, a member of the clinic staff briefly outlined the study. Then those patients who expressed an interest in participating in the study were contacted by the researcher and a meeting was arranged prior to their first physiotherapy appointment. At this meeting the researcher provided them with more verbal and written detail about the study and their expected role in it (Appendix 20), and obtained informed consent (Appendix 21). Next the participants completed the questionnaires about their personal demographic, clinic and ankle sprain characteristics, the antecedents to adherence (pain, motivation for physiotherapy and normative beliefs), and the LLTQ, and they attempted the activities on the Motor Activity Scale (Wilson et al., 1998). Participants were randomly assigned to an experimental group from their clinic list. Those in the no
information group answered the BASPS, whereas those in the two information groups watched the video and read the information before answering the BASPS.

After the initial assessment, the participants’ physiotherapy programmes were commenced. The physiotherapists planned and implemented the participants’ physiotherapy programme in accordance with the ACC Treatment Profile Guidelines (ACC, 2000), tailored it to suit the needs of each participant, and progressed it as warranted. Throughout the course of physiotherapy the participants’ adherence to the clinic- and home-based physiotherapy was evaluated. At the beginning of each treatment, the participants rated their adherence to the components of their home-based physiotherapy for the time since their last physiotherapy appointment on the self-report scale. Then at the end of each treatment the physiotherapists assessed the participants’ clinic behaviours on the SIRAS.

At the end of the course of physiotherapy, the number of clinic appointments the participants attended was recorded along with the number recommended. The researcher undertook the post-physiotherapy assessment, in which participants completed the LLTQ, and undertook the activities on the Motor Activity Scale. Participants who did not attend their last physiotherapy appointments were contacted by the researcher and a meeting was arranged for them to complete the post-physiotherapy assessment.

The study procedures were modified slightly for the rural clinic, because it was not feasible for the researcher to meet with each new participant to inform them about the study and undertake their pre- and post-course of physiotherapy assessments. Along with the information given to the clinics previously outlined, the researcher gave the clinic staff information about the randomisation list, and demonstrated the procedure for the enrolment and pre- and post-physiotherapy assessments with two participants.

Results

Group equivalency

Chi-square and ANOVA were used to compare the three groups’ demographic characteristics, factors relating to the clinic they attended, ankle sprain characteristics, and antecedents of adherence namely motivation, pain and normative beliefs. As can be seen in
Table 5, the groups were equivalent on their demographic characteristics. Participants consisted of more females than males, had a mean age of mid-thirties, and most of the participants identified as New Zealand born Europeans (Pakeha). Most participants were employed in skilled occupations and most had earnings in the middle-income bracket. Only a few participants did not take part in any form of regular activity, with the majority doing some form of recreational physical or sport activity on a frequent basis.

The majority of participants had a history of injuries and had been treated by physiotherapy in the past. In terms of the choice of physiotherapy clinic the groups were equivalent, participants were more likely to select one they had been there previously, although recommendations from other people were also important. The convenience of the clinic was important, and for the majority of participants the clinic they attended was on the route they took on a daily basis to get to other important places in their lives, such as work and home. Most participants travelled by car to their physiotherapy appointments (see Table 6).
<table>
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<th>Variable</th>
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<td></td>
</tr>
<tr>
<td>Home maker</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
<td></td>
<td>$\chi^2(4) = 3.31$</td>
<td>.507</td>
</tr>
<tr>
<td>Less than $25,000</td>
<td>4</td>
<td>5</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$25,000$ to $50,000$</td>
<td>9</td>
<td>12</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over $50,000</td>
<td>10</td>
<td>6</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level of sport participation</td>
<td></td>
<td></td>
<td></td>
<td>$\chi^2(4) = 4.55$</td>
<td>.337</td>
</tr>
<tr>
<td>Recreational</td>
<td>15</td>
<td>16</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Competitive</td>
<td>5</td>
<td>7</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No regular physical activity</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of previous injuries</td>
<td>21</td>
<td>21</td>
<td>22</td>
<td>$\chi^2(2) = 1.88$</td>
<td>.390</td>
</tr>
<tr>
<td>Previous physiotherapy</td>
<td>19</td>
<td>18</td>
<td>20</td>
<td>$\chi^2(2) = 1.00$</td>
<td>.608</td>
</tr>
</tbody>
</table>

Table 5. *The Three Intervention Groups' Demographic Characteristics*
Table 6. Reasons for Choosing and Convenience of the Clinic, Mode of Transport to Treatment for the Three Intervention Groups

<table>
<thead>
<tr>
<th>Variable</th>
<th>PMT present (n = 25)</th>
<th>Attention control (n = 23)</th>
<th>No information (n = 23)</th>
<th>Statistic</th>
<th>Significance (p value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reasons for Choosing Clinic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Been before</td>
<td>6</td>
<td>6</td>
<td>10</td>
<td>$\chi^2(12) = 10.22$</td>
<td>.579</td>
</tr>
<tr>
<td>Recommended by other health provider</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommended by family or friend</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Convenient</td>
<td>6</td>
<td>7</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment fees</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knew physiotherapist</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only clinic in area</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinic is on usual route to other places</td>
<td>19</td>
<td>16</td>
<td>17</td>
<td>$\chi^2(2) = 1.09$</td>
<td>.579</td>
</tr>
<tr>
<td>Distance from home to clinic (km)</td>
<td>10.27 (±15.65)</td>
<td>5.17 (±4.33)</td>
<td>7.23 (±10.92)</td>
<td>$F(2,68) = 1.21$</td>
<td>.305</td>
</tr>
<tr>
<td>Distance from work to clinic (km)</td>
<td>5.42 (±7.23)</td>
<td>5.20 (±5.06)</td>
<td>9.85 (±11.07)</td>
<td>$F(2,68) = 2.41$</td>
<td>.097</td>
</tr>
<tr>
<td>Type of transport used to go to clinic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walk</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car</td>
<td>21</td>
<td>18</td>
<td>22</td>
<td>$\chi^2(4) = 5.43$</td>
<td>.246</td>
</tr>
<tr>
<td>Public transport</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The groups were also equivalent on the characteristics of their ankle sprain (see Table 7). The number of days between spraining the ankle and starting physiotherapy ranged from half a day through to 214 days, with 55% of sample having commenced their course of physiotherapy by the fifth day following injury. The participant who took 214
days to start physiotherapy was in the attention control group. A histogram revealed that he was an extreme outlier, and therefore his data were excluded from this analysis. The amount of ankle pain experienced by the groups at the time of the injury was similar. Most of the participants’ ankle sprain was graded as moderate, with a smaller percentage of the sample sustaining either a mild or severe sprain, and for about 40% of the sample their sprain was recurrent. Relatively similar numbers of participants sustained their sprains either during sporting activity or some other activity, such as slipping over on uneven or wet ground while walking.

Table 7.
Characteristics of the Ankle Sprains for the Three Intervention Groups at the Beginning of the Physiotherapy Rehabilitation

<table>
<thead>
<tr>
<th>Variable</th>
<th>PMT (n = 25)</th>
<th>Neutral (n = 23)</th>
<th>Control (n = 23)</th>
<th>Statistic</th>
<th>Significance (p value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Days between injury and starting physiotherapy</td>
<td>13.13 (±16.10)</td>
<td>10.75 (±16.32)</td>
<td>10.61 (±14.75)</td>
<td>F(2,65) = .19</td>
<td>.831</td>
</tr>
<tr>
<td>Ankle pain</td>
<td>6.26 (±2.68)</td>
<td>6.43 (±2.29)</td>
<td>5.74 (±2.60)</td>
<td>F(2,65) = .47</td>
<td>.627</td>
</tr>
<tr>
<td>Cause of sprain</td>
<td></td>
<td></td>
<td></td>
<td>(\chi^2(2) = 1.06)</td>
<td>.588</td>
</tr>
<tr>
<td>During sport</td>
<td>11</td>
<td>14</td>
<td>14</td>
<td>(\chi^2(2) = .15)</td>
<td>.997</td>
</tr>
<tr>
<td>Other activity</td>
<td>12</td>
<td>9</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade of sprain</td>
<td></td>
<td></td>
<td></td>
<td>(\chi^2(4) = .15)</td>
<td>.997</td>
</tr>
<tr>
<td>Mild</td>
<td>6</td>
<td>7</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>14</td>
<td>13</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recurrent sprain</td>
<td>7</td>
<td>8</td>
<td>12</td>
<td>(\chi^2(2) = 2.57)</td>
<td>.279</td>
</tr>
</tbody>
</table>

The descriptive data for the groups’ scores on the antecedents of adherence (i.e., motivation, pain, and normative beliefs) are presented in Table 8. Of the four measures of motivation, identified regulation had the highest mean, followed by external regulation, intrinsic motivation and lastly amotivation. The mean normative beliefs scores were relatively high, with being around 17 out of a maximum of 21. The maximum possible score for the ability to cope with pain was 10 and as can be seen overall scores were relatively high. As can be seen in Table 9, the one-way ANOVA did not reveal any significant differences between the three groups on any of the antecedents of adherence.
Table 8. 
The Three Intervention Groups' Descriptive Data for the Antecedents of Adherence

<table>
<thead>
<tr>
<th></th>
<th>PMT present (n = 25)</th>
<th>Attention control (n = 23)</th>
<th>No information (n = 23)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Range</td>
</tr>
<tr>
<td>Intrinsic motivation</td>
<td>9.16</td>
<td>4.31</td>
<td>4.00 – 18.00</td>
</tr>
<tr>
<td>Identified regulation</td>
<td>19.44</td>
<td>1.50</td>
<td>16.00 – 21.00</td>
</tr>
<tr>
<td>External regulation</td>
<td>12.96</td>
<td>6.58</td>
<td>4.00 – 25.00</td>
</tr>
<tr>
<td>Amotivation</td>
<td>6.04</td>
<td>2.92</td>
<td>4.00 – 15.00</td>
</tr>
<tr>
<td>Normative beliefs</td>
<td>16.96</td>
<td>2.57</td>
<td>12.00 – 21.00</td>
</tr>
<tr>
<td>Pain tolerance</td>
<td>7.84</td>
<td>1.34</td>
<td>4.00 – 10.00</td>
</tr>
</tbody>
</table>
Table 9. 
*Antecedents of Adherence for the Three Intervention Groups*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Statistic</th>
<th>Significance (p value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrinsic motivation</td>
<td>.83</td>
<td>.439</td>
</tr>
<tr>
<td>Identified regulation</td>
<td>1.14</td>
<td>.324</td>
</tr>
<tr>
<td>External regulation</td>
<td>.57</td>
<td>.567</td>
</tr>
<tr>
<td>Amotivation</td>
<td>.16</td>
<td>.854</td>
</tr>
<tr>
<td>Normative beliefs</td>
<td>.54</td>
<td>.588</td>
</tr>
<tr>
<td>Pain tolerance</td>
<td>1.39</td>
<td>.257</td>
</tr>
</tbody>
</table>

**Beliefs about injury and physiotherapy group differences**

Descriptive statistics on the groups’ pre-physiotherapy data for the four PMT variables, threat and coping appraisals and protection motivation are presented in Table 10.

ANOVA with planned comparisons compared the groups’ BASPS scores along with partial eta squared effect sizes and observed power are presented in Table 11. After watching the video and reading the written information the PMT present group was significantly higher overall on protection motivation than the other two groups. The same pattern of results was evident in the threat appraisal, with the PMT present group scoring significantly higher than the other two groups, which were carried through to severity and vulnerability. The groups did not differ significantly for coping appraisal. Results showed a significant trend effect for response efficacy, but no significant differences were found for self-efficacy.
Table 10. *Descriptive Data for the Three Intervention Groups' PMT Variables, Threat and Coping Appraisals and Protection Motivation*

<table>
<thead>
<tr>
<th>BASPS</th>
<th>PMT present (n = 25)</th>
<th>Attention control (n = 23)</th>
<th>No information (n = 23)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Range</td>
</tr>
<tr>
<td>Severity</td>
<td>25.56</td>
<td>4.70</td>
<td>15.00 - 35.00</td>
</tr>
<tr>
<td>Vulnerability</td>
<td>22.04</td>
<td>3.31</td>
<td>14.00 – 28.00</td>
</tr>
<tr>
<td>Threat appraisal 1</td>
<td>47.60</td>
<td>6.26</td>
<td>36.00 – 62.00</td>
</tr>
<tr>
<td>Response efficacy</td>
<td>12.76</td>
<td>1.36</td>
<td>10.00 – 14.00</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>60.44</td>
<td>6.38</td>
<td>50.00 – 71.00</td>
</tr>
<tr>
<td>Coping appraisal 2</td>
<td>73.20</td>
<td>6.96</td>
<td>60.00 – 85.00</td>
</tr>
<tr>
<td>Protection motivation 3</td>
<td>120.80</td>
<td>11.73</td>
<td>99.00 – 147.00</td>
</tr>
</tbody>
</table>

1 Threat appraisal = severity + vulnerability, 2 Coping appraisal = response efficacy + self-efficacy, 3 Protection motivation = threat appraisal + coping appraisal.
Table 11.
Analysis of Variance of the Three Intervention Groups' PMT Variables, Threat and Coping Appraisals and Protection Motivation

<table>
<thead>
<tr>
<th>BASPS</th>
<th>$F(df = 2,68)$</th>
<th>Significance</th>
<th>Effect size $\eta^2$</th>
<th>Observed power</th>
<th>Planned comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severity</td>
<td>3.14</td>
<td>.05</td>
<td>.09</td>
<td>.59</td>
<td>PMT present &gt; attention control &amp; no information $p &lt; .046$</td>
</tr>
<tr>
<td>Vulnerability</td>
<td>22.30</td>
<td>.0001</td>
<td>.40</td>
<td>1.00</td>
<td>PMT present &gt; attention control &amp; no information $p &lt; .0001$</td>
</tr>
<tr>
<td>Threat appraisal $^1$</td>
<td>14.15</td>
<td>.0001</td>
<td>.29</td>
<td>1.00</td>
<td>PMT present &gt; attention control &amp; no information $p &lt; .0001$</td>
</tr>
<tr>
<td>Response efficacy</td>
<td>2.80</td>
<td>.068</td>
<td>.08</td>
<td>.53</td>
<td>PMT present &gt; attention control &amp; no information $p &lt; .025$</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>1.24</td>
<td>.295</td>
<td>.04</td>
<td>.26</td>
<td></td>
</tr>
<tr>
<td>Coping appraisal $^2$</td>
<td>1.81</td>
<td>.171</td>
<td>.05</td>
<td>.37</td>
<td></td>
</tr>
<tr>
<td>Protection motivation $^3$</td>
<td>8.39</td>
<td>.001</td>
<td>.20</td>
<td>.96</td>
<td>PMT present &gt; attention control &amp; no information $p &lt; .0001$</td>
</tr>
</tbody>
</table>

$^1$ Threat appraisal = severity + vulnerability, $^2$ Coping appraisal = response efficacy + self-efficacy, $^3$ Protection motivation = threat appraisal + coping appraisal.
**Intentions to adhere to the physiotherapy group differences**

Analysis of the groups’ descriptive data was undertaken and is presented in Table 12. ANOVA compared the groups’ intentions to attend the clinic appointments and to adhere to the clinic- and home-based physiotherapy. No significant differences were found between the groups on any of the intentions, and the effect sizes for each of the intentions were small (Table 13).

Table 12.  
*Intervention Groups' Descriptive Data for their Intentions to Attend the Clinic Appointments and Adhere to the Clinic- and Home-Based Physiotherapy*

<table>
<thead>
<tr>
<th>Intentions</th>
<th>PMT present (n = 25)</th>
<th>Attention control (n = 23)</th>
<th>No information (n = 23)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Range</td>
</tr>
<tr>
<td>Clinic appointments</td>
<td>12.24</td>
<td>1.64</td>
<td>8.00 – 14.00</td>
</tr>
<tr>
<td>Clinic-based physiotherapy</td>
<td>12.64</td>
<td>1.41</td>
<td>10.00 – 14.00</td>
</tr>
<tr>
<td>Home-based physiotherapy</td>
<td>11.96</td>
<td>1.37</td>
<td>9.00 – 14.00</td>
</tr>
</tbody>
</table>

Table 13.  
*Analysis of Variance of the Three Intervention Groups' Intentions to Attend the Clinic Appointments and Adhere to the Clinic- and Home-Based Physiotherapy.*

<table>
<thead>
<tr>
<th>Intention</th>
<th>$F(df = 2, 68)$</th>
<th>Significance (p value)</th>
<th>Effect size ($\eta^2$)</th>
<th>Observed power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinic appointments</td>
<td>.28</td>
<td>.755</td>
<td>.01</td>
<td>.09</td>
</tr>
<tr>
<td>Clinic-based physiotherapy</td>
<td>.73</td>
<td>.486</td>
<td>.02</td>
<td>.17</td>
</tr>
<tr>
<td>Home-based physiotherapy</td>
<td>.02</td>
<td>.983</td>
<td>.03</td>
<td>.05</td>
</tr>
</tbody>
</table>
**Attendance at physiotherapy and adherence behaviours group differences**

The descriptive attendance and adherence to physiotherapy data are presented in Table 14. Overall there were high scores for the percentage of attendance, SIRAS and the home-based physiotherapy components of refraining from undertaking activities detrimental to their recovery and strapping of the ankle.

ANOVA and Bonferroni post-hoc testing compared the groups’ mean scores for percentage of attendance and their clinic- and home-based adherence behaviours, and Chi-square analysis compared the groups’ rate of completion of their course of physiotherapy (see Table 15). The three intervention groups did not differ significantly on the number of clinic appointments they attended, the number scheduled, or their percentage of attendance. Similarly they did not differ on their rate of completion of the physiotherapy, with four participants in the PMT present and attention control groups and three in the no information group not completing their course of physiotherapy With regard to the groups’ adherence to the clinic- and home-based physiotherapy, the only significant difference occurred between the groups for the clinic-based adherence, with the no information group having significantly higher SIRAS scores than the attention control group.
Table 14.
Descriptive Data for Attendance at Clinic Appointments and Adherence to Clinic- and Home-Based Physiotherapy

<table>
<thead>
<tr>
<th></th>
<th>PMT present (n = 24)</th>
<th>Attention control (n = 23)</th>
<th>No information (n = 23)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Range</td>
</tr>
<tr>
<td>Attendance at clinic appointments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appointments attended</td>
<td>7.91</td>
<td>3.48</td>
<td>1.00 – 15.00</td>
</tr>
<tr>
<td>Appointments required</td>
<td>8.52</td>
<td>3.54</td>
<td>2.00 – 16.00</td>
</tr>
<tr>
<td>Percentage of attendance</td>
<td>89.79</td>
<td>20.07</td>
<td>14.00 – 100.00</td>
</tr>
<tr>
<td>Number who completed physiotherapy</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adherence to clinic- and home based physiotherapy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinic-based (SIRAS)</td>
<td>4.48</td>
<td>.47</td>
<td>3.32 – 5.00</td>
</tr>
<tr>
<td>Home exercises</td>
<td>3.80</td>
<td>.64</td>
<td>2.50 – 5.00</td>
</tr>
<tr>
<td>Home refrain from specified activities</td>
<td>4.50</td>
<td>.50</td>
<td>3.33 – 5.00</td>
</tr>
<tr>
<td>Home strapping</td>
<td>4.36</td>
<td>.98</td>
<td>1.00 – 5.00</td>
</tr>
<tr>
<td>Home elevation</td>
<td>3.33</td>
<td>1.03</td>
<td>2.00 – 5.00</td>
</tr>
<tr>
<td>Home ice</td>
<td>3.69</td>
<td>1.56</td>
<td>0.00 – 5.00</td>
</tr>
</tbody>
</table>
Table 15.

*Statistical Comparison of the Three Intervention Groups’ Attendance at Physiotherapy and Adherence to Clinic- and Home-Based Physiotherapy*

<table>
<thead>
<tr>
<th>Adherence variable</th>
<th>Statistic</th>
<th>Significance</th>
<th>Effect size $\eta^2$</th>
<th>Observed power</th>
<th>Bonferroni post-hoc test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Attendance at clinic appointments</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appointments attended</td>
<td>$F(2,66) = .66$</td>
<td>.520</td>
<td>.01</td>
<td>.11</td>
<td></td>
</tr>
<tr>
<td>Appointments required</td>
<td>$F(2,66) = .59$</td>
<td>.557</td>
<td>.02</td>
<td>.14</td>
<td></td>
</tr>
<tr>
<td>Percentage of attendance</td>
<td>$F(2,66) = .37$</td>
<td>.691</td>
<td>.02</td>
<td>.10</td>
<td></td>
</tr>
<tr>
<td>Number who completed physiotherapy</td>
<td>$\chi^2(2) = .17$</td>
<td>.917</td>
<td>.00</td>
<td>.06</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adherence to clinic- and home based physiotherapy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinic-based (SIRAS)</td>
<td>$F(2,66) = 3.75$</td>
<td>.029</td>
<td>.18</td>
<td>.73</td>
<td>No information group &gt; attention control $p &lt; .028$</td>
</tr>
<tr>
<td>Home exercises</td>
<td>$F(2,66) = 2.16$</td>
<td>.123</td>
<td>.11</td>
<td>.48</td>
<td></td>
</tr>
<tr>
<td>Home refrain from specified activities</td>
<td>$F(2,62) = 1.56$</td>
<td>.215</td>
<td>.03</td>
<td>.16</td>
<td></td>
</tr>
<tr>
<td>Home strapping</td>
<td>$F(2,62) = .90$</td>
<td>.411</td>
<td>.00</td>
<td>.06</td>
<td></td>
</tr>
<tr>
<td>Home elevation</td>
<td>$F(2,51) = .58$</td>
<td>.566</td>
<td>.01</td>
<td>.08</td>
<td></td>
</tr>
<tr>
<td>Home ice</td>
<td>$F(2,46) = 1.14$</td>
<td>.328</td>
<td>.04</td>
<td>.19</td>
<td></td>
</tr>
</tbody>
</table>
**Functional outcomes**

**Pre and post physiotherapy ankle function.**

The groups’ descriptive data for the pre- and post-physiotherapy ankle function scores are presented in Table 16. ANOVA were used to compare the three groups’ pre- and post-physiotherapy ankle function mean scores. No significant differences were found between the groups (Table 17).

**Changes in ankle function over the duration of the course of physiotherapy**

Between subject repeated measure ANOVAs were used to investigate the time effect and group x time effect for the ankle function outcome scores. Significant time effects, but not time x group effects were found respectively for LLTQ subscales of recreational activity ($F(1,66) = 249.71, p < .0001, \eta^2 = .79$ and $F(2,66) = .43, p = .653, \eta^2 = .01$) and functional activity $F(1,66) = 121.16, p < .0001, \eta^2 = .65$ and $F(2,66) = .50, p = .610, \eta^2 = .02$) and the Motor Activity Scale ($F(1,66) = 264.14, p < .0001, \eta^2 = .80$ and $F(2,66) = .58, p = .561, \eta^2 = .02$). The groups’ post-physiotherapy LLTQ scores were lower than those at pre-physiotherapy, whereas the Motor Activity Scale scores were lower at the beginning of the physiotherapy than those at the end.
Table 16. **Descriptive Data of the Intervention Groups' Pre- and Post-Physiotherapy Ankle Function**

<table>
<thead>
<tr>
<th></th>
<th>PMT present (n = 25)</th>
<th>Attention control (n = 23)</th>
<th>No information (n = 23)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Range</td>
</tr>
<tr>
<td><strong>Pre-physiotherapy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LLTQ recreational activities</td>
<td>30.78</td>
<td>9.67</td>
<td>3.00 – 40.00</td>
</tr>
<tr>
<td>LLTQ functional activities</td>
<td>12.70</td>
<td>8.73</td>
<td>1.00 – 32.00</td>
</tr>
<tr>
<td>Motor Activity Scale</td>
<td>1.30</td>
<td>1.58</td>
<td>0.00 – 6.00</td>
</tr>
<tr>
<td><strong>Post-physiotherapy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LLTQ recreational activities</td>
<td>11.09</td>
<td>7.64</td>
<td>1.00 – 33.00</td>
</tr>
<tr>
<td>LLTQ functional activities</td>
<td>1.26</td>
<td>1.74</td>
<td>0.00 – 7.00</td>
</tr>
<tr>
<td>Motor Activity Scale</td>
<td>4.70</td>
<td>1.82</td>
<td>0.00 – 6.00</td>
</tr>
</tbody>
</table>

Note: High scores on LLTQ sub-scales and low scores on Motor Activity Scale indicate difficulty undertaking the activity.
Table 17. *Analysis of Variance of the Groups’ Pre- and Post- Physiotherapy Scores on the LLTQ Subscales and the Motor Activity Scale*

<table>
<thead>
<tr>
<th>Variable</th>
<th>$F$ ($df = 2.68$)</th>
<th>Significance ($p$ level)</th>
<th>Effect size $\eta^2$</th>
<th>Observed power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-physiotherapy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LLTQ recreational activities</td>
<td>.19</td>
<td>.826</td>
<td>.01</td>
<td>.09</td>
</tr>
<tr>
<td>LLTQ functional activities</td>
<td>.24</td>
<td>.786</td>
<td>.01</td>
<td>.11</td>
</tr>
<tr>
<td>Motor Activity Scale</td>
<td>.19</td>
<td>.824</td>
<td>.01</td>
<td>.09</td>
</tr>
<tr>
<td>Post-physiotherapy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LLTQ recreational activities</td>
<td>.67</td>
<td>.513</td>
<td>.02</td>
<td>.16</td>
</tr>
<tr>
<td>LLTQ functional Activities</td>
<td>.85</td>
<td>.433</td>
<td>.03</td>
<td>.19</td>
</tr>
<tr>
<td>Motor Activity Scale</td>
<td>.25</td>
<td>.777</td>
<td>.01</td>
<td>.09</td>
</tr>
</tbody>
</table>

**Relations between antecedents to adherence, PMT-based beliefs, intentions, behaviours and pre- and post- physiotherapy ankle function**

Pearson correlation coefficients analysed the relationships between the antecedents to adherence (intrinsic motivation, identified regulation, external regulation, amotivation, normative beliefs, pain tolerance and ankle pain at the time of the injury), the BASPS scores, intentions to adhere, adherence behaviours, and pre- and post-physiotherapy ankle function (see Table 18). Insofar as antecedents of adherence are concerned, there were significant positive correlations of a moderate strength between identified regulation and response efficacy and self-efficacy, and the three intentions to adhere to the physiotherapy. A significant weak association occurred between identified regulation and vulnerability. External regulation was significantly negatively correlated to adherence to home rest and ankle strapping, and the post-physiotherapy Motor Activity Scale score. Amotivation had significant negative relations with response and self-efficacy, intentions to adhere to the home-based physiotherapy, and it had a positive correlation with the post-physiotherapy LLTQ functional activity scale.
Significant positive correlations occurred between the normative beliefs and response and self-efficacy and the three adherence intentions. However normative beliefs had a significant negative correlation with adherence to strapping the ankle at home. Pain tolerance was significantly positively related to self-efficacy, and negatively related to the pre-physiotherapy Motor Activity Scale. Similarly ankle pain had a significant negative relationship with the pre-physiotherapy Motor Activity Scale.

Insofar as the beliefs about ankle sprains and physiotherapy are concerned (see Table 19), beliefs about the severity of the sprain were significantly positively related to the pre- and post-physiotherapy LLTQ recreational activity subscale scores. The only significant correlation for vulnerability occurred with intentions to adhere to the clinic-based physiotherapy. Response efficacy had significant positive correlations with the three intentions to adhere to the physiotherapy. Self-efficacy had similar but stronger significant correlations with the intentions to adhere as well as a negative correlation with the post-physiotherapy LLTQ recreational activity scale.

With respect to rehabilitation intentions (see Table 20) intention to attend the clinic appointments was significantly positively correlated to adherence to home exercises, and the intention to adhere to the home physiotherapy was positively related to home exercises and negatively related to adherence to home elevation.

Finally, Pearson correlation analyses revealed two significant relationships between adherence and functional outcome measures (see Table 21). These were a negative correlation between percentage of attendance and post-physiotherapy LLTQ functional activity scale and a positive relationship between elevation of the ankle at home and post-physiotherapy LLTQ functional activities.
Table 18.
Correlations of Antecedents to Adherence, PMT-Based Beliefs, Intentions to Adhere, Adherence Behaviours and Pre- and Post-Physiotherapy Ankle Function

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intrinsic Motivation</th>
<th>Identified regulation</th>
<th>External regulation</th>
<th>Amotivation</th>
<th>Normative beliefs</th>
<th>Pain tolerance</th>
<th>Ankle pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severity</td>
<td>-.15</td>
<td>.08</td>
<td>.07</td>
<td>-.14</td>
<td>.02</td>
<td>-.02</td>
<td>.07</td>
</tr>
<tr>
<td>Vulnerability</td>
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<td>.24*</td>
<td>-.12</td>
<td>-.06</td>
<td>.12</td>
<td>-.01</td>
<td>.09</td>
</tr>
<tr>
<td>Response efficacy</td>
<td>-.31</td>
<td>.43**</td>
<td>.02</td>
<td>-.40**</td>
<td>.27*</td>
<td>.07</td>
<td>-.10</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>-.07</td>
<td>.52**</td>
<td>.06</td>
<td>-.28*</td>
<td>.30*</td>
<td>.27*</td>
<td>.18</td>
</tr>
<tr>
<td>Intention to attend clinic</td>
<td>.04</td>
<td>.38**</td>
<td>-.01</td>
<td>-.14</td>
<td>.24*</td>
<td>.17</td>
<td>.08</td>
</tr>
<tr>
<td>Intention to adhere to clinic physiotherapy</td>
<td>-.02</td>
<td>.41**</td>
<td>.13</td>
<td>-.18</td>
<td>.28*</td>
<td>.08</td>
<td>.02</td>
</tr>
<tr>
<td>Intention to adhere to home physiotherapy</td>
<td>.03</td>
<td>.50**</td>
<td>.06</td>
<td>-.24*</td>
<td>.32**</td>
<td>.17</td>
<td>.03</td>
</tr>
<tr>
<td>Percentage of attendance</td>
<td>-.13</td>
<td>.00</td>
<td>-.02</td>
<td>-.20</td>
<td>.09</td>
<td>-.23</td>
<td>.06</td>
</tr>
<tr>
<td>Clinic-based adherence (SIRAS)</td>
<td>.00</td>
<td>.12</td>
<td>-.01</td>
<td>-.02</td>
<td>.14</td>
<td>.09</td>
<td>.05</td>
</tr>
<tr>
<td>Adherence to home exercise</td>
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<td>.16</td>
<td>-.10</td>
<td>.01</td>
<td>-.10</td>
<td>-.20</td>
<td>.03</td>
</tr>
<tr>
<td>Adherence to home rest</td>
<td>-.19</td>
<td>.05</td>
<td>-.27*</td>
<td>-.16</td>
<td>-.18</td>
<td>-.04</td>
<td>.16</td>
</tr>
<tr>
<td>Adherence to home ice</td>
<td>.23</td>
<td>.01</td>
<td>.06</td>
<td>-.01</td>
<td>.06</td>
<td>.04</td>
<td>.16</td>
</tr>
<tr>
<td></td>
<td>Intrinsic Motivation</td>
<td>Identified regulation</td>
<td>External regulation</td>
<td>Amotivation</td>
<td>Normative beliefs</td>
<td>Pain tolerance</td>
<td>Ankle pain</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>----------------------</td>
<td>-----------------------</td>
<td>---------------------</td>
<td>-------------</td>
<td>------------------</td>
<td>---------------</td>
<td>------------</td>
</tr>
<tr>
<td>Adherence to home strapping</td>
<td>-.06</td>
<td>-.07</td>
<td>-.37**</td>
<td>.00</td>
<td>-.48**</td>
<td>-.08</td>
<td>.13</td>
</tr>
<tr>
<td>Adherence to home elevation</td>
<td>-.02</td>
<td>.18</td>
<td>-.01</td>
<td>-.18</td>
<td>-.09</td>
<td>-.05</td>
<td>.05</td>
</tr>
<tr>
<td>LLTQ recreational activity T1</td>
<td>.15</td>
<td>.11</td>
<td>.07</td>
<td>-.17</td>
<td>.12</td>
<td>.19</td>
<td>.16</td>
</tr>
<tr>
<td>LLTQ functional activity T1</td>
<td>.21</td>
<td>.02</td>
<td>.20</td>
<td>-.05</td>
<td>.19</td>
<td>.18</td>
<td>.16</td>
</tr>
<tr>
<td>Motor Activity Scale T1</td>
<td>-.14</td>
<td>-.05</td>
<td>-.21</td>
<td>-.02</td>
<td>-.02</td>
<td>-.31**</td>
<td>-.36**</td>
</tr>
<tr>
<td>LLTQ recreational activity T2</td>
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<td>.05</td>
<td>.18</td>
<td>.18</td>
<td>-.12</td>
<td>.15</td>
</tr>
<tr>
<td>LLTQ functional activity T2</td>
<td>.17</td>
<td>-.10</td>
<td>.13</td>
<td>.25*</td>
<td>-.11</td>
<td>.21</td>
<td>.22</td>
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<tr>
<td>Motor Activity Scale T2</td>
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<td>-.12</td>
<td>-.34**</td>
<td>-.07</td>
<td>-.07</td>
<td>-.17</td>
<td>-.12</td>
</tr>
</tbody>
</table>

* p < .05, ** p < .01. T1 = pre-physiotherapy, T2 = post-physiotherapy. Correlations are those of transformed scores for the intentions to adhere to the physiotherapy and the adherence behaviours.
Table 19. 
*Correlations of PMT-Based Beliefs, Intentions to Adhere, Adherence Behaviours and Pre- and Post-Physiotherapy Ankle Function*

<table>
<thead>
<tr>
<th></th>
<th>Severity</th>
<th>Vulnerability</th>
<th>Response Efficacy</th>
<th>Self-Efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention to attend clinic</td>
<td>.10</td>
<td>.09</td>
<td>.34**</td>
<td>.52**</td>
</tr>
<tr>
<td>Intention to adhere to clinic physiotherapy</td>
<td>.06</td>
<td>.30*</td>
<td>.55**</td>
<td>.67**</td>
</tr>
<tr>
<td>Intention to adhere to home physiotherapy</td>
<td>.05</td>
<td>.19</td>
<td>.30**</td>
<td>.49**</td>
</tr>
<tr>
<td>Percentage of attendance</td>
<td>-.02</td>
<td>.09</td>
<td>.11</td>
<td>.06</td>
</tr>
<tr>
<td>Clinic-based adherence (SIRAS)</td>
<td>-.14</td>
<td>-.05</td>
<td>.02</td>
<td>.01</td>
</tr>
<tr>
<td>Adherence to home exercise</td>
<td>-.24</td>
<td>.07</td>
<td>.01</td>
<td>.22</td>
</tr>
<tr>
<td>Adherence to home rest</td>
<td>.09</td>
<td>.01</td>
<td>.17</td>
<td>.09</td>
</tr>
<tr>
<td>Adherence to home ice</td>
<td>-.14</td>
<td>-.05</td>
<td>.12</td>
<td>-.02</td>
</tr>
<tr>
<td>Adherence to home strapping</td>
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<td>.05</td>
<td>.02</td>
<td>.07</td>
</tr>
<tr>
<td>Adherence to home elevation</td>
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<td>.12</td>
<td>.15</td>
<td>.13</td>
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<td>.01</td>
<td>.12</td>
<td>.09</td>
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<td>.15</td>
<td>.11</td>
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<td>Motor Activity Scale T1</td>
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<td>-.22</td>
<td>-.06</td>
<td>-.12</td>
</tr>
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<td>.31**</td>
<td>.13</td>
<td>-.08</td>
<td>-.25*</td>
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<td>LLTQ functional activity T2</td>
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<td>.02</td>
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<td>-.21</td>
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<td>-.22</td>
<td>.00</td>
<td>.04</td>
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</table>

*p < .05, ** p < .01, T1 = pre-physiotherapy, T2 = post-physiotherapy. Correlations are those of transformed scores for the intentions to adhere to the physiotherapy and the adherence behaviours*
Table 20.  
*Correlations of Intentions to Adhere to the Physiotherapy, Adherence Behaviours and Pre- and Post-Physiotherapy Ankle Function*

<table>
<thead>
<tr>
<th>Intentions</th>
<th>Attend clinic appointments</th>
<th>Adhere to clinic physiotherapy</th>
<th>Adhere to home physiotherapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of attendance</td>
<td>.08</td>
<td>.04</td>
<td>-.02</td>
</tr>
<tr>
<td>Clinic-based adherence (SIRAS)</td>
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<td>.05</td>
<td>.14</td>
</tr>
<tr>
<td>Adherence to home exercise</td>
<td>.24*</td>
<td>.19</td>
<td>.25*</td>
</tr>
<tr>
<td>Adherence to home rest</td>
<td>-.10</td>
<td>-.12</td>
<td>.09</td>
</tr>
<tr>
<td>Adherence to home ice</td>
<td>-.05</td>
<td>.02</td>
<td>.02</td>
</tr>
<tr>
<td>Adherence to home strapping</td>
<td>-.02</td>
<td>.00</td>
<td>.05</td>
</tr>
<tr>
<td>Adherence to home elevation</td>
<td>-.07</td>
<td>.03</td>
<td>.38**</td>
</tr>
<tr>
<td>LLTQ recreational activity T1</td>
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<td>-.11</td>
<td>-.14</td>
</tr>
<tr>
<td>LLTQ functional activity T1</td>
<td>-.11</td>
<td>-.17</td>
<td>-.17</td>
</tr>
<tr>
<td>Motor Activity Scale T1</td>
<td>.06</td>
<td>.09</td>
<td>.19</td>
</tr>
<tr>
<td>LLTQ recreational activity T2</td>
<td>.20</td>
<td>.11</td>
<td>.14</td>
</tr>
<tr>
<td>LLTQ functional activity T2</td>
<td>.08</td>
<td>.18</td>
<td>-.07</td>
</tr>
<tr>
<td>Motor Activity Scale T2</td>
<td>-.03</td>
<td>.05</td>
<td>.03</td>
</tr>
</tbody>
</table>

* * p < .05, ** * p < .01. T1 = pre-physiotherapy, T2 = post-physiotherapy. Correlations of intentions to adhere to physiotherapy and adherence behaviours are those of transformed scores.
Table 21.  
*Correlations of Adherence Behaviours and Pre- and Post-Physiotherapy Ankle Function*

<table>
<thead>
<tr>
<th></th>
<th>Attendance Percentage n = 70</th>
<th>Clinic adherence n = 69</th>
<th>Home exercise adherence n = 65</th>
<th>Home rest adherence n = 65</th>
<th>Home ice adherence n = 49</th>
<th>Home strapping adherence n = 65</th>
<th>Home elevation adherence n = 54</th>
</tr>
</thead>
<tbody>
<tr>
<td>LLTQ recreational activity T1</td>
<td>.11</td>
<td>-.11</td>
<td>.04</td>
<td>.05</td>
<td>.12</td>
<td>-.03</td>
<td>.15</td>
</tr>
<tr>
<td>LLTQ functional activity T1</td>
<td>.11</td>
<td>-.02</td>
<td>.04</td>
<td>.28</td>
<td>.17</td>
<td>.24</td>
<td>.17</td>
</tr>
<tr>
<td>Motor Activity Scale T1</td>
<td>-.17</td>
<td>.02</td>
<td>-.03</td>
<td>-.13</td>
<td>-.06</td>
<td>-.13</td>
<td>-.26</td>
</tr>
<tr>
<td>LLTQ recreational activity T2</td>
<td>-.01</td>
<td>.00</td>
<td>-.09</td>
<td>.03</td>
<td>.19</td>
<td>.03</td>
<td>.15</td>
</tr>
<tr>
<td>LLTQ functional activity T2</td>
<td>-.29*</td>
<td>-.15</td>
<td>.12</td>
<td>-.01</td>
<td>.03</td>
<td>-.01</td>
<td>.28*</td>
</tr>
<tr>
<td>Motor Activity Scale T2</td>
<td>.04</td>
<td>-.01</td>
<td>-.01</td>
<td>.08</td>
<td>.05</td>
<td>.08</td>
<td>-.07</td>
</tr>
</tbody>
</table>

* p < .05. T1 = pre-physiotherapy, T2 = post-physiotherapy. Correlations are those of transformed scores for the adherence behaviours.
Predictors of beliefs about the injury and physiotherapy, intentions to adhere, adherence behaviours and post-physiotherapy ankle function

Standard multiple regression analyses were used to explore the significant relationships between variables that made conceptual sense in a temporal sequence. Only variables that showed significant bivariate associations from the previous results section were considered in this analysis.

Predicting intention

The regression equation predicting the intention to attend the physiotherapy was significant \( F(2,68) = 6.50, p < .003 \), adjusted \( R^2 = .14 \), with identified regulation (\( \beta = .34, p < .006 \)) being the sole significant predictor, but not normative beliefs (\( \beta = .12, p = .301 \)). Similarly the equation for the prediction for the intention to adhere to the clinic-based physiotherapy was significant \( F(2,68) = 8.47, p < .001 \), adjusted \( R^2 = .18 \), with identified regulation (\( \beta = .36, p < .003 \)) being a significant predictor, but not normative beliefs (\( \beta = .17, p = .140 \)). Lastly the equation for the intentions to adhere to the home-based physiotherapy was significant \( F(3,67) = 8.44, p < .001 \), adjusted \( R^2 = .24 \), with identified regulation (\( \beta = .44, p < .0001 \)) being a significant predictor, but not normative beliefs (\( \beta = .16, p = .169 \)) or amotivation (\( \beta = -.02, p = .842 \)).

Predicting adherence

In terms of the adherence behaviours, the regression equation predicting adherence to strapping the ankle at home was statistically significant, \( F(2,62) = 9.31, p < .0001 \), adjusted \( R^2 = .21 \), with normative beliefs being a significant predictor (\( \beta = -.34, p < .007 \)), but not external regulation. However the intentions to attend physiotherapy (\( \beta = .13, p = .367 \)) and adhere to the home-based physiotherapy (\( \beta = .17, p = .244 \)) were not significant predictors of adherence to home exercises (\( F(2,66) = 2.53, p = .087 \), adjusted \( R^2 = .04 \)).

Predicting ankle function

Regarding the prediction of the post-physiotherapy LLTQ functional activity scores, the regression equation was statistically significant \( F(2,51) = 5.49, p < .007 \), adjusted \( R^2 = .15 \), with both the percentage of attendance at the clinic appointments (\( \beta = -.33, p < .012 \))
and adherence to home elevation ($\beta = .28, p < .031$) making unique and significant contributions. As a consequence of the outcome of this regression analysis, an ANOVA was undertaken to compare the scores on the LLTQ functional activity scale of the participants who attended all their clinic appointments with those who did not. It was found that those who attended all their clinic appointments had significantly better LLTQ functional activity scores than the participants who did not ($F(1,67) = 5.11, p < .027$).

**Discussion**

The results of this study be discussed in relation to each of the hypotheses and will be interpreted within the context of the research and the findings of other related studies. The discussion will end with an outline of the strengths and limitations of the research and a short summary of the key findings.

*The effects of the PMT intervention on the beliefs about the sprain and physiotherapy – hypothesis 1*

Only partial support was found for the prediction that in comparison to those not exposed to the persuasive information ground in PMT, those who were exposed to it would have significantly stronger beliefs about the sprain and the physiotherapy. The limited support came from the PMT present group’s significantly stronger beliefs about the severity of the injury, vulnerability to further injury and efficacy of the physiotherapy (response efficacy) in comparison to the two controls immediately following the intervention. These increases were also evident the threat appraisal and protection motivation.

The success of the manipulation of severity, vulnerability and response efficacy at the beginning of the physiotherapy appear to have been due to the content of these components in the intervention plus the educational techniques used to convey the information in the intervention. The PMT-present group’s scores on the severity, vulnerability and response efficacy scales of the BASPS suggest that these participants understood the information presented in the intervention, and that it had a meaningful impact. The use of the video as the primary form of media brought a sense of realism to the information, and was further enhanced by the use of experts (physiotherapist and patient)
and having the information presented in simple everyday language and specific to the ankle sprains. Information presented in this manner has been shown to enhance understanding (Ley, 1988; Meade, 1996), and the use of experts reportedly bring credibility to persuasive communications which in turn alters knowledge and beliefs (Gleitman et al., 1999).

The inability of the PMT-based intervention to successfully manipulate self-efficacy may have been due to the study’s design and the participants’ previous experiences with physiotherapy. Earlier research that successfully manipulated self-efficacy (see Brouwers & Sorrentino, 1993; Courneya & Hellsten, 2001; Maddux & Rogers, 1983; Wurtele & Maddux, 1987) employed factorial designs with the variables being manipulated at either high or low levels, and relied on fabricated information. In the present study ethical and pragmatic constraints prevented the use of a factorial design with fabrication of content, as the participants had an existent injury (ankle sprain), had sought physiotherapy for it and were entitled to correct factual information. Given the moderate size of the group differences on the PMT variables, the factually correct information may not have had the persuasive power of the fabricated information in previous investigations.

A possible cause for the three intervention groups’ pre-physiotherapy mean self-efficacy scores being similar and moderately high was that many of the participants had a past history of injuries (64 out of a final sample of 70) and being treated by physiotherapy (57). These previous experiences may have prepared them for their current course of physiotherapy, and their role in it. Another line of evidence of their level of understanding comes from the pattern of scoring on the SIMS subscales, with the high identified regulation and low amotivation scores, which are indicative of people knowing why they are having physiotherapy (Byerly et al., 1994; Duda et al., 1989; Fields et al., 1995; Fisher et al., 1988; Pizzari et al., 2002; Terpstra et al., 1992). Further if these people had been adherent to their previous physiotherapy there is evidence to suggest from recent research that this can be a predictor of future self-efficacy (Woodgate et al., 2005).
Intention to adhere and attend physiotherapy – hypothesis 2

Like the pilot study, the PMT-based information did not cause any significant differences between the groups’ goal intentions to adhere to the home- and clinic-based components of their physiotherapy and to attend all clinic appointments, which is contrary the findings of previous PMT-based intervention studies (see Wurtele & Maddux, 1987; Yzer et al., 1998). As the characteristics of the participants in this study and the pilot were similar, it could be assumed that the reasons for the lack of manipulation of intentions are the same in both studies. First the participants differed from those in other PMT-based intervention research in that they had an existent injury and were seeking physiotherapy to obtain symptomatic relief. Therefore it is highly likely that in the initial stages of their physiotherapy they intended to follow the treatment requirements. This likelihood gains further credence from the previous experiences the participants have had with physiotherapy and injuries, their subsequent awareness of the necessity to adhere to the treatment if they wanted symptomatic relief, and ultimately their relatively high levels of adherence.

Second the possibility of response bias causing the high undifferentiated intention to adhere scores cannot be excluded. Participants could well have wanted to be seen in a positive light. Similarly, the intention items may have prompted the participants, especially those in the control groups, to think about aspects of their physiotherapy, such as adherence to the clinic- and home-based components that they had not considered previously. Instead of the items eliciting a true representation of the participants’ knowledge, they may have been of informative value thereby changing their intentional beliefs (Ogden, 2003).

Third in spite of having been to physiotherapy before, the participants completed the questionnaires prior to commencing their physiotherapy, at which time they may have been well intentioned with regard to carrying out the physiotherapy, but when faced with the reality of the treatment requirements it may have proved not to be as easy as originally thought.

Fourth in light of the pilot study having similar results, and the intention scores in this one also being high and undifferentiated, the possibility of a ceiling effect with the intentions questionnaire cannot be overlooked (Domholdt, 2005). This effect may be due to
the use of goal intentions, as opposed to implementation intentions. Goal intentions only specify an end point, which in the present study were the desired adherence behaviours. However implementation intentions act to promote the behaviours that form the goal intentions, by specifying how the behaviours are going to be implemented, and where and when they were going to be done (see Gollwitzer, 1999). Had implementation intentions been used in this study, as opposed to the two control groups, the PMT present group may have had the stronger intentions as the intervention included advice about the how, when and where of implementing the clinic- and home-based components of their physiotherapy. Before any firm conclusions can be drawn about the value of implementation intentions as opposed to goal intentions, research is required into their effectiveness particularly in the clinical and research settings of physiotherapy.

The effects of the PMT-based intervention on adherence behaviours – hypothesis 3

The intervention failed to increase the PMT group’s adherence behaviours in comparison to the two controls and there are three possible reasons for this outcome. First, the influence of the participants’ relatively high levels of self-efficacy, their previous experiences of physiotherapy and their apparent understanding of the physiotherapy rehabilitation process on their adherence behaviours cannot be underestimated. These are known to make a significant contribution to rehabilitation adherence (Hall et al., 2002). Second, examination of the participants’ scores on the antecedents to adherence questionnaires revealed that they were motivated to undertake the physiotherapy, had strong normative beliefs (pressure from others to undertake physiotherapy) and high tolerance for pain, which are known precursors to adherence (see, Brewer, Van Raalte, Cornelius et al., 2000; Byerly et al., 1994; Campbell et al., 2001; Duda et al., 1989; Fields et al., 1995; Fisher et al., 1988; Terpstra et al., 1992). However another antecedent to adherence that could have been operating in this study is previous adherence behaviours (Meichenbaum & Turk, 1987). These behaviours have been shown to reduce the PMT variables’ contribution to the intentions to adhere and future adherence behaviours (Norman, Boer, & Seydel, 2004; Norman et al., 2003; Woodgate et al., 2005). In hindsight it would have been beneficial to have assessed their previous adherence behaviours.
Third, some caution needs to be taken in interpreting the high adherence scores, as they may due to a response bias, with both the participants and physiotherapist overestimating the level of adherence. In relation to adherence research concerns have expressed about whether participants are actually behaving in the manner they report or whether they are giving what they believe is a desired response (Gahimer & Domholdt, 1996; Sluijs et al., 1998). In the present study, the possibility of the physiotherapists being biased in their use of the SIRAS was acknowledged, and random reliability checks were undertaken by the researcher. The high level of agreement found between the physiotherapists’ and researcher’s scoring points the physiotherapists not being lenient in their use of the SIRAS.

There was a significant group difference for the clinic-based adherence, which was between the two control groups, with the no information group having the highest SIRAS scores. Some caution needs to be exercised in the interpretation of this finding as close scrutiny of the two groups’ descriptive data shows very little difference between their means (attention-control 4.24 and no information control 4.60), standard deviations and ranges. While this difference is statistically significant, it is of little clinical importance as both groups are in the realms of being considered highly adherent.

**Effect of the intervention on ankle function – hypothesis 4**

The intervention did not lead to the PMT group’s rate of recovery being superior to that of the two control groups. Initially the three groups had poor ankle function on the outcome measures, specifically the two subscales of the LLTQ and the Motor Activity Scale. In spite of the apparent delay in seeking treatment, there was significant improvement in participants’ ankle function over the duration of the physiotherapy, with no difference between the intervention groups, and the ankle function being near to normal by the end of the physiotherapy. Further the mean numbers of appointments recommended ranged from 7.39 to 8.52, which are lower than that the ten sessions regarded as necessary for optimal recovery (Accident Compensation Corporation, 2000). This smaller number of appointments may have been due to the high levels of adherence reported, and also the extensive use of home programmes to supplement the clinic treatments, which are known reasons for optimal recovery (Accident Compensation Corporation, 2002b; Bassewitz &
Shapiro, 1997; De Carlo & Sell, 1997; Goodwin et al., 2003; Roddey et al., 2002; Safran, Zachazewski et al., 1999; Symons et al., 2001).

**Relations between the antecedents to adherence, PMT-based beliefs, intentions to adhere, adherence behaviours and pre- and post-physiotherapy ankle function – hypothesis 5**

**Antecedents**

The relationships between the antecedents to adherence and the other variables of interest showed similar patterns to those found in previous research (for example Byerly et al., 1994; Duda et al., 1989; Fields et al., 1995; Fisher et al., 1988). More specifically participants, who were motivated to undertake their physiotherapy because of the benefits obtained (identified regulation) and high levels of normative beliefs felt efficacious about coping with the treatment requirements (self-efficacy), believed that the physiotherapy was effective, and intended to attend and adhere to their clinic- and home-based treatment. Nonetheless it was surprising that there were only a few significant relationships between the antecedents and the adherence variables, and those that were present are somewhat difficult to interpret, such as the inverse relationships between external regulation and adherence to home-based strapping and rest. The other correlation of note was between a poor performance on the pre-physiotherapy Motor Activity Scale and high levels of ankle pain. This finding is consistent with other research that found pain was a limiting factor in the performance of tasks on the Motor Activity Scale (Wilson et al., 1998).

**PMT-based beliefs about the ankle sprain and physiotherapy**

In comparison to the other threat appraisal beliefs, self-efficacy and to a lesser extent response efficacy had the stronger relations with intentions to adhere, which is in line with other clinical research that has used the PMT as a guiding framework. Parents of children with muscular dystrophy had higher intentions to implement the treatment programme if they had stronger beliefs about their ability to implement the regimen and if they believed it to be an effective form of treatment (Flynn et al., 1995). A similar pattern of correlations was identified in two meta-analyses of PMT based studies (Floyd et al., 2000; Milne et al., 2000) in which the threat and coping appraisal variables had stronger relations with intentions than behaviours. However in light of previous research that has
identified relationships between PMT-based beliefs and the adherence variables (Brewer et al., 2003b; Duda et al., 1989; Flynn et al., 1995; Hall et al., 2002; Taylor & May, 1996; Woodgate et al., 2005), it was surprising that no such relationships were found in the current study.

The significant relationship between severity and post-physiotherapy LLTQ recreational subscale may be indicative of patients’ beliefs matching the seriousness of their injury. The significant correlation between self-efficacy and post-physiotherapy LLTQ recreational activity implies that people who feel efficacious about their ability to cope with treatment requirements have a good recovery as shown by the LLTQ recreational subscale. Similar findings come from a study by Taal, Rasker, Seydel and Wiegman (1993) in which patients with rheumatoid arthritis, who felt efficacious about coping with their disease by using minimal amounts of medication reported few symptoms and a high level of functional ability.

An examination of the predictors of self-efficacy and response efficacy revealed that identified regulation makes a significant contribution to both these variables. This implies that patients who are motivated to seek physiotherapy because of its potential benefits also believe the treatment will be effective and consider they can cope with its requirements. While it does not appear other research has investigated the role of self-motivation has in the prediction of response efficacy and self-efficacy, Duda et al. (1989) did find significant associations amongst these three variables.

Lastly it should be noted that the PMT variables were not significantly correlated to the adherence behaviours which provides support for the PMT (Rogers, 1983). This version of the PMT proposed that the threat and coping appraisal variables contributed directly to protection motivation (intentions), and in turn the intentions contribute to the coping modes, which in this research are adherence behaviours (Rogers, 1983, see Figure 1).

**Intentions**

Unlike previous medical research that has failed to find significant relations between intentions to adhere and adherence behaviours (Norman et al., 2003; Rudman et al., 1999), this study did have three significant intention-adherence behaviour correlations. The first two significant correlations showed that participants who intended to adhere to the
home-based physiotherapy had higher rates of adherence to the home-based exercises and elevation of their ankle. These relationships are understandable as these two activities are the mainstays of physiotherapy in the acute phase of the rehabilitation, which was the time when they completed the questionnaires. The third correlation revealed that participants who strongly intended to attend their physiotherapy appointments also adhered to their exercise programme could point to people who adhere to their home exercises also realise the value of attending clinic appointments to have their exercises reviewed and altered. One possible reason for the intention-adherence behaviour link being present in this study is that the adherence behaviours were measured over time, whereas in other studies they were only measured at one time point (for example Rudman et al., 1999). It was surprising that the intentions to adhere to the clinic-based physiotherapy did not have any significant relations with the adherence behaviours. Nonetheless as outlined in the previous section of the discussion section these few significant intentions-adherence relationships do give support to the role protection motivation has with the coping modes in the PMT (Rogers, 1983, see Figure 1).

As with self-efficacy and response efficacy, identified regulation was the sole significant predictor of the three intentions to follow the requirements of the rehabilitation programme. This finding points to motivation to undertake physiotherapy to obtain symptomatic relief having a bearing on the intentions to follow the treatment requirements. It is difficult to interpret these findings in light of those of previous rehabilitation studies as the focus has been on the role of the antecedents have in adherence behaviours (see Duda et al., 1989) and not behavioural intentions.

**Adherence**

As outlined earlier, significant correlations existed between the home-based adherence behaviours of rest and ankle strapping and the antecedents to adherence. Also, normative beliefs were shown to be the sole significant predictor of adherence to strapping the ankle at home. While other rehabilitation research does not appear to have investigated the effect of normative beliefs on adherence, social support, a comparable concept, has been found to play a somewhat similar role in adherence, but it has been with clinic-based adherence and not home-based (Brewer, Van Raalte, Cornelius et al., 2000; Duda et al., 1989). Despite there being significant relationships between adherence to home exercises
and intentions to attend the clinic appointments and adhere to the home exercise programme, in the present study, the intentions failed to have a significant role in the prediction of adherence. This finding may be a reflection of earlier psychological research that suggests positive attitudes towards a behaviour does not mean necessarily that the behaviour will be implemented (Gleitman et al., 1999).

In regard to the adherence-functional outcome correlations, not only were there two significant relationships found between adherence and post-physiotherapy ankle function, but also the regression analyses revealed that two adherence variables were significant predictors of LLTQ functional activity. The first significant correlation, the positive one between adherence to home elevation and LLTQ functional activity scale is difficult to interpret as it suggests that high adherence to this treatment component is related to poorer outcomes. It could also be indicative of people who were more adherent to ice application, had more severe ankle sprains, and it is known that these injuries have less than optimal treatment outcomes (Accident Compensation Corporation, 2000).

The second significant relationship was between the percentage of attendance and the post-physiotherapy LLTQ functional activity scale and it does support the hypothesis that high levels of adherence are associated with optimal treatment outcomes. It is given further credence by the finding that attending all scheduled clinic appointments leads to better functional activity scores on the LLTQ as opposed to not attending all the appointments. While keeping clinic appointments is not indicative of adherence behaviours during the clinic treatment session, attending all appointments does enable continuity in the progression of the patients’ clinic- and home-based physiotherapy, with the ultimate expectation of a better recovery. Safran, Benedetti, Bartolozzi and Mandelbaum (1999) considered the successful rehabilitation for ankle sprains is dependent upon the patients being in regular communication with their physiotherapists about their progress and that the programme should be designed specifically to meet their physical abilities. Clinic attendance has also been found to be important indicator of the rehabilitation outcomes of hand injuries (Groth et al., 1994; Lyngcoln et al., 2005) and anterior cruciate ligament repair (Brewer et al., 2004; Brewer, Van Raalte, Cornelius et al., 2000).
Strengths and limitations of the study

The strengths of this study lay in the measurement of adherence and ankle function, and focus on one injury. First, the multidimensional approach to the measurement of adherence behaviours, along with the use of established valid measures ensured the behaviours necessary to undertake the physiotherapy programme were included in the assessment. Second, the use of two outcome measures, one objective (Motor Activity Scale) and the other a self-report questionnaire (LLTQ), enabled a broad functional perspective of the outcomes to be taken. Third, by confining this study to only one injury, the behavioural demands of the rehabilitation programme and the outcome measures were uniform for all participants.

There were seven limitations in this study that merit highlighting. First, if there had been a second set of PMT present information focusing on the later stages of recovery from the sprain and the physiotherapy the PMT present group’s heightened beliefs may have been maintained over the duration of the physiotherapy. Second, the high undifferentiated intention scores may have been due to (1) a ceiling effect occurring with the questionnaire and (2) the use of goal intentions instead of implementation intentions. Third, in hindsight the measurement of adherence should have included a measure of over-adherence, and some indication of past adherence behaviours. Fourth, the high clinic- and home-based adherence scores suggest the possibility of response bias. Fifth, the past experiences of the participants and their apparent predisposition to adhere may have been responsible for the inability of the intervention to manipulate self-efficacy and strengthen adherence behaviours. Sixth, a larger sample size may have strengthened the power and effect sizes of some of the group comparisons. Seventh, as only patients with ankle sprains were included in the study, it may be difficult to generalize these findings to other disorders and rehabilitation programmes.

Summary

In summary, the use of the protection motivation theory as an intervention framework does have the ability to alter patients’ beliefs about their injury and their physiotherapy. The inability of the intervention to manipulate self-efficacy, intentions and adherence behaviours appears to be due to the participants’ previous experiences of injury
and physiotherapy and their predisposition to be adherent to the treatment. The findings have added clarity to the relationships between the antecedents to adherence, the PMT-based beliefs, intentions to adhere, adherence behaviours and functional outcomes. In terms of the relations between PMT beliefs and intentions and adherence, the findings are in line with the PMT (Rogers, 1983) in that the beliefs and intentions had significantly stronger relationship as opposed to those between the beliefs and behaviours. Lastly, the positive association between adherence and functional outcomes lends support to the notion that the more adherent patients are the better their treatment outcomes.
CHAPTER EIGHT
HOME-BASED PHYSIOTHERAPY WITH ADHERENCE ENHANCING STRATEGIES VERSUS CLINIC-BASED MANAGEMENT
STUDY 3

Introduction

The importance of patients attending all the scheduled physiotherapy clinic appointments was underscored by the finding in Study Two, which showed that participants who did not attend all clinic appointments had significantly poorer scores on the LLTQ functional activity scale. Previous research has reported attendance at the scheduled clinic appointments to be less than desirable. A survey of outpatient physiotherapy clinics in Great Britain showed that between 5.8% and 10.68% of patients failed to attend their first appointments, and between 7.17% and 14.3% did not return for follow-up appointments (see Vasey, 1990). More recently a Canadian study of patient non-attendance at a physiotherapy outpatient clinic revealed that approximately 6% of patients were unable to attend their scheduled appointments (El-Tantawy et al., 2000). While these non-attendance figures are low, the reasons given for not attending physiotherapy are similar to those given for missing appointments for other forms of health care (Meichenbaum & Turk, 1987; Oldridge et al., 1983; Symons et al., 2001). The most common reasons are problems with getting time off work or study, finding suitable short-term child care, treatment expenses, transport to the treatment, and having to wait too long to be seen at the time of the clinic appointment.

In an attempt to overcome some of the problems blamed for poor clinic attendance, the use of home-based programmes as an alternative method of treatment has been investigated. Most studies have focused on programmes for chronic disorders such as back pain (Cherkin et al., 2001), polymyositis and dermatomyositis (Alexanderson et al., 1999), osteoarthritis of the knees (Callaghan, Oldham, & Hunt, 1995), rheumatoid arthritis (Stenstrom, 1994), and following myocardial infarction (Grace et al., 2005) and cardiac surgery (Arthur, Smith, Kodis, & McKelvie, 2002; Grace et al., 2005). Improvements were shown in the patient outcome measurements over the course of the home-based treatment programmes and at follow-up.
In three studies that compared the home programme with its clinic-based equivalent, no significant differences were found between them on the primary outcome measurements (Arthur et al., 2002; Callaghan et al., 1995; Cherkin et al., 2001). Social factors, such as employment responsibilities, perceived time constraints due to family and work commitments and the time taken to travel to the clinic were reasons patients gave for preferring home-based cardiac rehabilitation programmes (Grace et al., 2005). In contrast, Torstensen et al. (1998) found that if chronic back pain patients assigned to home-based programmes are left too much to their own devices and do not have any formal supervision they are inclined to drop out of such treatment programmes.

No significant differences have been found in comparisons of the effectiveness of clinic-based and home-based rehabilitation of acute disorders (Bowman et al. as cited in Anonymous, 2001; De Carlo & Sell, 1997; Goodwin et al., 2003; Roddey et al., 2002; Symons et al., 2001). Three studies evaluated the effectiveness of management following arthroscopic orthopaedic surgery (De Carlo & Sell, 1997; Goodwin et al., 2003; Roddey et al., 2002), and two others compared home- and clinic-based treatment of acute injuries (Bowman et al. as cited in Anonymous, 2001; Symons et al., 2001). While concern has been expressed over the safety of home-based treatment for acute injuries and the need for vigilant monitoring of patients during the early rehabilitation (see Symons et al., 2001), the findings of Bowman et al. (as cited in Anonymous, 2001) and Symons et al. (2001) dispute this.

A study conducted by Bowman et al. (as cited in Anonymous, 2001) that is particularly relevant to the current project compared home and clinic based treatment for sprained ankles. Participants in the home group were given an information booklet and equipment (ice pack, balance boards, elastic bandage, and exercise bands) by their physician. They were then left to their own devices to implement the treatment, and only seen at the clinic at three and six weeks following the injury for post-experimental testing. The clinic group was referred to physiotherapy, where they were given treatments that differed from that of the home group. It is difficult to make an informed judgment about the integrity of this study as it has only been reported anonymously by people, who were not the researchers, in a written discussion about the rehabilitation of ankle sprains. In that discussion it was criticised for (1) the lack of congruency in the content of the home and
physiotherapy programmes, (2) the diverse range of treatments given to the physiotherapy group and (3) the disparity in the number of clinic visits (1 to 18) required by the different physiotherapy programmes (Anonymous, 2001). A further weakness is the measures used to evaluate the effectiveness of the programmes, with only physical outcomes being tested and no inclusion of psychological/patient satisfaction measures. Hence it is not known whether factors other than the treatment may have mediated its effectiveness. For example, the patients’ involvement in the home programme may have given them a greater sense of ownership of their treatment than their physiotherapy counterparts. Given these concerns, it would be premature at this time to conclude that home-based programmes are effective for treating an acute injury such as an ankle sprain.

Home-based treatment is seen as a cost-effective way of administering physiotherapy because less clinic visits are necessary (Callaghan et al., 1995; De Carlo & Sell, 1997), but De Carlo and Sell (1997) stress that this method of treatment may not suit every patient. As previously mentioned one problem that has been encountered with the use of physiotherapy home programmes is less than desirable levels of adherence (Sluijs et al., 1998), but with the use of suitable cognitive-behavioural and patient education techniques as adjuncts to treatment, the effectiveness of home-programmes can be increased, particularly for chronic disorders. Cognitive-behavioural techniques found to be valuable are goal setting (Bassett & Petrie, 1999; Duncan & Pozehl, 2002; Moore, Von Korff, Cherkin, Saunders, & Lorig, 2000; Stenstrom, 1994); reinterpretation of pain (Stenstrom, 1994); individualised action plans (Moore et al., 2000); and cue cards (Sweeney et al., 2002). The educational methods shown to have merit are booklets, videos and verbal advice that provide information about the disorder, treatment and the benefits and barriers to exercise (Callaghan et al., 1995; Moore et al., 2000; Neuberger, Smith, Black, & Hassanein, 1993; Sweeney et al., 2002). A combination of written and verbal information improves adherence and knowledge (Ley, 1988; Raynor, 1998), but this combination is only effective if the content in both sources concurs (Little et al., 2001). Information presented in a meaningful manner using simple everyday language and tailored to the needs of the patient improves patient understanding and satisfaction with the content (Ley, 1988; Raynor, 1998) and also treatment adherence (Raynor, 1998). Well-informed patients tend to have a collaborative relationship with their health care provider, which leads to them
becoming more involved in their treatment and its planning and having a greater sense of ownership over it (Meichenbaum & Turk, 1987).

In conclusion home-based physiotherapy programmes are a viable option for chronic disorders, and to a lesser extent acute disorders. Thus far concerns over their safety for acute disorders appear unfounded. If patients are given the appropriate educational information and cognitive-behavioural skills the evidence suggests that the problem of poor adherence to home-based programmes can be overcome. The limited evidence thus far points to there being no detrimental effects of home-based treatments on the patients’ recovery and consequently their treatment outcomes. As yet there appears to be no investigations into the effectiveness of home-based physiotherapy programmes steeped in adherence enhancing strategies for patients with acute injuries.

**Purposes and Hypotheses**

The primary aim of this study was to compare the effectiveness of a home-based physiotherapy programme steeped in adherence enhancing strategies with its traditional clinic-based equivalent for patients with sprained ankles. This comparison involved the evaluation of the relevant determinants of adherence, functional ankle outcomes, and patient clinic- and home-based adherence behaviours. More specifically it was hypothesised that:

1. The traditional clinic-based and the home-based groups would not differ on levels of treatment adherence.

2. In comparison to the traditional clinic-based group, the home-based group would not be disadvantaged in terms of their post-physiotherapy functional outcomes.

3. The home-based group would have a higher sense of investment in their treatment programme as shown by their higher levels of identified regulation, external regulation, internal recovery locus of control, and social support, and their lower levels of amotivation, external locus of control and anxiety as opposed to the clinic group.

4. Significant relations would be found between the adherence behaviours, functional outcomes and psychological variables.
Methods

Participants

Forty-seven people, who had sustained an ankle sprain (first time or recurrent) and about to begin a course of physiotherapy were recruited for the study by their physiotherapists. As part of the legal informed consent process, participants were required to be 16 years or older, and those younger, who expressed an interest in taking part obtained signed parental consent before being enrolled. The sole exclusion criterion was a poor command of the English language that could impede understanding of the intervention information and the questionnaires.

The sample consisted of 19 females and 28 males, whose ages ranged from 13 to 62 years (mean = 30.02, ±12.43). Twenty-four participants sustained a moderate sprain, 18 a mild sprain and five a severe sprain, of these 21 were ‘first time sprainers’ and 26 were recurrent injuries. The number of physiotherapy clinic appointments attended ranged from one to 22 appointments (mean = 6.19, ±3.84), with the recommended number of treatments being from two to 22 (mean = 6.68, ±3.73). Three participants were lost from the study, and of the 44 participants who completed the study 37 made an uneventful recovery, eight had an incomplete recovery with two of these people being referred onto a medical specialist for other treatment. There were 11 participants, who did not attend their final physiotherapy appointments, and eight were able to be contacted by the researcher and they subsequently completed post-physiotherapy measures. These participants gave a number of reasons for not finishing their physiotherapy, the common ones being got sick and meant to make a follow-up appointment when they felt well; planned to return but could not find the time; and their ankle felt better, but forgot to cancel the appointment. Five participants had a clinical disorder that hindered their recovery, such as the long-term effects of previous injuries and one participant had recently suffered a deep vein thrombosis. A more detailed description of the characteristics of the sample is presented in the results sub-section titled group equivalency on demographic, accessibility of the physiotherapy clinic and ankle sprain characteristics.
Study design

This study is a two group, controlled, randomised, repeated measures, experimental design in which participants were followed through their physiotherapy programme. Participants were randomly allocated to either the clinic- or home-based physiotherapy groups. An intention to treat analysis was used, whereby the participants are kept in the group to which they are originally assigned, irrespective of whether they completed their course of physiotherapy (Hollis & Campbell, 1999). For a schematic representation of the study refer to Figure 3.

Measures

Demographic characteristics

Like the previous two studies, the participants’ age, gender, cultural affiliation, occupation, level of sport involvement and physical activity (competitive, recreational or no regular activity), and previous history of injury and physiotherapy treatment were recorded. Accessibility of the physiotherapy and the reasons for choosing the clinic were measured in the same manner as the second study in this thesis (Appendix 10).

The same methods of assessing the characteristics of the ankle sprain in the second study were used here. The characteristics assessed were the date and how it happened, whether it occurred during sport or other physical activity (Appendix 10), its severity as measured by the O’Donoghue (1976) grading system (Appendix 7), and pain at the time of the injury (box plot in Appendix 12).
Figure 3. Study design of traditional clinic versus home-based management of ankle sprains
Psychological variables

Motivation to start the physiotherapy rehabilitation. The Situational Motivational Scale (SIMS: Guay et al., 2000) was used to assess the participants’ motivation towards undertaking the physiotherapy (see Appendix 11). The origins and structure of this scale and the reliability of the sub-scales have been explained in the second study. In the present study the Cronbach alphas of the four subscales of the SIMS administered before the physiotherapy commenced were intrinsic motivation = .85, identified regulation = .55, external regulation = .73 and amotivation = .83. By deleting item 10 from the identified regulation sub-scale the alpha improved to .85, and the three item version of the subscale was used in the analyses. At the end of the physiotherapy the SIMS sub-scales’ Cronbach alphas were intrinsic motivation = .91, identified regulation = .43, external regulation = .82 and amotivation = .74. Once again with the deletion of item 10 from the identified regulation sub-scale the reliability increased to .77, and the three item sub-scale was used in the subsequent analyses.

Pain. Two aspects of pain measured were (1) how the participants coped with pain, discomfort and fatigue in their normal daily lives and (2) the amount of pain they experienced at the time of their injury (Appendix 12). The two items that measured the participants ability to cope with pain, discomfort and fatigue in their normal daily lives were derived from the perseverance/persistence scale of the Self-Motivation Inventory (SMI: Dishman & Ickles, 1981). The reasons for selecting these items, the reliability of the perseverance scale of the SMI have been outlined previously in the second study of this thesis In the present study the Cronbach’s alpha of the two-item coping with pain and discomfort scale was .87.

The current level of pain caused by their ankle sprain was measured on an 11 point box plot in preference to a visual analog scale (VAS). The underpinning rationale for using a box plot in preference to a visual analog has been outlined previously in the second study of this thesis.

Social support. The social support scale used in this study consisted of seven items (see Appendix 22). The first three items were those used in the second study to measure normative beliefs derived from the subjective norm component of the Theory of
Planned Behaviour (Ajzen, 1991). Items 4 to 7 inclusive came from the Social Support for Exercise Behaviors scale (Sallis, Grossman, Pinski, Patterson, & Nader, 1987; M. Stevens, Bakker-van Dijk, de Greef, Lemmink, & Rispens, 2000) and were chosen for two reasons. Firstly, they measured the type and quality of support given to the participants, factors known to influence adherence to home-based treatments (Clopton & McMahon, 1992; Terpstra et al., 1992). Secondly, they related to the planning and undertaking of therapeutic exercise. The scale was modified in that no distinction was made between family and friends, instead they were grouped together and referred to as ‘people who are important me’, which fits better with people’s social networks in contemporary New Zealand. Five of the items were positively worded and two negatively worded, and these latter items’ scores were reversed, and they were summed to give a total social support score. The reliability for this scale was .69 pre-physiotherapy and .65 post-physiotherapy, but with the deletion of item 7 the Cronbach alphas improved to .80 at both time points. Deletion of this item also made conceptual sense as it is not usual for adults to give rewards to people they know for doing their physiotherapy, and for this reason it caused some mirth amongst the participants. Hence in all subsequent analyses the six item scale was used.

**Recovery locus of control.** Perceptions of control over recovery was assessed by the Recovery Locus of Control Scale (RLOC; Partridge & Johnston, 1989), which consists of nine items scored on a five-point Likert scale from 1 = strongly disagree to 5 = strongly agree (see Appendix 23). Five items (1 to 5) measure internal RLOC or the extent to which the individual perceives he/she has control over their own recovery and four items (6 to 9) measure external RLOC or the extent to which patients believe that they do not have control over their recovery (Partridge & Johnston, 1989). Partridge and Johnston (1989) reported that the items in each sub-scale were significantly correlated with each other and the mean for their respective sub-scale and that there was a strong negative correlation between the two subscales (-.79).

Grunfeld, Jahanshahi, Gresty and Bronstein (2003) tested the value of the RLOC with a group of people who had vertigo, finding it to be a significant predictor of change in self-reported symptom severity ($\beta = -.35, p < .05$), and that it had a small to moderate significant correlation ($r = .47, p < .01$) with the internal locus of control sub-scale of the
Multidimensional Health Locus of Control Scale (Wallston et al., 1978). Grunfeld et al. (2003) did not outline how they operationalised the RLOC, but it appears from their paper that they must have reversed the scoring of the external locus of control items as they explained a high score on the RLOC was indicative of strong internal control and a low score indicated a high level external locus of control.

In the present study the Cronbach alphas for the RLOC sub-scales before the physiotherapy commenced were internal .81 and external .77 and at the end of the course of physiotherapy internal .75, and external .60. Deletion of item 6 from the external subscale the post-physiotherapy Cronbach alpha improved to .88. For the subsequent analyses it was decided to remove this item from both the pre- and post-physiotherapy versions of the subscale as its removal was not appreciably detrimental to the pre-physiotherapy version, with the Cronbach alpha being reduced by only .01 to .76.

Anxiety about the injury and treatment. The State Trait Anxiety Inventory (STAI: Spielberger, Gorsuch, & Lushene, 1970) consists of 20 items rated on a four-point scale (1 = almost never, 2 = sometimes, 3 = often, 4 = almost always), and has high internal consistency for the state scores of .83 to .92, and the trait scores of .86 to .92 (Spielberger, 1983). In the present study the aim of using the STAI was to measure the level of anxiety experienced as a result of their ankle sprain and physiotherapy. Hence the scores of the positively worded items were reversed, with a high score on the scale being an indication of participants experiencing high levels of anxiety with regard to their sprain and physiotherapy. The Cronbach alphas for STAI administered at the beginning of the physiotherapy were .87, and at the end of the physiotherapy .80 (see Appendix 24).

Adherence

Treatment adherence was measured throughout the course of physiotherapy in three ways, namely clinic attendance and adherence to the clinic- and home-based. The adherence measures employed in this study and the manner in which they were used was the same as in the second study of this thesis. The origins of these measures, their method of evaluation and their reliability have been outlined in the measures section of the second study. Clinic attendance was measured in two ways, first by the percentage of attendance (see Appendix 6) and second by the participants’ completion rate. The SIRAS (Brewer et
al., 1995) was used to measure the participants’ adherence during each of their rehabilitation sessions, and was completed by the physiotherapist at the end of each treatment session (Appendix 16). The Cronbach alpha for this study was .72.

Participant self-reports of adherence to the components of the home-based rehabilitation were completed at the beginning of each treatment session for the time since the last clinic appointment (Appendix 17). The self-report questionnaire was based on that used by Taylor and May (1996), with its internal consistency being α = .78.

**Ankle function**

Ankle function was measured in two ways using the LLTQ (P. McNair et al., 2003: see Appendix 18) and the Motor Activity Scale (Wilson et al., 1998: see Appendix 19). Both of these measures have been outlined in Study 2. The internal consistency for the two subscales of the LLTQ was high, with the pre- and post-physiotherapy Cronbach alphas for the recreational activity sub-scale were .97 and .95 respectively and for the functional activity sub-scale .97 and .90 respectively. The Cronbach alphas for the Motor Activity Scale (Wilson et al., 1998) were pre-physiotherapy .85 and post-physiotherapy .73.

**Home-based adherence materials**

The home-based adherence enhancing materials consisted of physiotherapy treatment equipment, a booklet, and cognitive-behavioural techniques. At the beginning of their treatment programme, participants were given strapping tape, tubigrip and ice packs, and loaned theraband and wobble boards to enable them to undertake their treatment at home without any disadvantage.

The written and pictorial information in the booklet was presented in simple everyday language, categorised, specific to ankle sprains and their treatment, which is considered to facilitate patients’ understanding of their injury and treatment (Ley, 1988; Raynor, 1998). Participants and physiotherapists also had to add information into specified spaces in the booklet, thus modifying the information to be specific to the individual participants’ needs. To group the information in the booklet, it was divided into four distinct sections, which were the introduction and a plan for each of the three treatment phases, namely acute, mobilising and strengthening (see Appendix 25). The introduction
familiarised the participants with the layout of the booklet and its use, along with the provision of basic information about the anatomy of the ankle; ankle sprains, the stages of recovery and their grading; physiotherapy management and the patients’ expected role in it; and the cognitive-behavioural adherence enhancing strategies.

The physiotherapy treatment activities for each phase of treatment were based on the treatment guidelines for sprained ankles (Accident Compensation Corporation, 2000). Each treatment phase section was presented in a uniform manner, with a brief outline of the purpose of the phase, a treatment goal, the suggested physiotherapy activities and their method of progression, and a progress sheet and diary grid.

Cognitive-behavioural techniques used to assist adherence were cues, treatment goals and diary sheets. Each of these was discussed with the participants at the beginning of treatment programme and they were advised to select those that would be the most effective reminders for them. Cues were the primary cognitive-behavioural techniques as these have been reported to be valuable in short-term adherence to physiotherapy (Sluijs & Knibbe, 1991), and during the adoption phase of exercises (Sallis, Hovell, & Hofstetter, 1992). Some of the cues employed were verbal, phone or text messages from friends, family and the researcher, and leaving the booklet and equipment in noticeable places. Participants were provided with laminated cue cards plus a set of magnetic strips. The messages on the cue cards reminded the participants to do their physiotherapy and stated its benefits (Appendix 26). Participants were advised to place the cards around their home and work places where they were noticeable, which has previously been found to be useful in home-based treatment programmes (Sweeney et al., 2002).

Diary sheets were used as adherence enhancing strategies and not as measures of adherence, because they have been criticised for enhancing adherence by acting as a cue to exercise, thereby not being an accurate estimation (Brewer, 1999; Meichenbaum & Turk, 1987; Rand & Wise, 1994). Another reason for not using the diaries as an adherence measure in this study was that the clinic-based participants did not use them and hence it was not possible to make a comparison between the groups. Treatment goals were used to give a sense of purpose to each phase. There was one global goal for each treatment/recovery phase, which had standardised wording listing the activities that needed
to be achieved in the phase, but the predicted time frame for achievement was left open for the physiotherapists and participants to decide on. In this way the goals were linked to the grading of the sprain and its anticipated rate of recovery, and therefore were consistent with the qualities of treatment goals in that they were challenging, achievable, specific, meaningful, measurable and predicted a time for evaluation (Cott & Finch, 1991; Meichenbaum & Turk, 1987).

**Procedure**

Ethical approval for the study was obtained from the Auckland Ethics Committee (approval number AKX/03/10/278). Four private physiotherapy clinics from a low to middle socio-economic multicultural suburban region agreed to take part and provide access to potential participants. Clinic staff was provided with information about the study that they could give to prospective participants. The best method for the clinic to facilitate contact between the researcher and the new participants was also established. Physiotherapists who were to treat the patients were given information about the O’Donoghue (1976) system of grading the ankle sprains, as well as information and training in the use of the SIRAS and participant self-report of their adherence to the home-based physiotherapy. Before data collection started a computer generated randomisation list was created for each of the clinics.

When patients who had sustained an ankle sprain and fitted the inclusion criteria made their first physiotherapy treatment appointment, a clinic staff member gave them a brief outline of the study. Then those patients who expressed interest in the study were contacted by the researcher, and a meeting was arranged prior to the commencement of their physiotherapy rehabilitation. At this meeting the researcher provided the participants with more detailed information about the study and their expected role (Appendix 27) and obtained informed consent (Appendix 28). Participants were randomly assigned to either the clinic- or home-based physiotherapy group. Then they completed pre-physiotherapy assessments which were the questionnaires about their personal demographic, clinic and ankle sprain characteristics, the psychological variables (pain, social support, motivation for physiotherapy, RLOC and anxiety), and the LLTQ, and attempted the activities on the Motor Activity Scale.
Following the initial assessments, the participants’ physiotherapy programmes were commenced, which were planned and implemented in accordance with the ACC Treatment Profile Guidelines (ACC, 2000), tailored to suit the individual needs, and progressed as warranted. The prime difference between the clinic- and home-based programmes was the number of scheduled clinic appointments. Participants allocated to the clinic-based group had regular clinic appointments for their physiotherapy that were scheduled as required, with a greater number of treatments for the more severe sprains. In addition their clinic-based physiotherapy was supplemented with a standard home programme of exercises and activities.

Participants in the home-based group were scheduled four physiotherapy clinic appointments. At their first appointment the home-based participants were assessed, the physiotherapy programme was planned, their role in the physiotherapy and the use of the adherence enhancing strategies were discussed, and instruction on filling out their diary, exercise and progress sheets was given. At this time they were supplied with the necessary equipment, such as balance boards, ice packs, theraband and tape. In addition they were advised to contact their physiotherapist if they had any concerns about their injury or progress.

For the home-based participants, the first appointment also included the planning of the participants’ treatment programme as well as the implementation of the acute phase. The following three visits coincided with the transition from one treatment phase to the next. Hence their second appointment was at the end of the acute phase and initiation of the mobilising phase and the third at the transition from the mobilising to the strengthening phase of treatment. At each of these clinic treatments the physiotherapists and/or researcher assessed the participants’ progress and taught them about the next phase of treatment and the method of progression of the exercises and modalities. The fourth appointment was the last one for most of the participants and this involved the final assessment, and education about long-term self-management of their ankle.

Irrespective of their grouping throughout the course of physiotherapy the participants’ adherence to the clinic- and home-based physiotherapy was evaluated. At the beginning of each clinic-based treatment, participants rated their adherence to the
components of their home-based physiotherapy for the time since their last physiotherapy appointment using the self-report scale. Then at the end of each of these treatment sessions the physiotherapists evaluated the participants’ clinic behaviours using the SIRAS. A physiotherapist who was not involved in the recruitment and treatment of the participants undertook random unannounced inter-rater reliability checks of the use of the SIRAS with the participating physiotherapists.

At the end of the course of physiotherapy, the number of clinic appointments the participants attended was recorded along with the number recommended, and whether or not they attended their final scheduled appointments. Immediately following their final treatment, the participants completed the post-physiotherapy assessments, which were the psychological variables questionnaires, with the exception of the pain measures, the LLTQ, and the activities on the Motor Activity Scale. Participants who did not attend their last physiotherapy appointments were contacted by the researcher and a meeting was arranged for them to complete the post-physiotherapy assessment.

**Results**

**Group equivalency**

Chi-square and ANOVA were used to compare the two groups on their demographic characteristics, factors relating to the clinic they attended and their ankle sprain characteristics. The groups were equivalent on the demographic characteristics presented in Table 22. The numbers of participants in each group for this analysis is based on that at the beginning of the physiotherapy and not the number at the end. Data were missing for the age of a clinic-based participant, who did not complete the physiotherapy. The sample consisted of more males than females, about half the sample identified as European, and most were employed in skilled and unskilled occupations or were students.
Table 22.  
*Demographic Characteristics of the Three Intervention Groups*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Clinic-based group (n = 25)</th>
<th>Home-based group (n = 22)</th>
<th>Statistic</th>
<th>Significance (p value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>29.25 (±13.78)</td>
<td>30.86 (±11.04)</td>
<td>$F(1,44) = .19$</td>
<td>.665</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>14</td>
<td>14</td>
<td>$\chi^2 (1) = .28$</td>
<td>.595</td>
</tr>
<tr>
<td>Females</td>
<td>11</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>European</td>
<td>12</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maori</td>
<td>4</td>
<td>5</td>
<td>$\chi^2 (3) = 4.08$</td>
<td>.666</td>
</tr>
<tr>
<td>Pacific Island</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skilled</td>
<td>8</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unskilled</td>
<td>6</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student</td>
<td>6</td>
<td>5</td>
<td>$\chi^2 (5) = 5.34$</td>
<td>.375</td>
</tr>
<tr>
<td>Retired</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home maker</td>
<td>0</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than $25,000</td>
<td>11</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$25,000 to $50,000</td>
<td>9</td>
<td>9</td>
<td>$\chi^2 (2) = .12$</td>
<td>.942</td>
</tr>
<tr>
<td>Over $50,000</td>
<td>5</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level of sport participation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recreational</td>
<td>12</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Competitive</td>
<td>12</td>
<td>9</td>
<td>$\chi^2 (2) = .616$</td>
<td>.735</td>
</tr>
<tr>
<td>No regular physical activity</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of previous injuries</td>
<td>22</td>
<td>21</td>
<td>$\chi^2 (1) = 3.85$</td>
<td>.112</td>
</tr>
<tr>
<td>Previous physiotherapy</td>
<td>15</td>
<td>19</td>
<td>$\chi^2 (1) = 2.85$</td>
<td>.091</td>
</tr>
</tbody>
</table>

Factors related to the reasons for choosing the clinic, proximity of the physiotherapy clinic to places the participants usually go to such as home and work, the type of transport used to go to their treatment, are presented in Table 23. There were differences between the groups for the reasons they chose the physiotherapy clinic,
especially with its closeness to home, knowing the physiotherapists, and recommendation
from friends and family. Furthermore, for most participants the clinic was relatively close
to their home and workplace and on their usual route to and from other places.

Table 23.
Reasons for Choosing and Convenience of the Clinic, Mode of Transport to Treatment for
the Three Intervention Groups

<table>
<thead>
<tr>
<th>Variable</th>
<th>Clinic-based group (n = 25)</th>
<th>Home-based group (n = 22)</th>
<th>Statistic</th>
<th>Significance (p value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reasons for Choosing Clinic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Been before</td>
<td>5</td>
<td>4</td>
<td>$\chi^2 (6) = 13.52$</td>
<td>.036</td>
</tr>
<tr>
<td>Recommended by other health provider</td>
<td>5</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommended by family or friend</td>
<td>7</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Convenient</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment fees</td>
<td>0</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knew physiotherapist</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Close to home</td>
<td>6</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinic is on usual route to other places</td>
<td>16</td>
<td>14</td>
<td>$\chi^2 (1) = .001$</td>
<td>.979</td>
</tr>
<tr>
<td>Type of transport used to go to clinic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walk</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car</td>
<td>22</td>
<td>21</td>
<td>$\chi^2 (1) = .15$</td>
<td>.696</td>
</tr>
<tr>
<td>Distance from home to clinic</td>
<td>4.32 (±0.04)</td>
<td>5.35 (±0.60)</td>
<td>$F(1,45) = .37$</td>
<td>.548</td>
</tr>
<tr>
<td>Distance from work to clinic</td>
<td>7.86 (±8.57)</td>
<td>8.53 (±9.50)</td>
<td>$F(1,45) = .07$</td>
<td>.800</td>
</tr>
</tbody>
</table>

The characteristics for the ankle sprains are presented in Table 24, and as can be seen most of the sprains occurred during some form of sporting activity. Despite the mean scores for the pain experienced at the time of the sprain being moderate, it took on average over a week for the participants to initiate physiotherapy treatment. There was a trend towards significantly more participants with mild sprains in the home-based group and more with moderate sprains in the clinic-based group.
Table 24. 
*Characteristics of the Ankle Sprains for the Groups at the Beginning of the Physiotherapy Rehabilitation*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Clinic-based group (n = 25)</th>
<th>Home-based group (n = 22)</th>
<th>Statistic</th>
<th>Significance (p value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Days between injury and starting physiotherapy</td>
<td>9.12 (±6.39)</td>
<td>13.59 (±16.04)</td>
<td>$F(1,45) = 1.65$</td>
<td>.206</td>
</tr>
<tr>
<td>Ankle pain at time of sprain</td>
<td>6.96 (±2.49)</td>
<td>5.95 (±2.08)</td>
<td>$F(1,45) = 2.22$</td>
<td>.143</td>
</tr>
<tr>
<td>Cause of sprain</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>During sport</td>
<td>18</td>
<td>16</td>
<td>$\chi^2 (1) = .001$</td>
<td>1.00</td>
</tr>
<tr>
<td>Other activity</td>
<td>7</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade of sprain</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>6</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>16</td>
<td>8</td>
<td>$\chi^2 (2) = 4.77$</td>
<td>.092</td>
</tr>
<tr>
<td>Severe</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recurrent sprain</td>
<td>11</td>
<td>15</td>
<td>$\chi^2 (1) = 1.88$</td>
<td>.171</td>
</tr>
</tbody>
</table>

**Adherence behaviour differences**

The descriptive data for the groups' clinic attendance, percentage of attendance and clinic- and home-based adherence are presented in Table 25. The mean adherence scores were uniformly high for both clinic and home-based components of the physiotherapy.
Table 25. 
*Descriptive Data for the Groups' Clinic Appointments, Percentage of Attendance, Completion Rate and Clinic-and Home-Based Adherence Behaviours*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Clinic-based group (n = 25)</th>
<th>Home-based group (n =22)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Appointments attended</td>
<td>7.64</td>
<td>4.54</td>
</tr>
<tr>
<td>Appointments recommended</td>
<td>8.44</td>
<td>4.12</td>
</tr>
<tr>
<td>Percentage of Attendance</td>
<td>87.28</td>
<td>17.76</td>
</tr>
<tr>
<td>Number who completed physiotherapy</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Clinic-based (SIRAS)</td>
<td>4.66</td>
<td>.47</td>
</tr>
<tr>
<td>Home Exercises</td>
<td>4.06</td>
<td>1.04</td>
</tr>
<tr>
<td>Home refraining from activity</td>
<td>4.40</td>
<td>.64</td>
</tr>
<tr>
<td>Home ice</td>
<td>3.49</td>
<td>1.08</td>
</tr>
<tr>
<td>Home ankle strapping</td>
<td>4.38</td>
<td>.80</td>
</tr>
<tr>
<td>Home elevation</td>
<td>3.82</td>
<td>.98</td>
</tr>
</tbody>
</table>

One-way analysis of variance (ANOVA) was used to compare the groups’ clinic attendance and adherence behaviours. The $p$ values were adjusted using Bonferroni corrected alphas, with an alpha of .006 being accepted as the level of significance. It can be seen in Table 26 there were significant differences between the two intervention groups for the number of clinic appointments attended and the number required, with the home-based group requiring and attending less clinic appointments than the clinic group. In addition, there was a trend towards significance for the percentage of attendance with the home group having a higher percentage of attendance. However no other significant differences occurred on the other clinic- and home-based adherence measures. Chi-square test
compared the groups’ rate of completion of their physiotherapy revealing that there was a significant difference between the groups ($\chi^2 (1) = 8.21, p < .004$), with more participants in the home-based group completing their physiotherapy programme as opposed to the clinic group.

Table 26. One-Way Analysis of Variance for Clinic Attendance and Clinic- and Home-Based Adherence for the Two Intervention Groups

<table>
<thead>
<tr>
<th>Adherence measure</th>
<th>df</th>
<th>F</th>
<th>Significance (p level)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appointments attended</td>
<td>1,45</td>
<td>8.89</td>
<td>.005</td>
</tr>
<tr>
<td>Appointments required</td>
<td>1,45</td>
<td>15.66</td>
<td>.0001</td>
</tr>
<tr>
<td>Percentage of Attendance</td>
<td>1,45</td>
<td>4.97</td>
<td>.031</td>
</tr>
<tr>
<td>Clinic-based (SIRAS)</td>
<td>1,45</td>
<td>.24</td>
<td>.625</td>
</tr>
<tr>
<td>Home Exercises</td>
<td>1,45</td>
<td>1.22</td>
<td>.275</td>
</tr>
<tr>
<td>Home refraining from activity</td>
<td>1,39</td>
<td>1.36</td>
<td>.250</td>
</tr>
<tr>
<td>Home ice</td>
<td>1,27</td>
<td>.02</td>
<td>.878</td>
</tr>
<tr>
<td>Home ankle strapping</td>
<td>1,40</td>
<td>2.64</td>
<td>.112</td>
</tr>
<tr>
<td>Home elevation</td>
<td>1,36</td>
<td>1.06</td>
<td>.310</td>
</tr>
</tbody>
</table>

It was previously shown that the two intervention groups differed on some of the reasons they gave for choosing the physiotherapy clinic, with the most noticeable being recommendations by a friend or family, knowing the physiotherapist and the clinics’ closeness to their home. As reasons for choosing a treatment provider are considered to influence treatment adherence (Clopton & McMahon, 1992; Meichenbaum & Turk, 1987), it was decided to use these as covariates, but the preliminary checks showed the assumptions for covariance were violated.

A trend ($p = .092$) towards a significant difference in number of participants with Grade I and II ankle sprains in each of the intervention groups was reported earlier in Table 24, with more Grade I sprains in the home group and more Grade II sprains in the clinic group. On this basis it was decided to treat ankle sprains as a covariate. Preliminary checks showed that the assumptions for covariance were violated for the adherence behaviours of refraining from detrimental activities at home, elevation at home and percentage of
attendance, but not for clinic-based adherence (SIRAS scores), and adherence to home exercises, ice and strapping. The results of the ANCOVA showed no significant differences between the clinic- and home-based groups for adherence to the clinic physiotherapy \( (F(1,45) = .01, p = .930, \eta^2 = .00) \), home exercises \( (F(1,45) = .40, p = .531, \eta^2 = .01) \) and home ice \( (F(1,27) = .02, p = .902, \eta^2 = .001) \), but a trend towards significance for home strapping with the clinic-based group scoring higher \( (F(1,40) = 3.12, p = .063, \eta^2 = .09) \). The groups’ respective adjusted means and standard error for adherence to home strapping were for the clinic-based group 4.45±.21 and the home-based group 3.85±.22.

**Ankle function outcome differences**

The descriptive data for the groups’ functional outcome measurements taken before and after their course of physiotherapy are presented in Table 27. In general, LLTQ scores were higher during pre-physiotherapy than post-physiotherapy whereas Motor Activity Scale scores were higher post-physiotherapy compared to pre-physiotherapy.

### Table 27.
**Descriptive Data for the Groups’ Pre- and Post-Physiotherapy Functional Outcome Measurements.**

<table>
<thead>
<tr>
<th></th>
<th>Clinic-based group ( n = 25 )</th>
<th>Home-based group ( n = 22 )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>LLTQ recreational activity</td>
<td>27.92</td>
<td>11.36</td>
</tr>
<tr>
<td>LLTQ functional activity</td>
<td>13.72</td>
<td>11.29</td>
</tr>
<tr>
<td>Motor Activity Scale</td>
<td>1.20</td>
<td>2.00</td>
</tr>
<tr>
<td>Post physiotherapy</td>
<td>n = 22</td>
<td></td>
</tr>
<tr>
<td>LLTQ recreational activity</td>
<td>12.00</td>
<td>10.10</td>
</tr>
<tr>
<td>LLTQ functional activity</td>
<td>2.32</td>
<td>3.60</td>
</tr>
<tr>
<td>Motor Activity Scale</td>
<td>5.14</td>
<td>1.28</td>
</tr>
</tbody>
</table>

Note: high scores on the LLTQ and low scores on Motor Activity Scale indicate difficulty performing the activities.
Between subject repeated measure ANOVAs were used to investigate the time effect and time x group effect for ankle function outcome scores over the duration of the course of physiotherapy. A significant time effect ($F(1,42) = 39.02, p < .0001, \eta^2 = .48$), as well as a time x group effect ($F(1,42) = 5.31, p < .026, \eta^2 = .11$) was shown for the LLTQ functional activity subscale (see Figure 4). Post-hoc $t$-tests show that both groups improved over the course of the physiotherapy [(clinic-based group ($t(21) = 5.13, p < .0001$) and the home-based group ($t(21) = 3.56, p < .002$)]. Results also show that the groups differed at pre-physiotherapy ($t(45) = 2.34, p < .024$), but not at post-physiotherapy ($t(42) = .46, p = .647$). Given the notable differences found at T1 (baseline) between the treatment conditions, a one-way ANCOVA was conducted to establish whether the groups differed by the end of the physiotherapy (T2) on LLTQ functional activity after controlling for T1 scores. Preliminary checks indicated that the LLTQ functional activity subscale did not violate any of the assumptions (reliability, normality, linearity, homogeneity of variances, and homogeneity of regression slopes) necessary for covariance. Results showed no significant differences between the two groups on the LLTQ functional activity scale by the end of the course of physiotherapy ($F(1,41) = .05, p = .826, \eta^2 = .001$). The post-physiotherapy adjusted means for the LLTQ functional activity subscale for the clinic-based group was 1.95 (SE = .77) and the home-based group 2.19 (SE = .77) respectively.

![Figure 4. The group x time interaction effect for the LLTQ functional activity subscale](image-url)
A significant time effect \( F(1,42) = 58.59, p < .0001, \eta^2 = .58 \), but not time x group effect \( F(1,42) = 1.32, p = .257, \eta^2 = .03 \) were shown for LLTQ recreational activity scale. Similarly a significant time effect \( F(1,42) = 178.22, p < .0001, \eta^2 = .81 \), but not time x group effect \( F(1,42) = .02, p = .880, \eta^2 = .001 \) was shown for the Motor Activity Scale\(^1\).

**Differences in the psychological variables**

The descriptive data for the groups’ pre- and post-physiotherapy scores for intrinsic motivation, identified regulation, extrinsic regulation, amotivation, social support, ability to tolerate pain, internal and external RLOC, and anxiety as measured by the STAI are presented in Table 28. Overall, scores were higher on intrinsic motivation, and identified and external regulation in contrast to amotivation. Similarly the internal RLOC scores were high in comparison to the external RLOC scores. The mean scores for social support were moderately high at both measurement times, and the anxiety scores were moderate at both times. Pain tolerance was only measured pre-physiotherapy and was high.

\(^1\) When the sample was divided into two groups based on the upper and lower quarter of the distribution of their adherence scores, no significant differences were found between adherence groups on post-physiotherapy functional outcomes. Therefore, this line of inquiry was not pursued further.
<table>
<thead>
<tr>
<th>Psychological variable</th>
<th>Pre-physiotherapy scores</th>
<th>Post-physiotherapy scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Clinic-based group (n = 25)</td>
<td>Home-based group (n = 22)</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Intrinsic motivation</td>
<td>12.75</td>
<td>6.67</td>
</tr>
<tr>
<td>Identified regulation</td>
<td>19.24</td>
<td>2.20</td>
</tr>
<tr>
<td>External regulation</td>
<td>15.64</td>
<td>6.43</td>
</tr>
<tr>
<td>Amotivation</td>
<td>7.56</td>
<td>5.36</td>
</tr>
<tr>
<td>Social support</td>
<td>33.68</td>
<td>5.20</td>
</tr>
<tr>
<td>Internal RLOC</td>
<td>21.68</td>
<td>3.71</td>
</tr>
<tr>
<td>External RLOC</td>
<td>4.60</td>
<td>1.94</td>
</tr>
<tr>
<td>Anxiety</td>
<td>35.44</td>
<td>8.22</td>
</tr>
<tr>
<td>Pain tolerance</td>
<td>8.44</td>
<td>1.42</td>
</tr>
</tbody>
</table>
Between subject repeated measure one-way ANOVAs were used to investigate the
time effect and time x group effect for the psychological variables over the duration of the
course of physiotherapy. No significant effects were found for time and for time x group respectively for intrinsic motivation \((F(1,41) = 1.77, p = .190, \eta^2 = .04; F(1,41) = .53, p = .471, \eta^2 = .01)\), identified regulation \((F(1,42) = .45, p = .505, \eta^2 = .01; F(1,42) = .16, p = .689, \eta^2 = .00)\), external regulation \((F(1,42) = 2.48, p = .123, \eta^2 = .06; F(1,42) = 1.17, p = .285, \eta^2 = .03)\), amotivation \((F(1,42) = 2.22, p = .144, \eta^2 = .05; F(1,42) = .07, p = .794, \eta^2 = .00)\), internal RLOC \((F(1,42) = 0.00, p = 1.00, \eta^2 = .00; F(1,42) = 1.85, p = .181, \eta^2 = .04)\), external RLOC \((F(1,42) = .03, p = .854, \eta^2 = .04; F(1,42) = .00, p = .951, \eta^2 = .00)\) and anxiety \((F(1,42) = 1.97, p = .168, \eta^2 = .05; F(1,42) = .53, p = .473, \eta^2 = .01)\).

However there was a significant time effect for social support \((F(1,42) = 4.73, p < .035, \eta^2 = .10)\), with home-based group scoring lower at T2 than T1, but there was no significant effect for time x group \((F(1,42) = .89, p = .351, \eta^2 = .02)\).

**Relations between adherence behaviours, functional outcomes and psychological variables**

Pearson correlations were used to investigate the relationships between the adherence behaviours, the pre- and post-physiotherapy functional outcome scores and the pre and post psychological variables. Insofar as the associations between the adherence behaviours and the pre- and post-physiotherapy ankle function measures are concerned, there were three significant relationships. These correlations were between all three pre-physiotherapy measures with the LLTQ subscales having positive relations and the Motor Activity Scale having a negative association with clinic-based adherence (see Table 29).
Table 29. 
Correlations of Adherence Scores and Pre- and Post Physiotherapy Ankle Function

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-physiotherapy</th>
<th>Post physiotherapy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LLTQ recreational</td>
<td>LLTQ functional</td>
</tr>
<tr>
<td></td>
<td>activity</td>
<td>activity</td>
</tr>
<tr>
<td>Percentage of attendance</td>
<td>.18</td>
<td>.17</td>
</tr>
<tr>
<td>Clinic-based (SIRAS)</td>
<td>.50**</td>
<td>.42**</td>
</tr>
<tr>
<td>Home-based components</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercises</td>
<td>.17</td>
<td>.18</td>
</tr>
<tr>
<td>Refraining from specified</td>
<td>.13</td>
<td>.10</td>
</tr>
<tr>
<td>activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strapping and bandaging</td>
<td>.25</td>
<td>.24</td>
</tr>
<tr>
<td>Elevation of ankle</td>
<td>.16</td>
<td>.16</td>
</tr>
<tr>
<td>Ice</td>
<td>-.02</td>
<td>.23</td>
</tr>
</tbody>
</table>

** p < .01. Correlations of those of transformed adherence scores.
With respect to relations between the adherence and the pre psychological variables, there were a number of significant correlations found (see Table 30). Specifically, significant correlations occurred between identified regulation and both strapping and ice. External RLOC was positively associated with refraining from activities. Finally, both amotivation and pain were both related to home-based exercises and elevation, respectively. In contrast the significant correlations that the adherence behaviours had with the post-physiotherapy psychological variables were between internal RLOC and adherence to elevation and ice at home, identified regulation and external regulation and adhering to refraining from detrimental activities at home. No significant correlations existed between any of the psychological variables and percentage of attendance and clinic-based adherence.

Significant positive relationships were found between two post-physiotherapy psychological variables and two pre-physiotherapy ankle function outcomes. As can be seen in Table 31 these occurred between post-physiotherapy intrinsic motivation and pre-physiotherapy Motor Activity Scale, and post-physiotherapy internal RLOC and pre-physiotherapy LLTQ functional activity sub-scale (T1).
Table 30.
Correlations between Clinic- and Home-based Adherence Scores and Psychological Variables measured at the Beginning and End of the Course of Physiotherapy

<table>
<thead>
<tr>
<th>Variable</th>
<th>Percentage of attendance (n = 47)</th>
<th>Clinic-based adherence (n = 47)</th>
<th>Exercises (n = 47)</th>
<th>Refraining from activity (n = 45)</th>
<th>Ice (n = 29)</th>
<th>Strapping (n = 42)</th>
<th>Elevation (n = 38)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrinsic motivation T1</td>
<td>.03</td>
<td>.03</td>
<td>.03</td>
<td>.06</td>
<td>-.16</td>
<td>-.03</td>
<td>.18</td>
</tr>
<tr>
<td>Identified regulation T1</td>
<td>-.07</td>
<td>.10</td>
<td>.08</td>
<td>.12</td>
<td>.47**</td>
<td>.45**</td>
<td>.13</td>
</tr>
<tr>
<td>External regulation T1</td>
<td>.02</td>
<td>.08</td>
<td>.28</td>
<td>.30</td>
<td>.01</td>
<td>.19</td>
<td>.20</td>
</tr>
<tr>
<td>Amotivation T1</td>
<td>-.12</td>
<td>.02</td>
<td>.32*</td>
<td>.26</td>
<td>.15</td>
<td>.09</td>
<td>.32*</td>
</tr>
<tr>
<td>Social support T1</td>
<td>.14</td>
<td>.24</td>
<td>.27</td>
<td>.20</td>
<td>.07</td>
<td>.02</td>
<td>.16</td>
</tr>
<tr>
<td>Pain tolerance</td>
<td>.05</td>
<td>.14</td>
<td>.29*</td>
<td>.16</td>
<td>.22</td>
<td>.16</td>
<td>.33*</td>
</tr>
<tr>
<td>Internal RLOC T1</td>
<td>.06</td>
<td>.12</td>
<td>.12</td>
<td>.06</td>
<td>.14</td>
<td>.07</td>
<td>.07</td>
</tr>
<tr>
<td>External RLOC T1</td>
<td>.18</td>
<td>-.01</td>
<td>.25</td>
<td>.34*</td>
<td>-.17</td>
<td>-.08</td>
<td>-.03</td>
</tr>
<tr>
<td>Anxiety T1</td>
<td>-.09</td>
<td>-.10</td>
<td>.10</td>
<td>.20</td>
<td>-.16</td>
<td>.04</td>
<td>.10</td>
</tr>
<tr>
<td>Intrinsic motivation T2</td>
<td>-.12</td>
<td>.01</td>
<td>-.06</td>
<td>.09</td>
<td>-.01</td>
<td>.10</td>
<td>.18</td>
</tr>
<tr>
<td>Identified regulation T2</td>
<td>.12</td>
<td>.03</td>
<td>.10</td>
<td>.37*</td>
<td>.11</td>
<td>.27</td>
<td>.13</td>
</tr>
<tr>
<td>External regulation T2</td>
<td>-.05</td>
<td>.07</td>
<td>.27</td>
<td>.34*</td>
<td>.04</td>
<td>.20</td>
<td>.20</td>
</tr>
<tr>
<td>Amotivation T2</td>
<td>-.23</td>
<td>.14</td>
<td>.02</td>
<td>.04</td>
<td>.02</td>
<td>.03</td>
<td>-.11</td>
</tr>
<tr>
<td>Social support T2</td>
<td>-.06</td>
<td>.12</td>
<td>.12</td>
<td>.11</td>
<td>-.11</td>
<td>.07</td>
<td>.12</td>
</tr>
<tr>
<td>Internal RLOC T2</td>
<td>-.09</td>
<td>.16</td>
<td>.09</td>
<td>.21</td>
<td>.31</td>
<td>.36*</td>
<td>.37*</td>
</tr>
<tr>
<td>External RLOC T2</td>
<td>-.02</td>
<td>-.17</td>
<td>-.01</td>
<td>.06</td>
<td>.12</td>
<td>.11</td>
<td>-.01</td>
</tr>
<tr>
<td>Anxiety T2</td>
<td>-.08</td>
<td>.14</td>
<td>.16</td>
<td>.01</td>
<td>.04</td>
<td>-.17</td>
<td>-.14</td>
</tr>
</tbody>
</table>

* p < .05, ** p < .01. Correlations are those of transformed adherence scores. T1 = pre-physiotherapy, T2 = post-physiotherapy.
Table 31. 
Correlations of Pre- and Post-Physiotherapy Psychological Variables and Ankle Function.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-physiotherapy</th>
<th>Post physiotherapy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LLTQ recreational activity</td>
<td>LLTQ functional activity</td>
</tr>
<tr>
<td>Intrinsic motivation T1</td>
<td>-0.15</td>
<td>-0.06</td>
</tr>
<tr>
<td>Identified regulation T1</td>
<td>0.09</td>
<td>0.28</td>
</tr>
<tr>
<td>External regulation T1</td>
<td>0.13</td>
<td>0.21</td>
</tr>
<tr>
<td>Amotivation T1</td>
<td>-0.14</td>
<td>0.09</td>
</tr>
<tr>
<td>Social support T1</td>
<td>0.01</td>
<td>0.11</td>
</tr>
<tr>
<td>Pain tolerance</td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>Internal RLOC T1</td>
<td>0.03</td>
<td>0.26</td>
</tr>
<tr>
<td>External RLOC T1</td>
<td>0.01</td>
<td>-0.02</td>
</tr>
<tr>
<td>Anxiety T1</td>
<td>0.11</td>
<td>0.03</td>
</tr>
<tr>
<td>Intrinsic motivation T2</td>
<td>-0.14</td>
<td>0.03</td>
</tr>
<tr>
<td>Identified regulation T2</td>
<td>0.11</td>
<td>0.19</td>
</tr>
<tr>
<td>External regulation T2</td>
<td>0.11</td>
<td>0.24</td>
</tr>
<tr>
<td>Amotivation T2</td>
<td>-0.22</td>
<td>-0.04</td>
</tr>
<tr>
<td>Social support T2</td>
<td>0.06</td>
<td>0.23</td>
</tr>
<tr>
<td>Internal RLOC T2</td>
<td>0.16</td>
<td>0.41</td>
</tr>
<tr>
<td>External RLOC T2</td>
<td>-0.18</td>
<td>-0.15</td>
</tr>
<tr>
<td>Anxiety T2</td>
<td>-0.16</td>
<td>-0.10</td>
</tr>
</tbody>
</table>

* p < .05, ** p < .01. T1 = pre-physiotherapy, T2 = post-physiotherapy
Discussion

The findings of this study will be discussed in relation to each of the hypotheses and will be interpreted within the context of the research and the findings of other related studies. The discussion will end with an outline of the strengths and limitations of the research and a short summary of the key findings.

Comparison of the clinic- and home-based physiotherapy programmes on adherence behaviours - hypothesis 1

In comparison to the clinic-based group, the home-based group had a significantly lower number of clinic treatments demonstrating that the manipulation of the independent variable, namely the mode of delivery of the physiotherapy was successful. There was also a trend towards the home-based group having a significantly higher percentage of attendance. In addition more participants in the home-based group (21 out of 22) participants completed their physiotherapy, whereas in the clinic-based group only 15 out of 25 finished the physiotherapy and three of the non-completers were unable to be tracked down by the researcher or clinic staff.

There are three possible reasons for the home-based groups’ better attendance and completion rate. First, the home-based group may have been motivated to attend each of their scheduled appointments as these coincided with key transitional times in their physiotherapy programme and the physiotherapist’s advice was of prime importance for the continued implementation and progression of their treatment. Patients who believe strongly in their physiotherapy being effective and valuable have been shown to have high rates of adherence and clinic attendance (Campbell et al., 2001; Taylor & May, 1996). Second, while the home-based group did not have many appointments, their progress was monitored closely and they were given instructions about contacting their physiotherapists if they needed additional assistance in the intervening time between appointments. Torstensen et al. (1998) reported that close supervision of this nature is known to encourage patients in home-based treatment programmes to attend their clinic appointments. Third, the participants made their appointments for times that suited them, which reduce the problem of inconvenient scheduling of clinic appointments causing poor attendance as found in previous research (see Fields et al., 1995; Fisher et al., 1988).
Like the home-based participants those in the clinic group were also entitled to make their appointments for times that suited them, but they still managed to have a significantly lower completion rate, which may have been due to reasons other than the timing of appointments. Maybe the clinic-based participants did not think that every one of their treatment appointments was necessary for their successful recovery, which has been identified previously as a reason for physiotherapy patients not completing their course of treatment (Vasey, 1990). Another common reason for failing to keep clinic appointments is patient forgetfulness (Vasey, 1990), however the clinics in the present study have procedures in place to minimise this problem, such as phoning patients in advance to remind them and routinely giving them clinic business cards with their next appointment times written on.

No significant differences existed between the two groups on the SIRAS (adherence to the clinic-based management), although the clinic-based group scored slightly higher on this adherence indicator, which may have been due to differences in the delivery of the physiotherapy programme for each group. The clinic-based group’s physiotherapy programme was modified gradually at each clinic appointment and the changes were less noticeable than those of the home-based group. For example, when the home-based group progressed from the acute to the mobilising phase, in many cases the entire the RICE regimen was stopped and completely replaced by the mobilising exercises. Whereas for the clinic-based group this same change took place over several clinic treatment sessions, with the components of the RICE regimen being gradually replaced with the mobilising exercises. Possibly for the home-based group participants the SIRAS was more of an assessment of their ability to learn about a new set of physiotherapy activities, rather than a measure of their adherence to a traditional clinic-based physiotherapy session.

Despite no significant differences occurring between the groups on their adherence to the components of the home-based physiotherapy, the clinic-based group had slightly higher scores, which was most evident for strapping of the ankle. At the end of each treatment session the physiotherapists followed the standard practice of strapping the participants’ ankles, requesting it be kept on for about two to three days. For the clinic group this length of time usually coincided with their next appointment, and in which case they were requested to remove the strapping prior to their treatment. However as the home-
based group had a longer duration between their physiotherapy appointments, they had to not only remove the strapping, but also re-strap the ankle. Hence in comparison to the clinic group, the strapping requirements were more complex for the home group participants, with a number of them frequently making mistakes in the strapping technique and finding it easier not to do. Difficulty in implementing complex treatment techniques is a well-known barrier to adhering to their requirements (Meichenbaum & Turk, 1987; Muszynski-Kwan et al., 1988).

There are several other possible reasons for the clinic-based group having higher home adherence scores than the home-based group. First, the home-based group undertook their entire physiotherapy programme at home and not just aspects as was the case for the clinic group. It is common practice for physiotherapists to ask patient, who are seen regularly at the clinic, to do no more than four exercises at home because a few simple ones are more likely to be remembered than a large number (Rastall et al., 1999; Schneiders et al., 1998). Second, some home-based participants expressed concern that they were not adhering fully to all facets of their physiotherapy, and therefore they did not think they were doing the programme justice. This type of comment implies that the home-based group was conscientious about their physiotherapy and aware of their shortcomings when it came to their adherence to the activities. Goodwin et al. (2003) found that in comparison to the group of patients supervised by the physiotherapist at the clinic those in the home group were more diligent in undertaking their physiotherapy and adhered closely to the written and verbal advice they had been given. Third, as the home-based group was well informed about their physiotherapy programme and its progression it is likely they had a greater appreciation of their role in the treatment than the clinic group. This may have lead to a response bias in the self-reported adherence to the home-based activities with the home-based group being more stringent in their scoring than the clinic group.

A reason for the overall high adherence levels in this study may have been due to the physiotherapists routinely using educational and adherence enhancing strategies with the participants irrespective of their intervention group. The physiotherapists verbally informed the participants about their diagnosis, purpose of the physiotherapy, its progression, the importance of the home-based management, and helpful hints on ways of remembering to do the activities. In some instances the verbal information was backed up
with standard and personalised written material about acute and long-term care of ankle sprains. Throughout the treatment programme the physiotherapy and the educational information were adapted to suit the participants’ progress and abilities. These methods of personalising the treatment and relevant information are seen as important ways of improving patients’ understanding of their treatment and role in it (Ley, 1988; Roddey et al., 2002; Sluijs et al., 1998; Symons et al., 2001). Similarly the treatment techniques in the home-based information booklet were adapted to suit the patients’ needs, and clarified by verbal explanations, along with demonstration of the activities, and feedback about their performance of the activities. As a consequence the booklet became central to the home-based participants’ physiotherapy, and both the participants and physiotherapists reported finding it a useful adjunct to the physiotherapy programme.

Cues were the primary cognitive-behavioural techniques used for the home group, with participants selecting those most akin to what they use as memory aids in their daily lives, which is why cues are thought to be successful in maintaining and improving adherence to the home exercise programmes (Sluijs & Knibbe, 1991; Sweeney et al., 2002). The popular methods were leaving the cue cards, physiotherapy booklet and equipment in conspicuous places, as well as getting other people to remind them to do their physiotherapy. These methods of cueing are suggested by physiotherapists routinely during treatments and were observed being given to clinic group participants, thereby possibly contributing to their relatively high adherence.

The treatment goal for each phase of the rehabilitation was used primarily as an indicator of how long it should take each home-based participant to successfully complete that phase. In this way participants had an indication of the timing of subsequent appointments and the probable duration of their rehabilitation. The time frame for the goals for each phase was based on the grading of each participant’s sprain, the progress made to that point and other commitments in their life that might affect the time they could devote to their physiotherapy. Structuring treatment goals in this manner has been associated with high levels of adherence (Bassett & Petrie, 1999; Duncan & Pozehl, 2002; Evans & Hardy, 2002; Scherzer et al., 2001). Participants in the clinic group may have also used treatment goals unbeknown to the researcher and their physiotherapists, which has been found to quite common in other research, where injured people have set their own goals to give
themselves a sense of purpose and direction with their rehabilitation programme (Iveleva & Orlick, 1991).

While the educational and cognitive behavioural techniques proved to be worthwhile adjuncts to the home-based physiotherapy the importance of the equipment loaned to the participants cannot be underestimated. Most of the equipment loaned to the participants are not items kept in most households, such as wobble boards and theraband. Not having access to the appropriate equipment at home has been blamed by patients for their poor levels of adherence (Pizzari et al., 2002). In the present study participants appreciated being loaned the equipment as they were able to progress their physiotherapy and were not hindered by having to wait to borrow equipment at a later stage. The value of the equipment is further emphasised by participants with a history of recurrent sprains having since purchased wobble boards to use as a prophylactic measure.

**Comparison of the clinic- and home-based physiotherapy programmes on ankle function outcomes – hypothesis 2**

Initially the groups differed on the LLTQ scores, which may have been a reflection of the greater number of people with mild sprains in the home-based group and more with moderate sprains in the clinic-based group. Although it is interesting to note that there were no significant differences on the Motor Activity Scale, which was the objective measure of ankle function. In addition many of the participants knew their ankle sprain grading prior to answering the LLTQ, and this knowledge about the severity of their injury could well have been a source of bias in their responses to the LLTQ items. By the end of the course of physiotherapy there were no significant differences between the two intervention groups on any of the ankle function measures, and over the course of physiotherapy both had made a significant improvement in their ankle function as was evidenced by the drop in their LLTQ scores and the increase in their Motor Activity Scale scores.

It is evident from the mean number of treatments recommended for the participants that they needed less treatments than suggested necessary for optimal recovery by the ACC treatment profiles (2000). This smaller number may have been due to the participants’ moderate to high levels of adherence, which has been linked to optimal recovery in previous research (Bassewitz & Shapiro, 1997; Brewer et al., 2004; Brewer, Van Raalte,
Petitpas et al., 2000). It has also been reported that the best possible recovery from ankle sprains is facilitated by patients following the requirements of their rehabilitation (Bassewitz & Shapiro, 1997).

The lack of significant differences between the two groups for their ankle function outcomes demonstrates that the home-based group was not disadvantaged in terms of their recovery, thereby adding support to previous research that has compared clinic- and home-based care (Anonymous, 2001; Arthur et al., 2002; Callaghan et al., 1995; De Carlo & Sell, 1997; Goodwin et al., 2003; Symons et al., 2001). Further the previous concerns that have been expressed about the safety of home-based programmes (see Symons et al., 2001 for these concerns) have been called into question by the findings of the present study.

**Comparison of the clinic- and home-based physiotherapy programmes on the psychological variables - hypothesis 3**

The clinic- and home-based groups did not differ on any of psychological variables at the two measurement points, and with the exception of social support these scores remained stable over time. Overall the participants scored high on identified regulation, social support, internal RLOC and ability to tolerate pain under normal conditions, whereas their scores were lower on amotivation and external RLOC. The direction of this pattern of scoring has been found to be associated with fast healing rates (Iveleva & Orlick, 1991) and high levels of adherence (Duda et al., 1989). The participants’ anxiety scores indicated as a group they were moderately anxious about their injury. When the nature of the injury is taken into account this set of scores is understandable. Ankle sprains are a very common injury, their recovery is predictable and reasonably fast in comparison to injuries of larger structures in the body, and there is wide publicity about the causes and treatment, all of which are known to reduce the perception of an injury or illness being serious and hence the associated anxiety (Leventhal, Diefenbach, & Leventhal, 1992). Consistent with the second study in this thesis the participants have scored more highly on the external regulation subscale of the SIMS than in previous research (Guay et al., 2000). It is apparent that in the context of rehabilitation people believe that to obtain symptomatic relief they have no other choice but to do the physiotherapy.
The change in the participants’ social support scores was due to the home-based group scoring lower at the end of the treatment. There are two possibilities for this decline. First, at the pre-physiotherapy measurement time the home group may have misjudged the level of social support they would get, and the post-physiotherapy score was a more accurate representation of the amount of support they actually received. Second, in the early stages of recovery when their disability levels were high, this group in particular needed help from others to be able to perform their daily activities, but over time as their functional ability improved they required less help and this was perceived as a decrease in social support. The levels and type of social support do fluctuate over the course of a rehabilitation programme (Udry, 1996), with practical support in the form of assistance with daily activities decreasing as patients become more functionally able.

**Relations between adherence behaviours, functional outcomes and psychological variables – hypothesis 4**

**Adherence-functional outcomes relationships**

The correlation analyses of the adherence and pre-physiotherapy functional outcomes revealed significant relationships between high levels of clinic-based adherence (SIRAS scores) and high levels of disability as indicated by the ankle function measures. Similar associations have been identified in studies that have used the PMT (Rogers, 1983) as a framework, with strong beliefs about the serious nature of the injury or illness, vulnerability to further problems if the treatment is not followed, the effectiveness of the treatment and one’s ability to cope with the treatment requirements being significantly correlated to high adherence scores (see Brewer et al., 2003b; Flynn et al., 1995; Norman et al., 2003; Rudman et al., 1999; Taylor & May, 1996). Also Sluijs and Knibbe (1991) reported that the presence of symptoms act as a cue to undertake physiotherapy exercises. Thus in the present study, it is seems likely that the disability the participants experienced was perceived as serious, which in turn prompted them to adhere to the components of their clinic-based physiotherapy.
Adherence-psychological variables relationships

Significant correlations were revealed between the adherence behaviours and the psychological variables. Correlations that made conceptual sense and are consistent with the findings of previous investigations into the relationship are between adherence and high levels of pain tolerance (Byerly et al., 1994; Fields et al., 1995; Fisher et al., 1988), motivation (Brewer, Van Raalte, Cornelius et al., 2000; Duda et al., 1989; Fields et al., 1995; Fisher et al., 1988), and sense of control over the recovery from the injury (Laubach et al., 1996; Murphy et al., 1999). These associations indicate that the antecedents consistently identified in other research also operated in this study and possibly underlie the participants’ high levels of adherence. The positive correlations between amotivation and adherence to home-based exercises and elevation do not seem to make conceptual sense as they imply that people are not motivated to undertake their physiotherapy are also highly adherent to these two treatment modalities. This finding is in contrast to that of previous research that has found low levels of self-motivation are related to poor levels of adherence (Brewer, Van Raalte, Cornelius et al., 2000; Duda et al., 1989; Fields et al., 1995; Fisher et al., 1988).

Functional outcomes-psychological variables relationships

Two significant moderate positive correlations occurred between the functional outcomes and the psychological variables. The first of these was between the pre-physiotherapy LLTQ functional activity subscale and post-physiotherapy internal RLOC, which is akin to findings of two studies in which physiotherapy patients who felt they had personal control over their progress made a good recovery (Iveleva & Orlick, 1991; Partridge & Johnston, 1989). However in these two studies personal control was seen as a forerunner to recovery. Whereas in the present study this is not the case, as the LLTQ functional activity was rated at the beginning of the physiotherapy and internal RLOC at the end. Therefore this relationship may be a reflection of those participants who initially had the greatest difficulty with functional activities finding that over the course of the physiotherapy to achieve optimal treatment outcomes they needed to take on responsibility for their treatment and recovery.

The second significant correlation between the pre-physiotherapy Motor Activity Scale and post-physiotherapy intrinsic motivation implies that those who initially had the
least problems undertaking the tasks on the Motor Activity Scale enjoyed doing the physiotherapy. While this relationship does not make conceptual sense, it may be an indirect indication that these participants did not find the physiotherapy to be the painful experience they expected it to be.

**Strengths and limitations**

The main strengths lay in the comparability of the physiotherapy programme content and the measurements of adherence and the psychological determinants of adherence. The content of the clinic- and home-based physiotherapy programmes were similar and only modified to suit the individual participants’ requirements. It was just the manner of delivery and the number of clinic appointments that differed between the two groups, making it possible to make valid comparisons between them. This is an advancement on other studies that have used different treatment protocols for the clinic- and home-based interventions in the management of ankle sprains (Bowman cited in Anonymous, 2001), back pain (Cherkin et al., 2001; Little et al., 2001), arthroscopic knee joint surgery (Goodwin et al., 2003) and osteoarthritis of the knee (Callaghan et al., 1995). In contrast to other studies that have compared home- and clinic-based programmes this one used a multifaceted approach to the measurement of adherence to capture all behavioural demands of the rehabilitation. Also the measures of clinic- and home-based adherence are recognised as being reliable and valid. Similarly the measurement of the sense of ownership in the treatment had a multifaceted approach by using reliable and valid tools to assess the psychological variables known to influence adherence and recovery.

This study had five notable limitations. First, randomisation failed to produce group equivalency on the pre-physiotherapy level of ankle function. In future this limitation could be overcome in clinical trials by using a combination of randomisation and matching participants on the basis of the severity of their injury. Second the physiotherapists had problems discriminating between severe grade I (mild) and mild Grade II (moderate) ankle sprains, which could be averted by strictly applying O’Donoghue’s (1976) criteria when assessing the injury and employing independent assessors. Many of the physiotherapists admitted to using their own heuristics for grading the ankle sprains, and while these were based on O’Donoghue’s (1976) criteria some discrepancies did creep into their
assessments. Third, the participants as a group were highly adherent to their treatment requirements, which could have been responsible for the lack of support for previously proven positive relationship between adherence and functional outcomes. Future research into adherence issues in physiotherapy should focus on the patients who have problems adhering to their physiotherapy. Fourth, this study appears to have been under powered as evidenced with some of the relationships that showed a trend towards significance. For example, the group differences on the percentage of attendance, and the correlations between the pre-physiotherapy scores for internal RLOC and LLTQ functional activity scale, and the post-physiotherapy scores of these variables. Fifth, as a cost analysis of the two levels of intervention was not undertaken, it is unclear whether the use of home-based physiotherapy programmes does really reduce treatment costs and until this analysis is undertaken the financial benefits remain unclear.

Summary

The findings of this study have shown home-based physiotherapy to be a safe and viable option for patients with ankle sprains. The participants in the home-based group were not disadvantaged psychologically or in terms of their rate of recovery, and their treatment adherence was comparable to that of the clinic-based group. Like previous research into other home-based physiotherapy programmes (see De Carlo & Sell, 1997; Goodwin et al., 2003; Roddey et al., 2002), the home-based programme for ankle sprains in this study was proven to be successful, but caution is needed when generalising its outcomes to other injuries, as every patient and injury has different needs. Clinic-based physiotherapy and closer supervision may be a preferable treatment option for some patients and some acute injuries or disorders.
CHAPTER NINE
DISCUSSION, RECOMMENDATIONS AND CONCLUSIONS

The aim of this final chapter is to (a) discuss some of the notable findings from the studies (b) outline strengths and limitations common to the studies (c) make recommendations for future research into adherence issues in the context of physiotherapy and (d) discuss the clinical implications of this research. The chapter will end by presenting the conclusions drawn from the research.

Discussion

While the PMT intervention successfully manipulated the beliefs about severity of the sprain, vulnerability to further sprains and response efficacy, but failed to manipulate self-efficacy. In Studies 1 and 2 all the groups’ self-efficacy scores were moderately high, suggestive of the participants starting their physiotherapy in the belief that they could cope with the treatment requirements. The self-efficacy finding contradicts that of earlier PMT based research in which it has been successfully manipulated (Brouwers & Sorrentino, 1993; Courneya & Hellsten, 2001; Maddux & Rogers, 1983; Wurtele & Maddux, 1987). It could well be that self-efficacy may not be very easy to manipulate within the context of health care, particularly as many people seek treatment they consider to be effective (Lau & Hartman, 1983; Leventhal, Myer, & Nerenz, 1980), and that they believe they can cope with (Meichenbaum & Turk, 1987)

Like self-efficacy the groups’ scores for the intentions to adhere to the components of the physiotherapy were high and undifferentiated in the first two studies. This is not surprising as the participants had sought physiotherapy to obtain symptomatic relief and hence it could be reasonably assumed they had every intention of adhering to their physiotherapy. The relatively high adherence scores and the significant relationships between the intentions and adherence behaviours provide evidence of participants acting on their intentions. However it should also be noted that these scores may be due to a ceiling effect with the questionnaire, the use of goal intentions instead of implementation intentions (Gollwitzer, 1999), and that the intention items were of informative value for the participants, thereby overriding their evaluative power (Ogden, 2003). While intentions to implement behaviours (protection motivation) are integral in the PMT (Rogers, 1983), they
are not valued within the context of physiotherapy. Patient adherence behaviours carry more weight and therefore the value of measuring intentions within this context becomes questionable. This preference was evident in the two studies that tested the ability of the PMT to discriminate between high and low adhering rehabilitation patients, and did not investigate the intentions to adhere (Brewer et al., 2003b; Taylor & May, 1996).

With regard to the rates of adherence found in Studies 2 and 3, it is on the whole slightly better than that of earlier research. There was a higher percentage of attendance with it being in the vicinity of 90% as opposed to 80% to 87% previously reported (Duda et al., 1989; Kolt & McEvoy, 2003; Lampton et al., 1993). Clinic-based adherence of approximately 90% is also greater than the 80% found by Duda et al. (1989). Likewise adherence to home exercises was slightly higher at 78% than the 70% from other studies (Bassett & Petrie, 1999; Kolt & McEvoy, 2003; Lyngcoln et al., 2005), but lower than the 90% found by Tooth et al. (1993). While the 5% non-completion rate (one participant) in the home-based group of Study 3 is better than 7.2% to 14.3% range found by Vasey (1990), the overall rate in the current research (17% in Study 2 and 24% in Study 3) is lower.

The groups’ relatively high undifferentiated adherence scores in Studies 2 and 3 point to the likelihood that other factors negated some of the effectiveness of the interventions. First, many participants had been treated by physiotherapy before and some were treated by physiotherapists they had been to previously. Participants’ comments indicated they were seeking physiotherapy again because they had confidence in it as a form of treatment and the physiotherapists’ ability. Attitudes of this nature are known predictors of high levels of adherence (Hall et al., 2002). Second, the pattern of scoring on the antecedents of adherence questionnaires was high on identified regulation, social support (Study 3 only) and pain tolerance, and low on amotivation, which are typical characteristics of adherent patients (see reviews by Brewer, 1999; Spetch & Kolt, 2001). Third, in spite of reliability checks being undertaken on the physiotherapists’ use of the SIRAS, some response bias could have occurred in these assessments. Similarly the participants may have over-estimated their level of adherence to the home-based components of the physiotherapy.
Nonetheless there were differences in clinic attendance between the clinic- and home-based groups in Study 3. As expected the home-based group required and attended significantly less clinic appointments than the clinic group. While there was a trend towards their percentage of attendance being significantly higher than that of the clinic group, significantly more home-based participants (21/22) completed their course of physiotherapy as opposed to those in clinic group (15/25). These findings demonstrate that patients are likely to attend clinic appointments if only a limited number are scheduled, and if each appointment has a predetermined purpose, as was the case with the home-based group. A down side to a limited number of appointments is that for optimal recovery to be achieved patients need to undertake a larger home-based component of physiotherapy, which is known to undermine adherence to this component of physiotherapy (Schneiders et al., 1998; Sluijs, 1991).

The influence of the educational techniques used by the physiotherapists cannot be ignored with regard to the interventions and adherence behaviours. In New Zealand, physiotherapists are ethically bound to fully inform their patients about their diagnosis, the planned treatments, their effects and in turn patients have to give consent before the treatments can be implemented (New Zealand Society of Physiotherapists (Inc.), 2003). The physiotherapists who took part in the current research followed these ethical requirements. Irrespective of the research intervention and its level, the bulk of the educational information was given verbally, but in some instances particularly in relation to home-based activities, it was backed up with personalised written information. The verbal explanations tended to be given in simple everyday language, specific to the patients’ needs, categorised and repeated. This manner of structuring patient information cannot be considered out of the ordinary, as previous research has had similar findings (Chase et al., 1993; Sluijs, van der Zee et al., 1993). Also the patients were asked for feedback, questioned about their understanding of the information they had been given and required to demonstrate the activities they had been doing at home. In addition they were encouraged to ask questions when they needed more information. These techniques are known to improve patients’ understanding of their treatment and their adherence to it (Clopton & McMahon, 1992; Feinberg, 1988; Green, 1979; Ley, 1988). Furthermore encouraging patients to ask questions is one way in which rapport and trust can be
augmented in the patient-physiotherapist relationship, thereby further enhancing adherence (Pizzari et al., 2002; Purtilo & Haddad, 1996; Sluijs, Kok et al., 1993).

The significant improvement in the participants’ ankle function over the duration of the physiotherapy rehabilitation programme was achieved in a fewer number of treatments than normally expected. Treatment guidelines recommend 10 to 12 physiotherapy treatments are necessary to obtain optimal recovery from ankle sprains (Accident Compensation Corporation, 2000, 2002b). This lower mean number of treatments may have been due to the participants’ moderate to high levels of adherence which has been previously linked to optimal recovery in patients with ankle sprains (Bassewitz & Shapiro, 1997). Also it is worthy to note that the home-based group’s recovery was not disadvantaged by them having significantly fewer appointments than their clinic-based counterparts.

In terms of the relationships amongst the variables of interest investigated in the three studies there are several that warrant highlighting. First significant relationships were found between the PMT-variables, the intentions to adhere and adherence behaviours investigated in Studies 1 and 2. While self-efficacy and response efficacy had significant relationships with the intentions to adhere, none of the PMT-based variables were significantly correlated with adherence behaviours. However in Study 2 the intentions to attend the clinic appointments and adhere to the home physiotherapy were significantly correlated to adherence to home exercises and elevation of the limb. Support for these findings comes from a meta-analysis of PMT based studies (Milne et al., 2000). First, in the PMT model (Rogers, 1983) both threat and coping appraisals are described as positively influencing protection motivation (intention), and in turn protection motivation (intention) positively influences the health protective behavior, but the appraisal variables do not influence behaviour directly. Second, the major findings from the meta-analysis were (a) threat and coping appraisal components of PMT were found to be useful in predicting health-related intentions but not subsequent behavior and (b) intention had the strongest, most robust, and most consistent association with subsequent behavior. These two issues, taken in concert, clearly indicate that the findings of the two PMT-based studies are in line with theory and previous research.
Second, while the relationships between psychological characteristics (antecedents in Study 2 and psychological variables in Study 3) were not consistent across Studies 2 and 3, some of those involving motivation, pain tolerance and internal RLOC merit outlining. Motivation to undertake physiotherapy for its beneficial effects (identified regulation) was significantly associated with the four PMT beliefs, the intentions to adhere to physiotherapy and home based adherence behaviours. These relationships add further weight to the evidence of the importance motivation has been found to have in other rehabilitation adherence studies (Brewer, Van Raalte, Cornelius et al., 2000; Duda et al., 1989; Fields et al., 1995; Fisher et al., 1988). In line with other research significant links also occurred between high pain tolerance and beliefs about the treatment being effective and adherence to home physiotherapy (Byerly et al., 1994; Duda et al., 1989; Fields et al., 1995; Fisher et al., 1988), and internal RLOC and adherence (Laubach et al., 1996; Murphy et al., 1999). As many participants in the present research had been treated by physiotherapy before, these relationships may be a reflection of their prior knowledge of the treatment process, and confidence in their ability to cope with the treatment requirements.

Third, the relationships between adherence and functional outcomes were not consistent across Studies 2 and 3. The notion that high levels of adherence will facilitate better functional outcomes received some support from Study 2. In this study participants who attended all of their treatments had significantly lower scores on the LLTQ functional activity scale than those who did not. Regardless of clinic attendance not being considered an appropriate measure of adherence to the clinic-based physiotherapy (Brewer, Van Raalte, Petitpas et al., 2000), it does appear that attending all appointments has a positive effect. This result implies that if patients attend all their clinic appointments their physiotherapy treatment can be progressed in a manner that is conducive with their change in symptoms and their rate of recovery. With regard to Study 3, the significant relationship between all the measures of pre-physiotherapy ankle function and clinic-based adherence relationship points to greater levels of disability acting as cues to adherence. This supports the notion that higher levels of adherence are more likely in the presence of symptoms (Sluijs & Knibbe, 1991). These findings are also similar to those of other PMT-based studies in which strong beliefs about the severity of the symptoms and vulnerability to
further problems from the injury have been found to be linked to high levels of adherence (Brewer et al., 2003b; Taylor & May, 1996).

**Strengths and Limitations**

This research has four methodological strengths. First, the multiple measures of adherence revealed that adherence to each of the components of the physiotherapy rehabilitation are not uniform. This was especially apparent in the third study with the two intervention groups having different rates of attendance and completion of their course of physiotherapy, but yet their adherence rates during the treatment session were similar. This provides support for the notion that attendance alone is not a measure of adherence to the components of the clinic-based physiotherapy (Brewer, Van Raalte, Petitpas et al., 2000). Using separate scales for the different home-based treatment modalities provided insight into the extent to which each was undertaken. Additionally it provided the participants with an accurate and simple way of grading their home-based adherence, which would not have been possible if there had been only one global item.

Second, the use of the patient self-report (LLTQ functional and recreational subscales) and an objective measure (the Motor Activity Scale) enabled a diverse range of daily functional and recreational activities to be evaluated. The participants’ self-reports on the LLTQ proved to be worthwhile because they captured activities not observable in the clinical setting, but indicative of their functional performance in their daily lives. This finding adds weight to Rothstein’s (1989) opinion that patient perceptions should not be discredited as methods of assessment.

Third, the combination of the multiple measures of adherence and ankle function enabled a significant relationship between these variables to be detected, namely that of percentage of attendance and LLTQ functional activity scale. Not only is this approach to testing in line with the recommendations for the measurement of adherence and functional outcomes, but also is congruent with other studies that have found in favour of a relationship between the two variables (for example Brewer et al., 2004; Brewer, Van Raalte, Cornelius et al., 2000; Groth et al., 1994; Lyngcoln et al., 2005).

Fourth, restricting the sample to people with ankle sprains proved advantageous. This injury has a relatively uniform physiotherapy rehabilitation programme which in turn
eliminated sources of treatment variability that are inherent in rehabilitation programmes that are not standardised. It also enabled the use ankle specific functional outcome measures and adherence indicators that could be tailored to the requirements of the components of the physiotherapy. In addition the two adherence enhancing interventions under investigation were able to be specific to ankle sprains and the physiotherapy for these injuries, thereby fulfilling requirements of effective patient education (Ley, 1988).

Five notable limitations occurred in the research. First, had the participants’ past adherence behaviours been measured in some way, light may have been shed on the reasons why self-efficacy and adherence were not enhanced by the PMT-based information. Second, the absence of a pre-test belief assessment period prevented conclusions to be drawn about the actual change in the PMT constructs. Third, notwithstanding the results showing that the participants were highly adherent, the possibility that these were due to response bias must not be discounted as it is a recognised problem in adherence research particularly when self-reports are used (Sluijs et al., 1998). Fourth, a larger number of participants in each of the studies may have strengthened the power and effect sizes of the group comparisons, and lead to more correlations being significant. Fifth, as no cost analysis of the interventions was undertaken there is no indication as to whether they are financially viable.

**Directions for Future Research**

There is still a need for further investigation into educational and cognitive-behavioural methods designed to overcome the problem of poor adherence to physiotherapy, particularly as the evidence from this thesis suggests that poor clinic attendance is related to less than optimal post-physiotherapy ankle function. The true worth of informational interventions like the PMT-based intervention may only be apparent if participant recruitment is limited to novice physiotherapy patients and those who have been identified as poor adherers or have a past history of poor adherence. However, a major disadvantage of this recommendation is that to get sufficient numbers of participants, the data collection phase may be drawn out. While the home-based physiotherapy programme with adherence enhancing adjuncts was shown to be a safe and viable option for people with ankle sprains the findings cannot be generalised to other acute injuries and diseases.
Therefore future research of this type should investigate the effectiveness of home-based physiotherapy programmes with other acute injuries and disorders, and include a cost effectiveness analysis.

At present it is unclear as to exactly how much adherence is required to get the best possible outcome from the treatment, and thus there is a need to establish the dose-response in physiotherapy rehabilitation. As the content of the rehabilitation programmes and the physical and psychological demands of different injuries and disorders vary, it would be expected that the amount of adherence required for each would differ. Hence in accordance with the recommendations for undertaking methodologically sound research into adherence, such investigations would have to be specific to an injury or disorder and have a standardised rehabilitation programme (Brewer, 1999).

Research is required in the development and testing of questionnaires used to evaluate the psychological factors involved in rehabilitation. The findings of this research indicate that the SIMS (Guay et al., 2000) is a useful tool in the measurement of motivation to undertake the physiotherapy. However it needs to be tested with patients, who have other injuries and disorders, and used in conjunction with other instruments that will provide proof of its construct validity. Similarly a suitable measure of social support needs to be explored. The social support questionnaire used in Study 3 shows promise, but needs more testing before any conclusions can be drawn about its suitability within the context of physiotherapy.

Future research should broaden its approach to the measurement of self-efficacy. Thus far investigations into self-regulatory efficacy in rehabilitation have tended to focus on barrier self-efficacy (see Brewer et al., 2003b; Sluijs, Kok et al., 1993; Taylor & May, 1996). However, in the context of rehabilitation the successful implementation of treatment programmes requires patients to utilise other self-regulatory skills, such as scheduling efficacy, goal setting efficacy, and relapse prevention efficacy (Fisher, 1990). By using multiple measures of self-regulatory efficacy it should be possible to capture the variety of skills and challenges associated with rehabilitation adherence.

The adherence-functional outcome relationship also requires further investigation. While a relationship was found in this research, this finding cannot be considered
conclusive proof of its existence, because like other research into this relationship not all the adherence and outcome variables were found to be associated (see Brewer et al., 2004; Brewer, Van Raalte, Cornelius et al., 2000; O'Reilly et al., 1999; Preisinger et al., 1996). At present this relationship is still debatable, and therefore research is warranted to give a clear indication of the nature of its existence. Irrespective of what direction future adherence and functional outcome research takes the outcomes of the current studies advocate the use of multiple measures of both variables.

**Clinical Implications**

The findings of this research can be used in several ways in the practice of physiotherapy. First, results of the first two studies indicate that patient information couched in terms of the four main variables of the PMT does have the ability to strengthen patients’ beliefs about their injury and physiotherapy. While it did not manage to increase the PMT present group’s self-efficacy, this method of delivering information may be more suitable for patients who do not feel efficacious about coping with the requirements of their physiotherapy and are having problems with adherence.

Second, home-based physiotherapy programmes that require a minimal number of clinic visits, but do allow patients access to their physiotherapists should they need advice, are a safe and viable method of administering physiotherapy. It should be considered for patients, who have problems attending regular scheduled appointments, are unable to pay treatment costs on a regular basis and for cultural reasons feel uncomfortable being in a western medical environment (see Bassett & Holt, 2002; White et al., 1999).

Third, fewer appointments appear to have the added advantage of improving the percentage of clinic attendance and completion of rate of the course of physiotherapy. In light of the significant relationship between the percentage of clinic attendance and functional outcomes a reduced number of clinic-based treatments might be beneficial for patients who for no good reason are poor at keeping appointments. This maybe a way of ensuring that they have a treatment programme progressed in accordance with their recovery. Fourth, physiotherapists should contemplate using a combination of patient self-report questionnaires and an objective motor function tests for the assessment of functional
outcomes. In the current research this combination of measures provided a broad picture of the participants’ physical abilities and their recovery.

**Conclusions**

Within the context of this research, which was undertaken with patients undergoing physiotherapy treatment for ankle sprains, five conclusions are drawn. First, a PMT-based intervention can successfully manipulate patients’ beliefs about the severity of their injury, vulnerability to further injury and treatment efficacy, but not self-efficacy. Second, the PMT-based intervention does not significantly alter patients’ intentions to adhere to physiotherapy, their adherence to the physiotherapy rehabilitation and their rate of recovery. Third, a home-based physiotherapy programme with adherence enhancing adjuncts which requires significantly less clinic treatments does not disadvantage patients psychologically and physically in terms of their post-physiotherapy functional outcomes. Fourth, significantly more patients in the home-based programme did complete their physiotherapy in contrast to those on the clinic-based counterpart. Fifth and finally, significant relationships exist between the antecedents of adherence, the PMT-based beliefs about the injury, the intentions to adhere, adherence behaviour, and functional outcomes. Particularly, noteworthy and relevant relationships include (a) self-efficacy and response efficacy are related to the intentions to adhere to physiotherapy, (b) the intentions to attend clinic appointments and adhere to home-based physiotherapy are correlated with adherence to home exercises and elevation, (c) motivation, high pain tolerance and internal RLOC are related to high levels of adherence, (d) patients who attend all their physiotherapy appointments have significantly better post-physiotherapy ankle function as measured by the LLTQ functional activity scale and (e) high levels of pre-physiotherapy disability are significantly related to high levels of adherence to clinic-based physiotherapy.
APPENDIX 1

PROTECTION MOTIVATION THEORY PRESENT AND ATTENTION CONTROL VIDEO INFORMATION

File 1, Original Protection Motivation Theory Present video used in the Pilot Study

File 2, Protection Motivation Theory Absent (attention-control) video using in the Pilot Study and Study 2.

File 3, The revised version of the Protection Motivation Theory video used in Study 2.
ANKLE SPRAINS ARE SERIOUS

Ankle sprains are serious, and you have a 70% chance of long-term disability occurring. Initially your ankle and foot are likely to be bruised, swollen, very painful to move and put weight through. For four to six weeks after your sprain your ankle will be weak and unstable. This will cause you to ‘go over’ or ‘roll over’ on your ankle when walking. You will have difficulty with balance activities and be unsteady in many of your everyday activities. It is highly likely it will take you three months to regain a high enough fitness level to be able to exercise regularly and participate in sport. You may even need to change your exercise and sport activities permanently because of your sprain.
The most common long-term problem you are likely to develop is an unstable ankle, which will ‘give way’ or ‘roll over’ when you are walking or running, especially over uneven ground, or changing direction suddenly. A vicious cycle is set up where the more you sprain your ankle the more it gets damaged, and the more likely you are to sprain it again. If this cycle of re-injury continues you will develop arthritis in your ankle. You could be like a few people, who get very stiff arthritic ankles following sprains. Respraining also occurs when people do not follow the required physiotherapy programme.
Physiotherapy is effective in hastening recovery from ankle sprains, the earlier it is started the quicker the recovery. Some treatments may cause pain, this will not damage your ankle. Ice given early reduces the swelling and pain, and speeds up your return to your normal activities. Pain and swelling are decreased by elevating your foot and ankle, and having them taped and bandaged all the time. Foot and ankle exercises, which are progressed to more strenuous activities will increase your chances by up to 90% of regaining normal strength and movement. Physiotherapy exercises using balance boards and theraband will make the strengthening exercises more effective.
You will need to attend physiotherapy at least three times a week. Make your physiotherapy appointments to fit in with your other daily activities. You will be given simple exercises and other treatment activities to do at physiotherapy and home. Get into the habit of doing your home exercises with other activities, such as watching TV, talking on the phone, or before meals. This will make them easy to remember to do when you change your daily routines. Always follow the advice of your physiotherapist who will tell you the correct way of doing exercises and other activities you are involved in.
COST OF ANKLE SPRAINS

During 2001 the Accident Compensation Corporation of New Zealand (ACC) spent $91 million on claims for injuries resulting from participation in sport. ACC statistics show that the ankle is the third most common site in the body to be injured, and that sprains are the most common type of ankle injuries. Similar rates of ankle sprains have also been reported in other countries, such as the United States of America, Great Britain and Australia.
Sprains of the ligament on the outer side of the ankle (lateral ligament) are far more likely to occur than sprains of the ligament on the inner side of the ankle (medial ligament). Lateral ligament sprains are very common injuries in sports such as netball, badminton, basketball, aerobics, gymnastics, rugby, tennis, volleyball, and tramping. These injuries tend to happen if the sole of the foot and ankle turn in too far as the foot makes contact with the ground. There are two types of activities which tend to provoke this inward action of the foot. Firstly, as the foot makes contact with the ground when landing from a jump, which can happen in netball, gymnastics and badminton. Secondly, as the foot comes into contact with the ground when walking or running over uneven ground, which can happen while tramping and playing soccer.
The lateral (outside) ligament of the ankle consists of three bands, all of which join the bony prominence on the outer side of the leg (fibula) to two of the foot bones. The first, posterior talofibular ligament, is a thick band and goes to the back of the talus (ankle bone). The second band, calcaneofibular ligament, is a round cord like structure, positioned on the outer most aspect of the ankle and goes to the calcaneus (heel bone). The third band, anterior talofibular ligament, is flat and attaches to the front of the talus. It is this band of the ligament that is most frequently injured, by being stretched. The medical word or term for a stretched ligament is sprain.
**APPENDIX 4**

**BELIEFS ABOUT ANKLE SPRAINS AND PHYSIOTHERAPY SCALE**

Using the scale shown below, respond to the statements by writing the number in the box by each statement that best fits how you feel about it:

<table>
<thead>
<tr>
<th>Very strongly disagree</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Very strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

1. I feel my ankle sprain is a serious injury.
2. My ankle movements will not be painful.
3. I expect that I will have to change my usual exercise and sport activities.
4. Over the next few weeks putting the usual amount of weight through my ankle will not be a problem.
5. I am not likely to re-sprain my ankle.
6. Respraining my ankle will make me susceptible to arthritis.
7. Following my physiotherapy will reduce the risk of re-spraining my ankle.
8. Respraining my ankle will not make me susceptible to arthritis.
9. Failure to do my physiotherapy will result in re-spraining of my ankle.
10. Physiotherapy exercises are important for regaining normal ankle strength.
11. Painful physiotherapy treatments will cause more damage to my injured ankle.
12. Physiotherapy treatment given early after the injury will speed up recovery.
13. Physiotherapy treatment methods do not increase the rate of healing of ankle sprains.
14. It will be easy for me to follow the advice my physiotherapist gives me.
15. I am not confident in my ability to do the physiotherapy exercises.
16. The physiotherapy activities and exercises will be simple to do.
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>17.</td>
<td>I am confident I will attend all my physiotherapy clinic appointments.</td>
</tr>
<tr>
<td>18.</td>
<td>I will forget to do my home exercises.</td>
</tr>
<tr>
<td>19.</td>
<td>I will not have problems remembering to do my physiotherapy programme at home.</td>
</tr>
<tr>
<td>20.</td>
<td>I will have difficulty fitting my physiotherapy appointments in with my other daily activities.</td>
</tr>
</tbody>
</table>
APPENDIX 5
INTENTIONS TO ADHERE QUESTIONNAIRE

For each of the following statements, mark on the line the extent to which you agree with each.

‘I plan to follow all of the advice and do all of the exercises given to me for each of the specified home-based physiotherapy sessions for the duration of my rehabilitation.’

Extremely
Unlikely

‘I intend to attend all the physiotherapy clinic appointments required for the rehabilitation of my sprained ankle.’

Extremely
Unlikely

‘I will try to follow all of the advice and do all of the exercises given to me at each clinic-based physiotherapy session.’

Extremely
Unlikely

‘I plan to attend all the physiotherapy clinic appointments required for the rehabilitation of my sprained ankle.’

Extremely
Unlikely
‘I will try to follow all of the advice and do all of the exercises given to me for each of the specified home-based physiotherapy sessions for the duration of my rehabilitation.’

Extremely
Unlikely

‘I intend to follow all of the advice and do all of the exercises given to me at each clinic-based physiotherapy session.’

Extremely
Unlikely

‘I will try to attend all the physiotherapy clinic appointments required for the rehabilitation of my sprained ankle.’

Extremely
Unlikely

‘I intend to follow all of the advice and do all of the exercises given to me for each of the specified home-based physiotherapy sessions for the duration of my rehabilitation.’

Extremely
Unlikely

‘I plan to follow all of the advice and do all of the exercises given to me at each clinic-based physiotherapy session.’

Extremely
Unlikely
APPENDIX 6
DEMOGRAPHIC CHARACTERISTICS QUESTIONNAIRE

Please answer the following questions, where an option is given circle the response that is correct for you.

<table>
<thead>
<tr>
<th>Age in years:</th>
<th>Gender: Male/Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultural Affiliation:</td>
<td>Occupation:</td>
</tr>
<tr>
<td>New Zealand European/Pakeha</td>
<td>Employed in sport</td>
</tr>
<tr>
<td>New Zealand Maori</td>
<td>Employed in other work</td>
</tr>
<tr>
<td>Pacific Island</td>
<td>Unemployed</td>
</tr>
<tr>
<td>Other, please specify</td>
<td>Student</td>
</tr>
<tr>
<td></td>
<td>Retired</td>
</tr>
</tbody>
</table>

| Level of physical activity/sport participation: | Date of ankle sprain: |
| Recreational | Cause of sprain: |
| Competitive | |

| Did the sprain occur during physical activity/ participation in sport? | Yes/No |
| Date of ankle sprain: | |
| Cause of sprain: | |

For any previous injuries, provide the following information about each of them in the columns below:

<table>
<thead>
<tr>
<th>Sites and types of injuries</th>
<th>Did they occur during physical activity/sport or not? (YES/NO)</th>
<th>Approximate dates of when they occurred</th>
<th>Was it treated by physiotherapy? (YES/NO)</th>
</tr>
</thead>
</table>

Rate the level of ankle pain you have been experiencing since your sprain by circling one number on the scale where 0 means no pain and 10 means worst possible pain imaginable.

<table>
<thead>
<tr>
<th>No pain at all</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>Worst possible pain</th>
</tr>
</thead>
</table>
APPENDIX 7
PARTICIPANT INJURY AND TREATMENT INFORMATION

This questionnaire is to be completed by the either the physiotherapist or the researcher. Please answer the following questions about the participant’s injury and treatment, where an option is given circle the response that is appropriate for the participant.

<table>
<thead>
<tr>
<th>Severity of Ankle Sprain:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade I</td>
</tr>
<tr>
<td>Grade II</td>
</tr>
<tr>
<td>Grade III</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of scheduled or recommended physiotherapy treatments:</th>
<th>Number of physiotherapy treatments participant attended:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Attendance ratio:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>
PARTICIPANT INFORMATION SHEET FOR THE RESEARCH,
ADHERENCE TO SPORT INJURY REHABILITATION PROGRAMMES: A PILOT STUDY

Researchers: Sandra Frances Bassett (Principal Researcher) and Dr Harry Prapavessis (Senior Lecturer, Department of Sport and Exercise Science, The University of Auckland). Telephone 3737599 ext. 6631

We wish to invite you to volunteer to take part in this study, but before you accept this invitation would you please read the following outline of the study, the reasons for it, and your role in it. This study has received ethical approval from the Auckland Ethics Committee.

What is the purpose of this study?

The purpose of this study is to test the effectiveness of written information and questionnaires to be used in a larger study of adherence to sport injury rehabilitation programmes.

How were you selected to be asked to be part of the study?

Your name has been given to us by the physiotherapist who is to treat you for your ankle sprain.

Who can take part in this study?

People, who have sustained an ankle sprain for the first time, and are about to start a course of physiotherapy for this injury. They must be 16 years or older, and participate in either competitive or recreational sports. The recreational sports can be activities such as jogging, walking and other
keep fit exercises. It is also necessary to be able to read and understand written English. Forty-five people will be required for this study.

**What happens in this study?**

This study will take about thirty minutes of the participants' time, and is conducted just prior to the start of the first physiotherapy treatment for the sprained ankle. Initially, people who take part will be asked to answer some questionnaires about themselves and their ankle sprain. One questionnaire requests demographic information, such as age, gender, cultural affiliation, occupation, level of sport participation, date and cause of the sprain, and any previous physiotherapy. There are three other short questionnaires that measure the support you are receiving from other people and your motivation for doing the rehabilitation, and how you cope with pain.

After you have completed these questionnaires you will be randomly allocated to one of three groups. Two groups will read short explanations about ankle sprains, and then to watch a short video of about them, the third group will not be given any information. One explanation and video contain information about the symptoms of sprains and the physiotherapy rehabilitation programme. The other explanation and video outline the cost of injuries, how ankle sprains occur, and the structure of the most commonly damaged ankle ligament. If you are in one of these two groups once you have read the information and watched the video you will answer a questionnaire about what you think about your sprain, the rehabilitation, and your intentions about doing the physiotherapy rehabilitation. The group that does not receive any information about ankle injuries will also answer this questionnaire. Your physiotherapist will provide the researcher with the grading of your ankle sprain.

Once all the information has been collected, the questionnaire responses will be analysed to establish the effectiveness of the written information and the questionnaires. This analysis may lead to changes in the information and questionnaires before the next study of adherence to sport injury rehabilitation programmes is started. The study and its results will be written up in a report for the University of Auckland and published in an academic journal. A short version of this report will be given to the physiotherapists whose patients will take part in the study. Participants are also entitled to a short version of the report, or alternatively the outcomes of the study can be discussed with the researcher. However, there will be a delay between participation in the study and receiving information about the study.
What are the discomforts and risks?

There are no physical or psychological discomforts or risks associated with this study.

What are the benefits?

The information you could be given may improve your knowledge and understanding of ankle sprains. Your participation in this study will ensure the information and questionnaires to be used in the larger study of adherence to sport injury rehabilitation will be effective.

What compensation is available for injury or negligence?

In the unlikely event of you sustaining any injury during the time of your participation in this study you will be eligible for compensation under the Accident Compensation Corporation of New Zealand (ACC).

How is my privacy protected?

Your name will not be mentioned in any of the reports and therefore you will not be identifiable with the study. For the analysis of the questionnaires, they will be given a confidential coding, so as the information supplied by each participant can be linked. After this analysis, the questionnaires will be kept locked in a filing cabinet at the Department of Sport and Exercise Science, The University of Auckland for ten years.

Are there any costs for participating?

The only cost to you taking part in this study will be your time. There are no monetary costs for you at all.

When do I have to make a decision about taking part in this study?

You will need to make a decision about taking part in this study prior to having your first physiotherapy treatment for your sprained ankle. However, you are not under any obligation to take part in this study if you do not wish to.

Who can give me more information about this study?

If you need more information you may contact Sandra Bassett, who is the principal researcher and will be undertaking the research with the participants. Sandra can be contacted at 09-3737599 ext 6631. Alternatively the physiotherapist, who will be treating you, can give you information about the study.
Opportunity to consider the invitation

Thank you for taking the time to read this information sheet and for the interest you have shown in the study. If you do agree to take part you are free to withdraw from the study at any time, without having to give any reason and this will in no way affect the physiotherapy you are about to have for your sprained ankle, and other health care you may require. Should you wish to take part, please inform the researcher, Sandra Bassett, whom you have already met.

If you have any questions or concerns about your rights as a participant in this study you can contact the Health Advocates Trust, phone: 0800 555 050.

This study has been approved by the Auckland Ethics Committee Sandra Bassett (Principal Researcher and Ph.D. student, Department of Sport and Exercise Science, The University of Auckland).

August 2002
APPENDIX 9
CONSENT FORM STUDY 1

Department of Sport and Exercise Science,
Tamaki Campus

Title of Project: ADHERENCE TO SPORT INJURY REHABILITATION PROGRAMMES: A PILOT STUDY

Researchers: Sandra Frances Bassett and Dr Harry Prapavessis

Name of Participant:

I have read and I understand the information sheet, dated August 2002, for volunteers taking part in the study designed to investigate effectiveness of the written information and questionnaires to be used in future research of adherence to sport injury rehabilitation. I have had the opportunity to discuss this study and I am satisfied with the answers I have been given. I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time and this will in no way affect my future health care or continuing health care. I understand that my participation in this study is confidential and that no material, which could identify me will be used in any reports on this study. I understand the compensation provisions for this study. I have had time to consider whether to take part. I know to contact the researchers if I have any questions about the study. I also know that if I wish, I can receive a copy of the results of the study, but I do realise that there may be a delay between my participation in the study and publication of the results. I understand that my consent to take part does not alter my legal rights.

I ___________________________________________ (please print) consent to take part in this study.

Participant’s signature: __________________________ Date: ____________

In my opinion consent was given freely and with understanding.

Witness name (optional): __________________________ (please print)

Witness signature (optional): __________________________ Date: ____________

Researchers: Sandra Frances Bassett, Dr Harry Prapavessis, Telephone 3737599, extn 6631
This questionnaire is to be completed by the participant. Please answer the following questions, where an option is given circle the response that is correct for you.

<table>
<thead>
<tr>
<th>Age in years at last birthday:</th>
<th>Gender: Male/Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultural Affiliation:</td>
<td>What is your occupation/job?</td>
</tr>
<tr>
<td>New Zealand European/Pakeha</td>
<td></td>
</tr>
<tr>
<td>New Zealand Maori</td>
<td></td>
</tr>
<tr>
<td>Pacific Island</td>
<td></td>
</tr>
<tr>
<td>Other, please specify:</td>
<td></td>
</tr>
<tr>
<td>What is your occupation/job?</td>
<td></td>
</tr>
<tr>
<td>Is your income:</td>
<td></td>
</tr>
<tr>
<td>below $25,000/year</td>
<td></td>
</tr>
<tr>
<td>between $25,000 and $50,000/year</td>
<td></td>
</tr>
<tr>
<td>above $50,000/year</td>
<td></td>
</tr>
<tr>
<td>Level of regular recreational physical activity/sport participation:</td>
<td>Date of ankle sprain:</td>
</tr>
<tr>
<td>Recreational</td>
<td>Cause of sprain:</td>
</tr>
<tr>
<td>Competitive</td>
<td></td>
</tr>
<tr>
<td>No regular physical activity</td>
<td>Did the sprain occur during participation in regular recreational physical activity/sport?</td>
</tr>
<tr>
<td>Travel to the Clinic:</td>
<td>YES/NO</td>
</tr>
<tr>
<td>How far is the clinic from your home?</td>
<td></td>
</tr>
<tr>
<td>How far is the clinic from your workplace?</td>
<td></td>
</tr>
<tr>
<td>What form of transport do you use to get to the clinic?</td>
<td></td>
</tr>
<tr>
<td>Is the clinic on your usual route between home and work or other places of importance to you?</td>
<td></td>
</tr>
<tr>
<td>Why did you choose this clinic?</td>
<td></td>
</tr>
</tbody>
</table>
For any previous injuries, provide the following information about each of them in the columns below:

<table>
<thead>
<tr>
<th>Sites and types of injuries</th>
<th>Did they occur during sport or not? (YES/NO)</th>
<th>Approximate dates of when they occurred</th>
<th>Was it treated by physiotherapy? (YES/NO)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX 11

REASONS FOR ATTENDING PHYSIOTHERAPY QUESTIONNAIRE

Use the scale below to indicate how well each statement answers the question about why you are starting the physiotherapy for your injury, by writing the number in the box by each statement that best fits your feelings about it.

<table>
<thead>
<tr>
<th>Corresponds not at all</th>
<th>Corresponds very little</th>
<th>Corresponds a little</th>
<th>Corresponds moderately</th>
<th>Corresponds enough</th>
<th>Corresponds a lot</th>
<th>Corresponds exactly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

Why are you starting the physiotherapy?

1. Because I think that the physiotherapy will be interesting.
2. Because I am doing it for my own good.
3. Because I am supposed to do the physiotherapy.
4. There may be many good reasons to do the physiotherapy, but personally I don’t see any
5. Because I think the physiotherapy will be pleasant.
6. Because I think the physiotherapy will be good for me
7. Because it is something that I have to do.
8. I will do the rehabilitation but I am not sure that it will be worth it.
9. Because the physiotherapy will be fun.
10. By personal decision.
11. Because I don’t have any choice.
12. I don’t know; I don’t see what the physiotherapy will do for me.
13. Because I will feel good when doing the physiotherapy.
14. Because I believe the physiotherapy is important for me.
15. Because I feel that I have to do it.
16. I am doing the physiotherapy, but I am not sure it is a good thing to pursue it.
APPENDIX 12
PAIN QUESTIONNAIRE

To indicate how you normally cope with pain, respond to the two statements by writing the number that best fits how you feel about that statement in relation to your normal way of coping with pain.

<table>
<thead>
<tr>
<th>Extremely uncharacteristic of me</th>
<th>Somewhat uncharacteristic of me</th>
<th>Neither uncharacteristic nor characteristic of me</th>
<th>Somewhat characteristic of me</th>
<th>Extremely characteristic of me</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

I can persevere at stressful tasks, even when they are physically tiring or painful

I can persist in spite of pain or discomfort.

Rate the level of ankle pain you have been experiencing since your sprain by circling one number on the scale where 0 means no pain and 10 means worst possible pain imaginable.

<table>
<thead>
<tr>
<th>No pain at all</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>Worst possible pain</th>
</tr>
</thead>
</table>

APPENDIX 13

NORMATIVE BELIEFS SCALE

For each of the following statements circle the words and number that best indicate the extent to which you agree with the statement.

People in my life who are important to me think that I should follow my rehabilitation programme

People, whose opinion I value would want me to follow my rehabilitation.

It is expected of me that I will follow my rehabilitation programme.
APPENDIX 14

BELIEFS ABOUT ANKLE SPRAINS AND PHYSIOTHERAPY SCALE

Using the scale shown below, respond to the statements by writing the number in the box by each statement that best fits how you feel about the statement:

<table>
<thead>
<tr>
<th>Very strongly disagree</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Very strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

1. My ankle will be swollen for at least 10 to 15 days.  

2. I feel my ankle sprain is a serious injury  

3. I expect that over the next few weeks I will have to change my usual exercise and sport activities.  

4. Over the next few weeks putting the usual amount of weight through my ankle will not be a problem.  

5. My ankle movements will be painful for the next 10 to 15 days.  

6. Respraining my ankle will make me susceptible to arthritis.  

7. Following my physiotherapy programme will reduce the risk of respraining my ankle.  

8. Respraining my ankle will not make me susceptible to arthritis.  

9. Failure to do my physiotherapy will result in respraining of my ankle  

10. Physiotherapy exercises are important for regaining normal ankle strength.  

11. Physiotherapy treatment given early after the injury will speed up recovery  

12. I am confident that I will be able to do the balance activities despite my ankle’s instability.  

13. I am confident I will attend all my physiotherapy clinic appointments.  

14. I am not confident the physiotherapy activities and exercises will be easy to do.  

15. I am confident I will be able to follow the advice my physiotherapist gives me.
16. I am confident I can fit my physiotherapy home activities and exercises in with my other daily activities.

17. I am not confident in my ability to do the physiotherapy exercises.

18. I am not confident in fitting my physiotherapy clinic appointments in with my other daily activities.

19. I am confident I will find physiotherapy activities and exercises easy to do.

20. I am confident the pain in my ankle will not stop me doing the necessary physiotherapy activities and exercises.

21. I am confident I can handle the pain associated with the physiotherapy activities and exercises.

22. I am not confident I will remember to do my home exercises.
APPENDIX 15

INTENTIONS TO ADHERE TO PHYSIOTHERAPY SCALE

Using the scale shown below, respond to the statements by writing the number in the box by each statement that best fits how you feel about the statement:

<table>
<thead>
<tr>
<th>Very strongly disagree</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Very strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

1. I plan to follow all of the advice and do all of the exercises given to me for each of the specified home-based physiotherapy sessions for the duration of my rehabilitation.

2. I intend to follow all of the advice and do all of the exercises given to me at each clinic-based physiotherapy session.

3. I will try to attend all the physiotherapy clinic appointments required for the rehabilitation of my sprained ankle.

4. I intend to follow all of the advice and do all of the exercises given to me for each of the specified home-based physiotherapy sessions for the duration of my rehabilitation.

5. I plan to attend all the physiotherapy clinic appointments required for the rehabilitation of my sprained ankle.

6. I will try to follow all of the advice and do all of the exercises given to me at each clinic-based physiotherapy session.
APPENDIX 16
SPORT INJURY REHABILITATION ADHERENCE SCALE

To be completed by the physiotherapist at the end of each of the participant’s treatment sessions.

For each of the following circle the number that best indicates the patient’s behaviour:

1. The intensity with which the patient completed the rehabilitation exercises during today’s appointment

   minimum effort  1  2  3  4  5  maximum effort

2. During today’s appointment, how frequently did the patient follow your instructions and advice?

   never  1  2  3  4  5  Always

3. How receptive was this patient to changes in the rehabilitation programme during today’s appointment?

   very unresponsive  1  2  3  4  5  very receptive
APPENDIX 17
PARTICIPANT SELF-REPORT SCALES OF THEIR HOME-BASED
REHABILITATION ADHERENCE

Participants are to complete these at the beginning of each treatment session. For each of the treatment methods you been requested by your physiotherapist to do at home please circle the words and number that best indicates the extent you have followed the instructions about doing this form of treatment.

**Exercises**

<table>
<thead>
<tr>
<th>Not at all</th>
<th>A little</th>
<th>Rather regularly</th>
<th>Very regularly</th>
<th>As advised</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Refraining from undertaking the sporting and daily activities that the rehabilitation personnel advised not to do

<table>
<thead>
<tr>
<th>Not at all</th>
<th>A little</th>
<th>Rather regularly</th>
<th>Very regularly</th>
<th>As advised</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

**Application of Ice**

<table>
<thead>
<tr>
<th>Not at all</th>
<th>A little</th>
<th>Rather regularly</th>
<th>Very regularly</th>
<th>As advised</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

**Bandaging, and or Strapping or Bracing of the Ankle**

<table>
<thead>
<tr>
<th>Not at all</th>
<th>A little</th>
<th>Rather regularly</th>
<th>Very regularly</th>
<th>As advised</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

**Resting with Leg Elevated/Raised**

<table>
<thead>
<tr>
<th>Not at all</th>
<th>A little</th>
<th>Rather regularly</th>
<th>Very regularly</th>
<th>As advised</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
APPENDIX 18
LOWER LIMB TASKS QUESTIONNAIRE

Please rate your ability to do the following activities in the past 24 hours by circling the number below the appropriate response.

If you did not have the opportunity to perform an activity in the past 24 hours, please make your *best estimate* on which response would be the most accurate.

Please answer all questions.

<table>
<thead>
<tr>
<th></th>
<th>no difficulty</th>
<th>mild difficulty</th>
<th>moderate difficulty</th>
<th>severe difficulty</th>
<th>unable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Jog for 10 minutes</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. Pivot or twist quickly while walking</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. Jump for distance</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. Run fast/sprint</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. Stop and start quickly</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6. Jump upwards and land</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. Kick a ball</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8. Walk along a narrow (4 inches) plank without falling</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9. Pivot or twist quickly while running</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10. Step sideways quickly</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>11. Walk for 10 minutes</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>12. Walk up or down 10 steps (1 flight)</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>13. Stand for 10 minutes</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>14. Stand for a typical work day</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>15. Lift and carry heavy groceries</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>16. Get on and off a bus</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>17. Get up from a lounge chair</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>18. Push or pull a heavy trolley</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
Participants are to attempt only the activities that they feel capable of doing. For each of the activities:

1 = the participant successfully completed the activity.
0 = the task was not attempted or not completed successfully.

Tick (✓) in the column that indicates the patient’s ability at doing the task.
All one-legged activities are attempted on the injured limb.

<table>
<thead>
<tr>
<th>Activity</th>
<th>0</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 metre walk (FWB without crutches)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40 metre run</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Figure-8 run (2 laps, 6 metres between the cones)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single hop (affected limb must clear the ground at each hop and for a distance of 6 metres)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cross-over hop (for a distance of 6 metres)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stair hop (up and down 14 steps, may use hand rail for stability, but not to pull or push on)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PARTICIPANT INFORMATION SHEET FOR THE RESEARCH,
ADHERENCE TO PHYSIOTHERAPY REHABILITATION FOR ANKLE SPRAINS.

Lead Investigators: Sandra Frances Bassett (Principal Researcher) and Dr Harry Prapavessis (Senior Lecturer, Department of Sport and Exercise Science, The University of Auckland). Telephone (09)3737599 ext. 86631

We wish to invite you to volunteer to take part in this study, but before you accept this invitation would you please read the following outline of the study, the reasons for it, and your role in it.

What is the purpose of this study?

The purpose of this study is to test the effect of video and written information on people’s adherence to physiotherapy for ankle sprains and their recovery from this injury.

How were you selected to be asked to be part of the study?

Your name has been given to us by the physiotherapist who will treat you for your ankle sprain.

Who can take part in this study?

People, who have sustained an ankle sprain and are about to start a course of physiotherapy for this injury. They must be 16 years or older, and may or may not participate in either competitive or recreational sports. The recreational sports can be activities such as jogging, walking and other keep fit exercises. It is also necessary to be able to read and understand written English. Seventy-five people will be required for this study.
What happens in this study?

This study will last for the duration of the course of physiotherapy for your ankle sprain. Prior to the first physiotherapy treatment you will be required to answer some questionnaires. These are about demographic characteristics (age, gender, cultural affiliation, occupation, level of sport participation), date and cause of the sprain, previous physiotherapy, the support you are receiving from other people, your motivation for doing the physiotherapy, pain tolerance, and ability to perform some lower limb activities. Also your ankle function will be assessed. Then you will be randomly allocated to one of three groups. Two groups will watch a short video and read a brief explanation about ankle sprains, and the third group will not be given this information. Next all participants will answer a questionnaire about what you think about your sprain, the physiotherapy, and your intentions to follow the physiotherapy.

Your physiotherapy will proceed as normal, and at each treatment your adherence to the clinic- and home-based physiotherapy will be measured. Halfway through the course of physiotherapy those in the two information groups you will be given the information again. At the last treatment your ankle function will be re-tested and you will answer the questionnaires about your attitudes to your ankle sprain and the lower limb activities. Your physiotherapist will provide the researcher with the grading of your ankle sprain, your rate of recovery, and the number of treatments you needed and attended.

Once all the information has been collected, the questionnaire responses will be analysed to establish the effect that the video and written information has had on people’s adherence to the physiotherapy for their ankle sprain and their recovery from the injury. The study and its results will be written up in a report for the University of Auckland, published in academic journals, and presented at academic and physiotherapy conferences. A short version of this report will be given to the physiotherapists whose patients take part in the study. Participants are also entitled to a short version of the report, or alternatively the outcomes of the study can be discussed with the researcher. However, there will be a delay between participation in the study and receiving information about the study.

What are the discomforts and risks?

There are no physical or psychological discomforts or risks associated with this study.
What are the benefits?

The information you will be given may improve your knowledge and understanding of ankle sprains, their prevention and physiotherapy. The results of this study will help physiotherapists inform their patients about their injury and treatment in a more meaningful manner.

What compensation is available for injury or negligence?

In the unlikely event of you sustaining an injury at the time of your participation in this study you will be eligible for compensation under the Accident Compensation Corporation of New Zealand (ACC). Should you have any questions about ACC, contact your nearest ACC office (freephone 0800 735 566, the ACC website (www.acc.co.nz/claimscare/making-a-Claim/medical misadventure/index.html), or Sandra Bassett, a lead investigator.

How is my privacy protected?

Your name will not be mentioned in any of the reports and therefore you will not be identifiable with the study. For the analysis of the questionnaires, they will be given a confidential coding, so as the information supplied by each participant can be linked. After this analysis, the questionnaires will be kept locked in a filing cabinet at the Department of Sport and Exercise Science, The University of Auckland for ten years.

Are there any costs for participating?

The only cost to you taking part in this study will be no more than one hour over the entire duration of your course of physiotherapy. There are no monetary costs involved.

When do I have to make a decision about taking part in this study?

You will need to make a decision about taking part in this study prior to starting the course of physiotherapy for your sprained ankle. However, you are not under any obligation to take part in this study if you do not wish to.

Who can give me more information about this study?

If you need more information you may contact Sandra Bassett, who is the principal researcher and will be working with the participants during the research. Sandra can be contacted at 09-3737599 ext 86631. Alternatively the physiotherapist, who will be treating you, can give you more information about the study.
Opportunity to consider the invitation

Thank you for taking the time to read this information sheet and for the interest you have shown in the study. If you agree to take part you are free to withdraw from the study at any time, without having to give any reason and this will in no way affect the physiotherapy you are receiving, and other health care you may require. Should you wish to take part, please inform the researcher, Sandra Bassett, whom has already been in contact with you.

If you have any questions or concerns about your rights as a participant in this study you can contact the Health Advocates Trust, phone 0800 555 050.

This study has been approved by the Auckland Ethics Committee Sandra Bassett (Principal Researcher and Ph.D. student, Department of Sport and Exercise Science, The University of Auckland).

July 2003
APPENDIX 21
CONSENT FORM STUDY 2

Title of Project: **ADHERENCE TO PHYSIOTHERAPY REHABILITATION FOR ANKLE SPRAINS**

Researchers: **Sandra Frances Bassett and Dr Harry Prapavessis**

Name of Participant: 

I have read and understood the information sheet, dated July 2003, about the research to investigate the effect of video and written information on adherence to physiotherapy for ankle sprains and recovery from this injury. I have had the opportunity to discuss this study with the researcher and am satisfied with the answers I have been given. I understand that taking part in this study is voluntary and that should I decide to withdraw from it, my current and future health care will not be disadvantaged in any way. I know that my participation in this study is confidential and that I will not be identifiable with the study in any of its reports. I also understand the compensation provisions for this study.

I have had time to consider whether to take part and know to contact the researchers should I have any further questions. I also know that I can receive a copy of the results of the study, but do realise that there may be a delay between my participation in the study and publication of the results. I understand that my consent to take part does not alter my legal rights.

I __________________________________________________________________________ (please print) consent to take part in this study.

Participant’s signature: __________________________________________________________________________ Date: __________

In my opinion consent was given freely and with understanding.

Project explained by: __________________________________________________________________________ (please print)

Signature: __________________________________________________________________________ Date: __________

I wish to receive a copy of a short report about the outcomes of this study YES/NO

Researchers: Sandra Frances Bassett, Dr Harry Prapavessis, Telephone 3737599, extn 86631
APPENDIX 22
SOCIAL SUPPORT SCALE

Write the number from the scale below that best indicates the extent to which you agree with each of the statements.

<table>
<thead>
<tr>
<th>Very strongly disagree</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Very strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

1. People who are important to me think that I should follow my rehabilitation programme.

2. People whose opinion I value would want me to follow my rehabilitation.

3. It is expected of me that I will follow my rehabilitation programme.

4. People who are important to me will give me encouragement to stick with my physiotherapy.

5. People who are important to me will give me helpful reminders to do the physiotherapy.

6. People who are important to me will be angry with me doing my physiotherapy.

7. People who are important to me will give me rewards for doing my physiotherapy.
APPENDIX 23

RECOVERY LOCUS OF CONTROL SCALE

Using the scale shown below, respond to the statements by writing the number in the box by each statement that best fits how you feel about the statement:

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

1. How I manage in the future depends upon me not on what other people can do for me.
2. It’s what I do to help myself that’s really going to make all the difference.
3. It’s up to me to make sure I make the best recovery possible under the circumstances.
4. Getting better now is a matter of my own determination rather than anything else.
5. It doesn’t matter how much help you get, in the end it’s your own efforts that count.
6. It’s often best to just wait and see what happens.
7. My own efforts are not very important, my recovery really depends on others.
8. My own contribution to my recovery doesn’t amount to much.
9. I have little or no control over my own progress from now on.
APPENDIX 24

STATE-TRAIT ANXIETY INVENTORY (STAI)

A number of statements which people have used to describe themselves are given below. Read each statement and, using the scale below, write the appropriate number in the space to the right of the statement to indicate how you feel about your ankle sprain and physiotherapy. There are no right or wrong answers.

Do not spend too much time on any one statement but give the answer that seems to describe how you feel right now.

1 2 3 4
Almost never Sometimes Often Almost always

1. I feel pleasant
2. I tire quickly
3. I feel like crying
4. I wish I could be happy as others seem to be
5. I am losing out on things because I can’t make up my mind soon enough
6. I feel rested
7. I feel calm
8. I am “cool, calm and collected”
9. I feel that difficulties are piling up so that I cannot overcome them
10. I am worry too much over something that doesn’t really matter
11. I am happy
12. I am inclined to take things hard
13. I lack self-confidence
14. I feel secure
15. I feel blue
16. I am content
17. Some unimportant thought runs through my mind and bothers me
18. I take disappointments so keenly I can’t put them out of my mind
19. I am a steady person
20. I get in a state of tension or turmoil as I think over my recent concerns and interests
APPENDIX 25
BOOKLET

HOME-BASED PHYSIOTHERAPY PROGRAMME
FOR ANKLE SPRAINS:
PATIENT INFORMATION BOOKLET
INSTRUCTIONS ON HOW TO USE THIS BOOK

1. Always follow the advice of your physiotherapist. He/she will tell you the correct way of doing the exercises and other activities.

2. Ensure that all the information about the exercises and other physiotherapy activities for each stage is clearly explained in the booklet.

This booklet is laid out in sections. The first part is about the part of the ankle most frequently sprained, then a bit about sprains and how you can avoid further injury to your ankle, a brief outline of the physiotherapy and its beneficial effects. Then a list of suggestions on how you can remember to do your exercises is presented. Use these suggestions and any others you find successful in your daily life for remembering to keep appointments or do other activities.

Then it is divided up into the three phases of physiotherapy and in each of these sections the some of the most commonly used exercises and treatment methods are explained. Diagrams and photographs of some of these are provided to give you a visual idea of how to do them. Your physiotherapist may prescribe other activities that will be as equally as good, and no doubt he/she has found these to be very successful in the treatment of ankle sprains.

You are expected to interact with the booklet in several areas. With your physiotherapist, record your ankle sprain grading on page , and also at the beginning of each phase of physiotherapy fill in how long it is expected you will take to be ready for the next phase. You will need to complete the activity diary sheets for each phase by writing each activity in the space provided and then recording the number of repetitions you do the exercise or the duration of time you spend doing the activity. Your physiotherapist will instruct you about whether repetitions or duration are to be recorded for each activity.

Don’t forget to make your appointments to coincide with these times.

If you have any worries about your ankle sprain and the symptoms, the progress you are making and how you are doing the exercises please contact your physiotherapist. Do not delay making this contact, it is best to be reassured that you are making the expected progress than to worry unnecessarily about how you are going. Your physiotherapist can be contacted by phone at between the hours of  and . Alternatively attach his/her card and hours of contact into the booklet.
STRUCTURE OF THE OUTER SIDE OF THE ANKLE

The diagram of the side view of the ankle shows the three bands of the lateral (outside) ligament of the ankle. These bands join the bony prominence on the outer side of the leg (fibula) to two of the foot bones. The posterior talofibular ligament is a thick band and goes to the back of the talus (ankle bone). The calcaneofibular ligament is a round cord like structure, on the outer most aspect of the ankle and goes to the calcaneus (heel bone). The anterior talofibular ligament is flat and attaches to the front of the talus. It is this band of the ligament that is most frequently injured, by being stretched or torn as shown in the diagram below. The medical word or term for a stretched or torn ligament is sprain.

ANKLE SPRAINS

Ankle sprains should be taken seriously as there is to a 70% chance of long-term disability occurring. Initially your ankle and foot are likely to be bruised, swollen, very painful to move and put weight through, but these symptoms will decrease over the first few days following the sprain. For four to six weeks after your sprain your ankle will be weak and unstable. This will cause you to ‘go over’ or ‘roll over’ on your ankle when walking. You will have difficulty with balance activities and be unsteady in many of your every day activities. It could take up to three months for you to regain a high enough fitness level to be able to exercise regularly and participate in sport. You may even need to change your exercise and sport activities permanently, because of your sprain.

The most common long-term problem you are likely to develop is an unstable ankle, which will ‘give way’ or ‘roll over’ when you are walking or running, especially over uneven ground, or changing direction suddenly. A vicious cycle is then set up where the more you sprain your ankle the more it gets damaged, and the more likely you are to sprain it again. If this cycle of re-injury continues you will develop arthritis in your ankle. Respraining frequently occurs when people do not follow the required physiotherapy programme, so it is really important that you follow the physiotherapist’s advice.
Grades of Ankle Sprains

Ankle sprains are graded according to the severity.

Grade I

• Ligament stretched.
• Mild sprain, with mild pain and little swelling and joint stiffness.
• There may be very laxity (loosening) of the ligament.
• The ankle remains fairly stable.
• Can return to activity within a few days of the injury (with some form of ankle support).

Grade II

• Partial tear of ligament.
• Moderate to severe pain, swelling and stiffness.
• Moderate loss of function, with difficulty on toe raises and walking.
• Takes up to two to three months before regaining close to full strength and stability in the joint.

Grade III

• Complete rupture of the ligaments.
• Severe pain, swelling and stiffness.
• Complete loss of ankle function, and may require crutches for several days.
• In a few cases surgical repair may be required.
• Recovery can take up to four months, and full strength and stability may never be completely regained.

Your ankle sprain is a Grade  (   ) and it is expected that if you progress as normal for that grade you should be back to your normal daily and sporting activities in about weeks/months.

Physiotherapy treatment

Physiotherapy is effective in hastening recovery from ankle sprains, and the earlier it is started the quicker the recovery. The course of physiotherapy consists of techniques and exercises that are progressed as your ankle improves, and is divided into three phases; acute, mobilising, and strengthening and coordination. The duration of each phase will depend upon the severity of the sprain. While some physiotherapy activities may cause pain, don’t be afraid to do them as they will not damage your ankle. However the physiotherapy is only of benefit if you do all the activities the physiotherapist recommends. This may mean that you will have to do several physiotherapy sessions daily.
STRATEGIES FOR REMEMBERING TO DO THE PHYSIOTHERAPY

It is important that the physiotherapy becomes another one of your daily routines. Any methods you use in your daily life you find are successful for helping you remember to keep appointments or do other important daily activities will be valuable strategies for to use during your physiotherapy. Some strategies that have found to be helpful for remembering to do physiotherapy home management programmes are:

1. Leave this book in a place where it is very noticeable and you will not miss it. In this way the booklet becomes a cue for you remembering to do you physiotherapy.

2. Put the cue cards in very noticeable places around your home or work, such on the fridge (use the magnets), by the telephone, by your bed, or at your work desk.

3. Do the physiotherapy in conjunction with other regular daily activities, such as exercising while watching TV or talking on the phone, at meal time or bed-time. The best activities to do your physiotherapy in conjunction with are those you continue to do when you change your normal daily routine. Once you decide on which activities are the best, then stick with them.

4. If you are changing your daily routine, such as going on holiday, don’t forget to continue your physiotherapy activities. To try to keep the usual routine of the activities going, such as doing the exercises at same time as you would have at home and in conjunction with the same activities. Also take your cue cards with you and put them in places where you will see them, but remember to bring them back with you.

5. Think of ways of overcoming the barriers that you think will hinder you doing the physiotherapy. For example many people say they do have time to do their physiotherapy, but in reality they find they are able to find more than enough time.

6. Use the goals to act as an incentive to do physiotherapy and read them regularly so as they keep you on track. If you are not making the progress you would like to be, think about why this may be happening and where possible try to overcome any barriers.

7. The researcher will prompt you on a daily basis by either text messaging, e-mails or phone messages. Make sure the method you select is the one that is most readily accessible to you.

8. Make the physiotherapy appointments to get the home physiotherapy activities upgraded at times that fit in with your other daily activities, such as work and study.
THE ACUTE PHASE

The acute phase is usually quite short, only lasting for about the first two to three days after the sprain has occurred. Physiotherapy during this time aimed at reducing the swelling, pain and bleeding (bruising). Rest, ice, compression and elevation (RICE) are the main mainstays of treatment. Applying ice early reduces the bleeding, swelling and pain, and speeds up your return to your normal activities. Pain and swelling are decreased by elevating your foot and ankle, having the ankle taped and bandaged all the time, and not doing too many weight bearing activities in the first 24 hours. When you do start to put weight through your ankle, support it by taping or splinting it.

During the first 24 hours after your injury, avoid hot showers, heat rubs, hot packs, drinking alcohol, and taking aspirin as they may aggravate your sprained ankle.

Goal

Within ________ days the swelling and pain will be reduced, and you will be able to weight bear to some extent through your ankle.

Suggested Physiotherapy Activities

The mainstay of physiotherapy at this stage is RICE:

Rest

Avoid any unnecessary movement and weight bearing activities (such as walking) for approximately 24 hours. Do not do the daily and sports activities that your physiotherapist has advised you not to do. Gentle ankle exercises, such as pointing your toes up and down can usually be started 24 hours after the sprain.

The activities you have been advised not to do are:

Ice

Ice your ankle for 15 to 20 minutes, 3 to 5 times per day, for the first 24 to 72 hours. Leave ice off for at least 1.5 hours between applications. Use a freezer pack that can be moulded to your ankle or a packet of frozen vegetables, such as peas or corn. Wrap the pack in a towel, and do not apply it directly to the skin as it may cause a burn.
Compression

Keep your ankle taped and have a compression bandage or firm tubigrip on at all times. Taping or strapping the ankle helps to protect the ligaments. If you use a compression bandage make sure your toes don’t turn blue, and wrap the bandage, using even pressure, from the toes up to the mid-calf (see the diagram below).

Taped ankle Compression bandage

There are two common myths about taping, (1) that it will make your ankle weaker and (2) it replaces strengthening exercises. Both are false, taping will not make your ankle weaker, and you will need to do strengthening exercise later in your rehabilitation.

Elevation

Whenever you are lying down or sitting put you injured up or elevated. In sitting rest your foot and ankle on a stool, and when lying down have your ankle above the level of your heart or hip. In both positions put a pillow under your leg to make it more comfortable. Elevation reduces the pain and swelling.

When the pain and swelling is starting to decrease begin putting as much weight as possible through your ankle. Progress the simple ankle movements by adding holds at then end of the movement. Make sure that no unnecessary pain is caused by any of the physiotherapy activities and exercises.
Phase 1 Treatment Methods and Diary Recording Sheets

You have been prescribed the following activities, each time you do them record either the duration or the number of repetitions for each activity:

**Activity:**

Prescription (duration/sessions and repetitions):

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MOBILISING PHASE

The mobilising phase commences once the pain and swelling have decreased, and the ankle feels easier to move. The exercises and activities in this stage are directed towards increasing your range of ankle movement and starting to improve muscle strength. Movements are gradually progressed from being free active with no resistance to more strenuous activities that may include using light resistance. Stretching exercises to improve the flexibility of your ankle are also started. Always tape your ankle prior to doing any weight bearing activities and strenuous exercises. You may experience a small amount of pain with some of the exercises, but it should not be unbearable. Stop any activities that do cause excessive pain. Still avoid doing any physical activities that your physiotherapist has advised against.

Goal

By the end of this phase in ___ days I will be able to do the maximum number of free active ankle exercises and resisted exercises prescribed, and be able to bear weight through my ankle in standing without causing any pain.

Suggested Physiotherapy Activities

Free Active Ankle Exercises

Situated or lying, move your foot and ankle up and down, and in and out as shown below. Another exercise is to move your foot around in circles.

Up and down movement of the foot

Progress the free active ankle exercises by increasing the range of movement, including holds at the end of range, and increasing the duration of the holds.
**Strengthening Exercises**

As your ligament heals, and the range of ankle movement increases you will be able to begin some simple strengthening exercises. These exercises should not cause excessive pain.

Pushing foot sideways against the wall, or heavy object, and hold for three seconds at least.

Use your non-injured limb as resistance by putting it on top of your injured limb. Push your injured foot up against the non-injured one, and hold for at least three seconds.

Sitting, with injured foot flat on the floor, using your toes to scrunch a towel underneath your foot.

Progress each of these exercises by increasing the length of time you hold the movement at the end of the range.
**Stretches or Flexibility Exercises**

These exercises will help to loosen your tight leg muscles, and make it easier for you to use stairs, walk, run and jump. Hold each of these exercises/stretches for 15 seconds. Do not bounce during the hold.

**Calf Stretch**

Sit with your knee straight and a towel looped around the ball of your injured foot. Use the towel to slowly pull your foot towards you, until you feel your upper calf stretch.

Once you can stand progress to

Lean forwards with your arms outstretched and hands placed flat on a wall. With your injured limb straight, place it behind the other, with the toes pointing forward. Keep heels on floor, and slowly bend the front until you feel the calf of back leg stretch.

**Heel Stretch**

Sit with your knees slightly bent, with a towel looped around the ball of the foot. Use the towel to slowly pull your foot towards you until you feel a stretch in your lower calf and heel.

Once you can stand progress to

Leaning forwards with your hands flat on a wall, with your injured limb behind the other, your toes pointing forward, your heels flat on the ground, and front knee slightly bent. Slowly bend the back knee until you feel a stretch in the back of the lower leg.
Phase 2 Treatment Methods and Diary Recording Sheets

You have been prescribed the following activities, each time you do them record either the duration or the number of repetitions for each activity:

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STRENGTHENING AND MOBILISING PHASE

This phase commences when your free active ankle movements and walking are nearly normal. Stretching exercises are continued and the strengthening exercises are progressed to full range resisted exercises. Balance or coordination exercises are commenced and progressed. Weight bearing activities such as walking, running, skipping and hopping are started in preparation for returning to your usual sport and physical activities. Return to these daily activities gradually and monitor your ankle throughout the return. At the end of this phase you will be discharged from the formal physiotherapy programme, but it is strongly recommended that you keep on with some of the exercises from this phase in an effort to reduce the risk of further reinjury.

Goal

By the end of this phase in __________ days I will be able to do the maximum number of strengthening and co-ordination exercises prescribed without causing any undue pain, and will be gradually getting back into my usual sporting and physical activities.

Suggested Physiotherapy Activities

Strengthening Exercises

These are done throughout the range of movement (isotonic), and in all directions. The resistance applied can be your body weight, the other limb and theraband.

Theraband Resistance

Theraband is an elastic band that comes in different strengths as indicated by its colour, red is light weight, green medium, and blue heavy). It is only effective as a resistance if your foot is pulling against it. You can hold onto the ends of the theraband and pull against it for the outwards and downwards movements. For upwards movement of the foot you will need to either attach the band to a stable piece of furniture or get another person to hold onto it.

Progress the theraband exercises by increasing the range of movement, length time you hold against the theraband at the end of the movement, and the weight/strength of theraband.
Body Weight Resistance

Once you are able to weight bear fully, then you can do strengthening exercises in standing.

Balance or Co-ordination Exercises

These are done in standing, progressed from standing on a stable surface to standing on an unstable surface.

Standing on Injured Limb on a Stable Surface

Start by standing on the injured limb for long as possible with your eyes open, and gradually the length of time you stand in this position. The position of your arms can also make the exercise more difficult, start with them out to help you keep your balance. To make it even harder, try standing with your eyes closed.

Progress by increasing the time you stand on your injured limb, change your arm position to down by your side then to folded across your chest. Once you are stable with your arms folded, try standing with your eyes closed.
Standing on an Unstable Surface
Use a balance/wobble board or a mini-trampoline for these exercises.

Progress by keeping the board as still as possible, or standing as still as possible on a mini trampoline, then try catching and throwing a ball, standing with your eyes closed and finally standing on your injured limb.

Weight bearing Activities
Walking, running, hopping, and skipping are weight bearing activities. To do these have your ankle taped or strapped, and make sure you do not experience any undue pain or weakness while doing them. It is important to practice these activities before starting back at your sport. Only go back to sport when you can do these activities easily.

Progress from walking to running to skipping to hopping, and increase the length of time you spend doing each of these activities.
Phase 3 Treatment Methods and Diary Recording Sheets

You have been prescribed the following activities, each time you do them record either the duration or the number of repetitions for each activity:

**Activity:**

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ADDITIONAL DIARY SHEETS

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APPENDIX 26
CUE CARDS

Have you done your physiotherapy?

• Physiotherapy hastens the recovery from ankle sprains by:
  – Reducing the swelling and pain
  – Improving the movement
  – Strengthening the ankle
  – Improving ankle stability
  – Reducing the risk of respraining

Exercises must be done regularly

• Exercises for ankle sprains will hasten the improvement of the ankle’s
  – Range of movement
  – Strength
• And your ability to be better at:
  – Standing Balance
  – Co-ordination

Don’t forget to do the physiotherapy

• Physiotherapy:
  – reduces the pain and swelling
  – improves the range of movement
  – strengthens the ankle
  – improves the balance
  – improves the coordination
  – gets you back to your normal sport and daily activities quickly
  – reduces the risk of respraining
Remember to do your physiotherapy

- Physiotherapy done regularly for ankle sprains:
  - Reduces the pain
  - Reduces the swelling
  - Improves the movement
  - Increases the strength
  - Improves your standing balance
  - Improves your walking

You will be able to do the balancing act

Physiotherapy is important for your recovery

- Doing your physiotherapy will get you back to normal life a lot faster

- By not doing your physiotherapy you will be like this for a lot longer

Physiotherapy is Important

Doing your physiotherapy regularly will get you back to your normal sport, work and other daily activities.
PARTICIPANT INFORMATION SHEET FOR THE RESEARCH,
COMPARISON OF HOME- AND CLINIC-BASED PHYSIOTHERAPY FOR ANKLE SPRAINS.

Lead Investigators: Sandra Frances Bassett (Principal Researcher) and Dr Harry Prapavessis (Senior Lecturer, Department of Sport and Exercise Science, The University of Auckland). Telephone (09)3737599 ext. 86631

We wish to invite you to volunteer to take part in this study, but before you accept this invitation would you please read the following outline of the study, the reasons for it, and your role in it.

What is the purpose of this study?

The purpose of this study is to compare the effectiveness of a home-based physiotherapy programme steeped in adherence enhancing strategies with its traditional clinic-based equivalent for patients with sprained ankles.

How were you selected to be asked to be part of the study?

Your name has been given to us by the physiotherapist who will treat you for your ankle sprain.

Who can take part in this study?

People, who have sustained an ankle sprain and are about to start a course of physiotherapy for this injury. They must be 16 years or older, and must be able to read and understand written English. Fifty people will be required for this study.

What happens in this study?

This study will last for the duration of the course of physiotherapy for your ankle sprain. Prior to the first physiotherapy treatment you will be
required to answer questionnaires about demographic characteristics (age, gender, cultural affiliation, occupation, level of sport participation), date and cause of the sprain, previous physiotherapy, your attitudes to your injury and physiotherapy, and pain tolerance. Your ankle function will also be assessed. Then you will be randomly allocated to one of two groups, the home- or clinic-based physiotherapy. The physiotherapy treatment techniques will be similar for both groups. The clinic-based group will need about six to eight physiotherapy clinic treatments, along with some activities to do at home between each appointment.

Participants in the home-based group will only be required to attend four appointments, and will undertake most of their physiotherapy at home. They will be supplied with an information booklet outlining the physiotherapy programme and how and when to progress it, as well as advice about how best to remember to do the treatment activities. These participants will be loaned equipment necessary to enable them to undertake the physiotherapy at home properly, and they will be informed about how to contact the physiotherapist if they have any concerns about their injury and treatment.

During each clinic treatment all participants’ adherence to the clinic- and home-based physiotherapy will be measured. At the last treatment your ankle function will be re-tested and you will answer the questionnaires about your attitudes to the physiotherapy and ankle sprain. Your physiotherapist will provide the researcher with the grading of your ankle sprain, and the number of treatments you needed and attended.

Once all the information has been collected, the questionnaire responses will be analysed to establish the effectiveness of the physiotherapy programmes. The study and its results will be written up in a report for the University of Auckland, published in academic journals, and presented at academic and physiotherapy conferences. A short version of this report will be given to the physiotherapists whose patients take part in the study, and to those participants who would like a copy, or alternatively it can be discussed with the researcher. However, there will be a delay between participation in the study and receiving information about the study.

**What are the discomforts and risks?**

There are no physical or psychological discomforts or risks associated with this study.
What are the benefits?

By participating in this study you may develop a better understanding of ankle sprains and their treatment. If either or both programmes are proved effective, then this evidence will be valuable to physiotherapists, their patients, and Accident Compensation Corporation (ACC). Should the home-based physiotherapy be found to be successful then there will be advantages in the for future physiotherapy patients who have limited financial resources and time that may prevent them from attending all the physiotherapy appointments required for their full recovery.

What compensation is available for injury or negligence?

In the unlikely event of you sustaining an injury at the time of your participation in this study you will be eligible for compensation under ACC. Should you have any questions about ACC, contact your nearest ACC office (freephone 0800 735 566), the ACC website (www.acc.co.nz/claimscare/making-a-Claim/medical misadventure/index.html), or Sandra Bassett, the lead investigator.

How is my privacy protected?

Your name will not be mentioned in any of the reports and therefore you will not be identifiable with the study. For the analysis of the questionnaires, they will be given a confidential coding, so as the information supplied by each participant can be linked. After this analysis, the questionnaires will be kept locked in a filing cabinet at the Department of Sport and Exercise Science, The University of Auckland, for ten years.

Are there any costs for participating?

The only cost to you taking part in this study will be no more than one hour over the entire duration of your course of physiotherapy. There are no monetary costs involved. People in the home-based group will not be expected to buy any of the equipment for their treatment, this will be loaned to them for the time of their physiotherapy.

When do I have to make a decision about taking part in this study?

You will need to make a decision about taking part in this study prior to starting the course of physiotherapy for your sprained ankle. However, you are not under any obligation to participate in this study if you do not wish to.
Who can give me more information about this study?

If you need more information you may contact Sandra Bassett, who is the principal researcher and will be working with the participants during the research. Sandra can be contacted at 09-3737599 ext 86631. Alternatively the physiotherapist, who will be treating you, can give you more information about the study.

Opportunity to consider the invitation

Thank you for taking the time to read this information sheet and for the interest you have shown in the study. If you agree to take part you are free to withdraw from the study at any time, without having to give any reason and this will in no way affect the physiotherapy you are receiving, and other health care you may require. Should you wish to take part, please tell your physiotherapist or the researcher, Sandra Bassett.

If you have any questions or concerns about your rights as a participant in this study you can contact the Health Advocates Trust, phone 0800 555 050.

This study has received ethical approval from the Auckland Ethics Committee.

Sandra Bassett (Principal Researcher and Ph.D. student, Department of Sport and Exercise Science, The University of Auckland).

October 2003
APPENDIX 28
CONSENT FORM STUDY 3

Title of Project: **A COMPARISON OF HOME- AND CLINIC-BASED PHYSIOTHERAPY FOR ANKLE SPRAINS.**

Researchers: **Sandra Bassett, Dr Harry Prapavessis**

Name of Participant:

I have:

- Read and understood the participant information sheet dated September 2003, about the research that will compare the effectiveness of home-based physiotherapy programme steeped in adherence enhancing strategies with the traditional equivalent clinic-based programme for the treatment of ankle sprains.
- Had the opportunity to discuss this study with the researcher and I am satisfied with the answers that I have been given.

I understand:

- That taking part in this study is voluntary, and that should I decide to withdraw from it my future health care will not be disadvantaged in any way.
- That my participation in this study is confidential and in no way will I be identifiable with it in any of the reports.
- The compensation provisions for this study.

Also I:

- Have had time to consider whether to take part, and know to contact the researchers should I have any further questions.
- Know that if I wish, I can receive a copy of the results of the study, but I do realise that there may be a delay between my participation in the study and publication of the results.

I ____________________________ (please print) consent to take part in this study.

Participant’s signature: ____________________________ Date: ______________

In my opinion consent was given freely and with understanding.

Witness name: ____________________________ (please print)

Signature: ____________________________ Date: ______________

I wish to receive a copy of a short report about the outcomes of this study YES/NO

Researchers: Sandra F. Bassett, Telephone 093737599, extn 86631, Dr Harry Prapavessis, Telephone 093737599 extn. 86860
REFERENCES


Cherkin, D. C., Eisenberg, D., Sherman, K. D., Barlow, W., Kaptchuk, T. J., Street, J., et al. (2001). Randomized trial comparing traditional Chinese medical acupuncture,
therapeutic massage, and self-care education for chronic low back pain. *Archives of Internal Medicine, 161,* 1081-1088.


