Osteoarthritis is a joint disease characterized by a loss of articular cartilage and structural changes to the ligaments, muscle and bones ends that can lead to pain and a loss of function, and primarily affects the knee and hip joints (Goldring & Goldring, 2003). It is a result of mechanical
breakdown of the structures within the joints, in particular the hyaline cartilage (Brooks, 2003). Osteoarthritis is also known as "wear and tear" or "degenerative" arthritis, but there is growing evidence that an inflammatory component may also be present (Brooks, 2003). The disease often causes a decrease in people’s activity that can lead to a loss of muscle strength, balance and bone density. The consequence of these deficits can be a reduction in independence, mental health and quality of life for people with osteoarthritis (Cook, Pietrobon, & Hegedus, 2007; Wise et al., 2010). In New Zealand, it is reported that 60% of people over the age of 65 years suffer from osteoarthritis and almost all over the age of 80 years will suffer from the disease (Boreman et al., 2010). As New Zealand has a population that is steadily aging and an average life expectancy that is increasing (Boreman et al., 2010), it can be expected there will be a corresponding increase in the numbers of New Zealanders suffering from osteoarthritis.

Management of osteoarthritis has traditionally been pharmaceutical and/or surgical (Hunter & Lo, 2008; McHugh, Luker, Campbell, Kay, & Silman, 2007), but it has been shown that people who have osteoarthritis of the hip and knee joints benefit from specific exercise programmes that improve their strength, flexibility and cardiovascular fitness (Fransen, Nairn, Winstanly, Lam, & Edmonds, 2007; Fransen & McConnell, 2009; Mikesky et al., 2006; O'Reilly, Muir, & Doherty, 1999; Roddy et al., 2005; Suomi & Collier, 2003; Thomas et al., 2002; Topp, Woolley, Hornyak, Khuder, & Kahaleh, 2002). It has also been found that the functional improvements gained following completion of some exercises programmes are comparable with those gained with non-steroidal anti-inflammatory drugs, and that following such programmes people with osteoarthritis are less reliant on health services (Fransen & McConnell, 2009). However adherence to prescribed exercise programmes and advice given by health professionals is known to be poor and better outcomes could be achieved if adherence behaviour was improved (Cook et
al., 2007; Hootman, Macera, Ham, Helmick, & Sniezek, 2003; Pisters et al., 2010; Roddy et al., 2005; van Gool et al., 2005). Research has identified a significant relationship between high levels of exercise adherence and better treatment outcomes of pain levels, self-reported physical function and physical performance (Pisters et al., 2010).

Exercise adherence is a complex multi-faceted behaviour, with many contributing factors (Bassett, 2003). One factor believed to have a considerable effect on adherence behaviour is self-efficacy (Bandura, 1977; Bandura, 1997; Schwarzer, Luszczynska, Zeigelmann, Scholz, & Lippke, 2006). Self-efficacy has been defined as a person’s beliefs of their capabilities to organise and manage prospective situations (Bandura, 1986). It has been proposed that if self-efficacy is enhanced it could lead to improved rates of adherence (Schwarzer et al., 2006), which in turn could improve perceived and actual functional performance (Pister et al., 2010). Self-efficacy beliefs have been shown to be improved with the use of implementation intentions (Gollwitzer & Schall, 1998) such as action and coping planning strategies (Schwarzer et al., 2006; Sniehotta, Scholz, & Schwarzer, 2005).

Implementation intentions are a planning process designed to bridge the gaps between intentions, goals and behaviour (Gollwitzer, 1993). Action plans are implementation strategies which require the participant to state how, when, where and with whom they are going to undertake the exercise (Sniehotta et al., 2005). Coping plans are strategies that assist the participants to positively cope with the barriers that may impede the completion of the exercise (Sniehotta et al., 2005). In combination, these two strategies have been shown to improve exercise completion in people attending cardiac rehabilitation classes (Sniehotta et al., 2005).
Despite the possible benefit of increased exercise adherence to people living with osteoarthritis, Research (Murphy et al., 2008; Pisters et al., 2010) shows, there are a limited number of studies in the current literature that have included adherence strategies such as action and coping planning to improve exercise adherence behaviour. If the use of action and coping planning strategies are shown to improve exercise adherence amongst people with osteoarthritis, these could be integrated into other similar exercise based programmes to improve their adherence rates. Furthermore, higher levels of exercise adherence could improve the management and lifestyle of people living with osteoarthritis in New Zealand.

1.2 Purpose Statement

This study will investigate whether using action and coping plans as an adjunct to an exercise programme will improve adherence to both a class-based and a home-based exercise programme, improve self-efficacy, improve perceived and actual functional performance and decrease pain in people with osteoarthritis for the hip and/or knee joint. The relationships between the variables of interest (adherence, self-efficacy, function and pain) will also be investigated.

1.3 Hypotheses

1). In comparison to the exercise only group, the exercise plus action and coping plans group will have significantly higher levels of clinic attendance and adherence to the class- and home-based exercise and walking programmes.
2). In comparison to the exercise only group, the exercise plus action and coping plans group will have significantly higher levels of self-efficacy with regard to the management of their osteoarthritis symptoms and their ability to exercise post-study.

3) In comparison to the exercise only group, the exercise plus action and coping plans group will have significantly higher levels of actual functional performance post-study.

4). In comparison to the exercise only group, the exercise plus action and coping plans group will have a significantly higher level of perceived functional performance post-study.

5). In comparison to the exercise only group, the exercise plus action and coping plans group will have a significantly lower pain scores post-study.

6). There will be significant relationships between the following variables: (1) pre-study phase specific self-efficacy and arthritis self-efficacy, and the adherence scores, (2) pre-study phase specific self-efficacy and arthritis self-efficacy, and the post-study treatment outcomes, (3) and adherence and post-study treatment outcomes.

1.4 Significance of the Study

This study should be regarded as a feasibility project for guiding the development of a larger study. While it has many of the characteristics of a randomised control trial, the resources available within the frame work of a Master’s thesis would not allow it to provide definitive findings and conclusions. Irrespective of the outcome, the findings will add to what is currently a very small body of literature in the area of adherence enhancing strategies for exercise programmes for osteoarthritis.
2. LITERATURE REVIEW

2.1 Introduction

This chapter is divided into eight sections. The first section outlines the search strategies undertaken to locate the papers used in the literature review. The second section discusses the current literature regarding the effects of exercise-therapy on people with osteoarthritis. The third section describes the problem of adherence to physiotherapy exercise programmes. The fourth section describes the measurement of adherence to physiotherapy exercise programmes. Following this is a description of the determinants of adherence to exercise in physiotherapy. The sixth section addresses the effect of self-efficacy on exercise adherence in physiotherapy. The seventh section reviews the theoretical models grounded in self-efficacy used in adherence research. The chapter concludes with a summary.

2.2 Literature Search Strategy

Literature relating to the clinical management of osteoarthritis, in particular therapeutic exercises, and adherence to physiotherapy and exercise-based rehabilitation were considered for this review.

Inclusion Criteria

The criteria used to determine which studies relating to the clinical management of osteoarthritis would be examined were: (1) those investigating the conservative management of osteoarthritis, (2) those investigating exercise-therapy in the management of osteoarthritis or studies investigating physiotherapy treatment of osteoarthritis, and (3) those investigating the outcome
measures used in the treatment of osteoarthritis of the lower limb. The criteria used to determine which studies relating to adherence to physiotherapy and exercise-based rehabilitation would be examined were: (1) those pertaining to adherence to exercise-based rehabilitation or adherence to physiotherapy treatment, and (2) those investigating the measurement of rehabilitation adherence. There were no limits placed on the types of research methodology used to investigate exercise therapy for osteoarthritis and/or adherence to physiotherapy/rehabilitation programme, or the types of literature reviews of these two bodies of knowledge.

**Exclusion Criteria**

Studies relating to the clinical management of osteoarthritis were excluded if they did not investigate exercise-therapy, evaluated only manual therapy or if they investigated the clinical management of other forms of arthritis. Studies relating to adherence behaviour were excluded if they did not relate to exercise adherence (i.e. drug addiction, or smoking cessation), and if they related to adherence to other forms of health care, such as recreational exercise. In addition studies were excluded if they were published in popular press such as magazines, newspapers or websites. Research and review articles were also excluded if they were not published in English.

**Databases and Resources Searched**

The studies were found electronically using the following listed databases: Cochrane Database of Systematic Reviews, Cumulative Index to Nursing and Allied Health Literature (CINAHL, 1982+), EBSCO Database, E-Journals (AUT Library), Medline (1950+), Proquest, Pubmed, Sports Discus, Socpus. The references lists of the included studies were manually reviewed for relevant studies that may have been overlooked using the electronic searches.
**Search Terms Used**

Literature searches were undertaken using the key words listed in Table 2.1. Index key words and varying combinations of the key words were used.

**Search Returns**

Forty-two articles met the inclusion criteria for the adherence based literature and 257 articles met the inclusion criteria for the osteoarthritis based literature.

**Table 2.1**

*Key Search Words Used*

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**2.3 The Effect of Exercise-Therapy on People with Osteoarthritis**
There are a number of treatment approaches that have been shown to improve the function of people living with osteoarthritis (Jordan, Arden, & Doherty, 2003; Roddy et al., 2005). One approach that has received much attention has been exercise therapy, which is widely accepted to be beneficial for people with osteoarthritis in either their hip or knee joints (Roddy et al., 2005; Vignon et al., 2006). A number of meta-analyses have been completed on the effects of exercise therapy in people with osteoarthritis, and subsequently some have then been used to develop management guidelines internationally (Mazieres et al., 2008; Roddy et al., 2005; Vignon et al., 2006; Zhang et al., 2007). The most noteworthy clinical trials that investigate exercise therapy for people with osteoarthritis will be reviewed in this section.

Studies have shown that after completing exercise-therapy based programmes, people with lower limb osteoarthritis have gained improvements in both their perception and performance of activities of daily living when compared with non exercising control groups (Allegrante & Marks, 2003; Deyle et al., 2005; Foley, Halbert, Hewitt, & Crotty, 2003; Hoeksma et al., 2004; Jan, Lin, Lin, Lin, & Lin, 2009; Mikesky et al., 2006; Roddy et al., 2005; Suomi & Collier, 2003; Thomas et al., 2002; Topp et al., 2002; Zhang et al., 2005). Furthermore, it has been shown that there are limited side effects to well designed exercise-therapy programmes (Allegrante & Marks, 2003; Roddy et al., 2005), providing further support for its use as a treatment option.

The manner in which exercise-therapy is delivered can differ. Exercise-therapy programmes can be water- or land-based (Foley et al., 2003; Fransen et al., 2007; Suomi & Collier, 2003), the exercises can be performed in classes or individually, and undertaken in either a clinic or gymnasium setting or as a home-based programme (Thomas et al., 2002). Exercise-therapy can be focused on improving muscle strength, joint range of motion or cardiovascular fitness (Jan et al., 2009; Mikesky et al., 2006; Topp et al., 2002). Two recent meta-analyses have indicated that
exercise-therapy is a more effective treatment for people with osteoarthritis of the knee joint (Fransen & McConnell, 2009) than of the hip joint (Fransen, McConnell, Hernandez-Molina, & Reichenbach, 2010). In addition some studies have included manual-therapy sessions in the exercise-therapy programme (Deyle et al., 2000; Deyle et al., 2005; Hoeksma et al., 2004). There is weak evidence to support manual-therapy in combination with exercise-therapy being better than exercise-therapy alone for the management of osteoarthritis of the hip joint (Deyle et al., 2000; Deyle et al., 2005). However further discussion of the effect of manual-therapy on osteoarthritis is outside of the scope of this thesis.

The findings of studies do not provide support for any particular type of exercise over another. For instance, no significant difference has been identified in the gains made in perceived functional performance and actual function performance between people completing hydrotherapy or land-based exercise programmes (Foley et al., 2003; Suomi & Collier, 2003). The differences noticed between the two groups were that the adherence rate was slightly greater with the hydrotherapy programme, but this difference was not significant (Foley et al., 2003; Suomi & Collier, 2003). The only other difference was that there was a trend toward greater quadriceps strength with the land-based programmes (Foley et al., 2003; Suomi & Collier, 2003). Tai Chi based exercise programmes have been shown to be less effective at improving perceived functional performance and actual function performance when compared to hydrotherapy programmes, however this difference could have been accounted for by the significantly greater rate of adherence to the hydrotherapy programme than the Tai Chi programme (Fransen et al., 2007).

Home-based exercise programmes have been shown to be an effective way of providing exercise-therapy for people with hip and knee joint osteoarthritis, as they have been found to be
cost effective due to the limited number of resources required to implement them (Thomas et al., 2002). Thomas et al. (2002) and Pisters et al. (2010) both found a positive correlation between higher levels of home-based exercise programme adherence and decreases in knee pain. Deyle et al. (2005) compared a home-based exercise programme only, to a home-based exercise programme combined with a short course of supervised clinic exercise and manual-therapy for the management of osteoarthritis of the knee joint. It was found that the addition of manual-therapy and supervised exercise improved the perceived effectiveness of the programme, but it did not affect the measures of function at the end of the eight-week programme and at the 12 month follow-up.

Specific muscle strengthening, joint range of motion and cardiovascular exercises have all been used with a range of outcomes (Jan et al., 2009; Mikesky et al., 2006; Topp et al., 2002; Roddy et al., 2005; Zhang et al., 2005). Topp et al. (2002) found a trend toward isometric strength exercises being more effective than isotonic strength exercises for improving completion of functional tasks in people with lower limb arthritis. Furthermore, both forms of strength training were shown to be significantly better than the control group. Strength training exercise programmes have been found to be moderately more effective ($p=.05$) than range of motion exercise programmes for maintaining muscle strength and joint space in people with osteoarthritis (Mikesky et al., 2006). Weight bearing exercises have proven to be no more effective than non-weight bearing exercises for improving strength and perceived functional performance for people with osteoarthritis of the knee joint (Jan et al., 2009). However weight bearing exercises have been shown to be significantly more effective ($p=.008$) than non-weight bearing exercises for improving position sense (Jan et al., 2009). It is of interest that Mikesky et
al. (2006) found that there was no correlation between the progression of joint space narrowing and quadriceps muscle strength, pain or exercise adherence.

In summary, the findings of the research point to exercise-therapy being useful for improving the perceived functional performance and actual functional performance of people with osteoarthritis of the hip and/or knee joints. Currently, there is limited evidence to suggest that any specific type of exercise is better than another. Meta-analyses of the available literature imply that a comprehensive programme including strength training, range of motion exercises and cardiovascular exercises is the best current management (Roddy et al., 2005; Zhang et al., 2005). However exercise-therapy can only be effective if the programmes are adhered to, at present there limited evidence about the extent of participants’ adherence to these exercise programmes.

2.4 The Problem of Adherence to Physiotherapy Exercise Programmes

Adherence can be defined as following the prescribed treatment programme and advice given by the health care professional (Bassett, 2003; Meichenbaum & Turk, 1987). The degree to which people adhere to prescribed exercises in rehabilitation has been measured in a number of studies and can be classified as full, partial and poor. The percentage of people described as fully adhering to prescribed exercises has been found to vary, with full adherence being reported as being as few as 10% of patients in one study (Forkan et al., 2006) and 35% in another (Sluij et al., 1993). Similarly the percentage of people described as partially adhering to their prescribed physiotherapy has also been found to vary widely with rates of partial adherence reported from between 39% to 100% (Barbour & Miller, 2008; Brassington, Atienza, Perczek, Di Lorenzo, & King, 2002; Fokran et al., 2006; Kovar et al., 1992; Krischak, Krasteva, Schnider, Gebhard, &
Kramer, 2009; Lyngcoln, Taylor, Pizzari, & Baskus, 2005; O’Reilly et al., 1999; Rogind et al., 1998; Sluijs et al., 1993; van Gool et al., 2005). Poor adherence to physiotherapy has also been found to be variable with Sluijs et al. (1993) reporting 22% and Forkan et al. (2006) 49% of the participants in their studies being categorized as poor adherers to prescribed physiotherapy.

The differences in findings of adherence studies described above could be due to five methodological factors. Firstly, differences can be seen in the method of reporting adherence rates. While some studies have rated participant attendance as high, medium or low (Brassington et al., 2002; Forkan et al., 2006; Sluijs et al., 1993; van Gool et al., 2005), others have calculated a percentage average for the sample (Krischak et al., 2009). Secondly, a variation has occurred in the types of adherence behaviour measured, such as appointment keeping, clinic or class behaviour and home behaviour. Thirdly, the tools used for the measurement of adherence have differed between studies. For example, adherence to home-based exercises has been measured by patient self-report scales (Sluijs et al., 1993; Taylor & May, 1996) and exercise diaries (Krischak et al., 2009; Lyngcoln et al., 2005).

Fourthly, adherence to a variety of treatment programmes for different disorders have been studied. These programmes included cardiac rehabilitation (Barbour & Miller, 2008), home-base knee joint osteoarthritis rehabilitation (Pisters et al., 2010), post-operative wrist rehabilitation (Krischak et al., 2009), falls prevention programme (Fokran et al., 2006), sports injury rehabilitation (Taylor & May, 1996) and a general physiotherapy out-patient treatments (Sluijs et al., 1993). The latter three studies (Fokran et al., 2006; Sluijs et al., 1993; Taylor & May, 1996) consisted of participants with a large variety of injuries and disorders, which are known to have different adherence rates. Brewer (1999) reports that these different rates of adherence are due to
the different demands of the disorder or injury on the individual and the different treatment behaviours required for the different rehabilitation programmes.

Fifthly, the duration of the treatment has a bearing on the level of adherence. It is usual for short-term physiotherapy programmes to have higher levels of adherence (Deyle et al., 2000; Kovar et al., 1992; Sluij et al., 1993) in comparison to long-term physiotherapy programmes (Barbour & Miller, 2008; Forkan et al., 2006; O’Reilly et al., 1999; Pisters et al., 2010). This decrease in adherence over time has been exemplified in the study by Rejeski et al. (1997), with adherence to the exercise programme being 85% three months after commencement of the programme and dropping to 50% at 18 months. In contrast, Forkan et al. (2006) found that the adherence rates did not decrease over time, with partial adherence rates being 69% at 12 months after commencement of the programme and 73% at 48 months after commencement. Forkan et al. (2006) found that a decrease of their general health status usually led to a decrease in participants’ adherence to exercises. Similarly the study by Brassington et al. (2002) found no significant decrease in exercise adherence rates over a 12 month period.

2.5 The Measurement of Adherence to Physiotherapy Exercise Programmes

Treatment adherence is a multifaceted phenomenon requiring different behaviours for different aspects of treatment in a variety of settings. Hence, different tools have been advocated for the measurement of adherence to exercise rehabilitation programmes (Bassett & Prapavessis, 2007; Levy, Polman, & Clough, 2008; Spetch & Kolt, 2001). Some studies have investigated the use of mechanical measures of adherence such as pedometers or exercise counters, these studies are beyond the scope of this review. This section will evaluate the three commonly used methods of
assessing adherence to physiotherapy rehabilitation; attendance at classes or clinic-based rehabilitation sessions (Bassett & Prapavessis, 2007; Brassington et al., 2002; Levy et al., 2008; Lyngcoln et al., 2005; Krischak et al., 2009; van Gool et al., 2005), class- or clinic-based observations of treatment behaviour (Bassett & Prapavessis, 2007; Brewer et al., 2000; Brewer, van Raalte, Petitpas, Sklar, & Ditmar, 1995; Levy et al, 2008; Lyngcoln et al., 2005) and self-reporting of the home-based rehabilitation (Bassett & Prapavessis, 2007; Fokran et al., 2006; Levy et al, 2008; Lyngcoln et al., 2005; Lysack, Dama, Neufield, & Andreassi, 2005; O’Reilly et al., 1999; Scholz, Sniehotta, & Schwarzer, 2005; Sluijs et al., 1993, van Gool et al., 2005).

The first common method of measuring adherence is attendance at class- or clinic-based rehabilitation sessions (Bassett & Prapavessis, 2007; Brassington et al., 2002; Levy et al., 2008; Lyngcoln et al., 2005; Krischak et al., 2009; van Gool et al., 2005). A percentage measure is calculated by dividing the number of sessions attended by the number of sessions scheduled (Bassett, 2003). The strength of this measure of adherence is its simplicity to calculate. The weakness is that clinic attendance does not correlate strongly ($r=.21$) with adherence to the prescribed clinic rehabilitation and does not necessarily represent the behaviour during the session (Brewer et al., 2000).

The second common method of measuring adherence is class- or clinic-based clinician observations (Brewer et al., 2000; Campbell, Evans, Tucker, & Quilty, 2001; Levy et al., 2008; Lyngcoln et al., 2005). A reliable and valid tool for this measurement is the Sports Injury Rehabilitation Adherence Scale (SIRAS; Brewer et al., 2000; Levy et al., 2008; Lyngcoln et al., 2005). The SIRAS is a three item, five point incremental scale that requires the clinician to measure the intensity that the participant exercises at, the ability of the participant to follow instructions during the session and how receptive the participant was to changes of the
programme during the session. A Cronbach’s alpha coefficient of .82 and a test-retest intra-class correlation coefficient of .77 were obtained for the SIRAS, pointing to it being a valid and reliable tool (Brewer et al., 2000). The strengths of the tool are that it is easily completed and it is not subject to participant bias. The weakness of this method is that it is prone to inter-tester variability.

The third common method of measuring adherence is participant self-reporting of the home-based rehabilitation (Bassett & Prapavessis, 2007; Brassington et al., 2002; Fokran et al., 2006; Levy et al., 2008; Lyngcoln et al., 2005; Lysack et al., 2005; Scholz et al., 2005; Sluijs et al., 1993; van Gool et al., 2005). This can be done either in the form of the completion of an exercise diary or as a patient self-report scale. The exercise diary is a participant completed record of the exercises undertaken. A percentage measure is created by dividing the number of completed exercises by the number prescribed (Levy et al., 2008). The patient self-report scale is a multiple item, five increment scale that requires the participant to rate the extent to which they followed the components of the home management programme (Bassett & Prapavessis, 2007; Taylor & May, 1996). The strengths of both these measures are that they give a measurement of the participants’ adherence behaviour outside of the clinical environment and they are quick and easy to complete. As with other self-reported measures, exercise diaries and self-reporting scales have been criticised for being vulnerable to both participant recall error and over reporting (Campbell et al., 2001; Pisters et al., 2010; Spetch & Kolt, 2001).

In summary, the three commonly used methods of assessing adherence to physiotherapy rehabilitation all have strengths and weaknesses. Given that treatment adherence is a multifaceted and complex issue and that no one measure is without its problems, a number of
measures should be used when assessing adherence so that a comprehensive representation of rehabilitation adherence behaviour is obtained (Lyngcoln et al., 2005; Spetch & Kolt, 2001).

2.6 Determinants of Adherence to Exercises in Physiotherapy

There are a number of determinants which have been shown to influence exercise adherence in physiotherapy (Campbell et al., 2001; Darmish, Perkins, Mikesky, Roberts, & O’Dea, 2005; Meichenbaum & Turk, 1987; Rejeski et al., 1997; Rovniak, Anderson, Winett, & Stephens, 2002; Roddy et al., 2005; Scholz et al., 2005; Sluijs et al., 1993; Veenhof et al., 2006). Determinants can have either an inhibitory or enhancing effect on adherence behaviour. For ease of discussion and comprehension the determinants have been divided into four categories (Meichenbaum & Turk, 1987) which are; patient-clinician interactions, disease or injury, treatment, and personal determinants.

Patient-Clinician Interactions

Patient-clinician interactions have been shown to affect adherence to exercise rehabilitation programmes, with adherence being enhanced by good therapist promotion of the prescribed exercises (Sluijs., et al., 1993) and previous positive interaction with a physiotherapist (Scholz et al., 2005; Veenhof et al., 2006). Sluijs et al. (1993) found that higher levels of adherence were seen when therapists asked patients to indicate their demands and regularly monitor their progress. Campbell et al. (2001) and Levy et al. (2008) found that if patients with osteoarthritis
of the knee joint described they felt a sense of obligation to the physiotherapist, they were seen to have enhanced short term adherence behaviour.

**Disease or Injury**

Disease or injury related determinants that have been shown to inhibit adherence to rehabilitation exercise programmes are pain (Sluijs et al., 1993), poor general health (Damush et al., 2005) and poor disease prognosis (Campbell et al., 2001). Disease or injury related determinants that have been shown to enhance adherence to exercise programmes are higher levels of disability (Sluijs et al., 1993) and a definitive clinical diagnosis (Damush et al., 2005). With regard to osteoarthritis, disease or injury related determinants that have been suggested as inhibiting exercise adherence are the presence of associated joint and muscle pain, limited cardiovascular fitness, joint stiffness as well as other age related co morbidities such as cardiac disease (Allegrante & Marks, 2003). Damush et al. (2005) found people were more adherent to a home-based exercise programme if they had been diagnosed with osteoarthritis of the knee joint when compared to those diagnosed with non-specific knee pain.

**Treatment**

Treatment related determinants that have been shown to inhibit adherence to rehabilitation exercise programmes are treatment regimes that extend over a long period of time (Rejeski et al., 1997), treatment regimes that are too complex (Roddy et al., 2005) and poor availability of the equipment and rehabilitation services (Roddy et al., 2005). In contrast, the use of exercise diaries and follow-up physiotherapy after discharge, have been shown to improve long-term adherence (Roddy et al., 2005). Nonetheless, Holden, Nichols, Hay, and Foster (2008) surveyed
physiotherapists in the United Kingdom about their management of knee joint osteoarthritis, founding only 12% of them would use an exercise diary and only 34% would offer follow up physiotherapy after discharge. Other treatment factors that have been identified as enhancing adherence behaviour are high levels of supervision (Roddy et al., 2005), a well structured organised exercise programme (Damush et al., 2005) and previous patient experience with the required activities (Damush et al., 2005). Attendance incentives have been shown to increase exercise adherence rates in studies with participants from lower socioeconomic groups (Damush et al., 2005).

**Personal**

Personal factors that have been identified as predictors of poor adherence to rehabilitation exercise programmes are not perceiving treatment benefit and having low outcome expectancies (Fokran et al., 2006), clinical depression (Barbour & Miller., 2008), decreases in health status (Fokran et al., 2006), decreased levels of social support (Veenhof et al., 2006), poor coping strategies (Scholz et al., 2005), perceived barriers to exercise (Fokran et al., 2006), poor knowledge of their illness (Campbell et al., 2001), not having enough time to complete the programme (Sluijs et al., 1993; Veenhof et al., 2006) and insufficient skills to complete the task (Marks & Allegrante, 2005). Personal factors that have been shown to enhance adherence to rehabilitation exercise programmes are increased levels of social support, particularly if the social support is that of a partner or spouse (Brassington et al, 2002; Damush et al., 2005; Rovnaik et al., 2002; Veenhof et al., 2006), positive outcome expectancy and perceived benefit of the intervention (Brassington et al., 2002; Campbell et al., 2001; Damush et al., 2005; Rovnaik et al., 2002; Scholz et al., 2005), increasing age (Sluijs et al., 1993; Damush et al., 2005), a greater degree of perceived severity (Campbell et al., 2001), a high level of coping skills
(Levy et al., 2008; Scholz et al., 2005), a high level of self-motivation (Rovniak et al., 2002) and a high level of self-efficacy (Brassington et al., 2002; Damush et al., 2005; Rovnaik et al., 2002; Scholz et al., 2005; Veenhof et al., 2006). Brassington et al. (2002) concluded that the most significant factors affecting exercise adherence in the elderly were cognitive factors, in particular self-efficacy and exercise expectations. Mazieres et al. (2008) described the most significant predictors of exercise adherence in people with osteoarthritis as being prior exercise behaviour, level of education regarding the disease and perceived benefit of the exercises. The findings of Mazieres et al. (2008) indicate that people with osteoarthritis may have different barriers to exercise adherence than seen in the general elderly population.

Summary

An understanding of the determinants of exercise adherence permits prescribers of exercise to facilitate better adherence. Programmes and guidelines have been designed using these determinants to reduce the impact of barriers to adherence to physiotherapy programmes (Fransen et al., 2010a; Jamtvedt et al., 2008; Roddy et al., 2005; Zhang et al., 2005). Patient’s beliefs with regard to an exercise programme need to be developed so that they have a high level of self-efficacy and a positive expectation with regard to their ability to undertake and adhere to the programme (Mazieres et al., 2008). This increase in self-efficacy can be facilitated through effective education and instruction with regard to the exercise programme, a comprehensive introduction process as well as close initial supervision and support (Brassington et al., 2006; Marks & Allegrante, 2003; Roddy et al., 2005; Zhang et al., 2005).

2.7 The Effect of Self-Efficacy on Exercise Adherence in Physiotherapy.
Self-efficacy was first described by Bandura (1977) as a key construct of the social cognition theory. Bandura (1986) defined self-efficacy as a person’s beliefs of their capabilities to organise and manage prospective situations. Self-efficacy has proven to be such a significant construct in the study of health behaviour research it is now seen as an essential component of most major models that describe behaviour change (Conner & Norman, 2005). Behaviour change is heavily influenced by a person’s sense of control, if people believe they can control an action or behaviour, they will be more inclined to make the change and then continue with the behaviour (Conner & Norman, 1995).

Self-efficacy is described as being context specific (Bandura, 1995; Lorig, Chastain, Ung, Shoor, & Holman, 1989; Marlatt, Baer, & Quigley, 1995; Orbell et al., 2001; Scholz et al., 2005; Schwarzer et al., 2006), and hence tools and questionnaires need to be designed to measure self-efficacy in the context of the behaviour being studied. It has also been found that the type of self-efficacy required for behaviour change can itself change during task acquisition and maintenance (Marlatt et al., 1995). Because of this, self-efficacy has been divided into five different phases or sub categories; resistance self-efficacy, harm reduction self-efficacy, task self-efficacy (pre action / action), maintenance self-efficacy (coping) and recovery self-efficacy (Marlatt et al., 1995; Scholz et al., 2005; Schwarzer et al., 2006). It is the latter three that have been linked to exercise adherence (Scholz et al., 2005; Schwarzer et al., 2006). As it relates to exercise-therapy, task self-efficacy is the belief that people have of their ability to adopt new exercise behaviours. Maintenance self-efficacy, also known as coping self-efficacy, describes peoples’ beliefs about their capability to overcome barriers that may prevent them from continuing to complete their exercises. Recovery-self efficacy is the belief that people have about their ability return to their exercise programme after a break or a return to old behaviours (Scholz et al., 2005).
Phase specific self-efficacy has been used to predict physical exercise behaviour in number of studies (Levy et al., 2008; Scholz et al., 2005; Schwarzer et al., 2006). Scholz et al. (2005) found a significant ($p < .05$) correlation between high levels of task, maintenance and recovery self-efficacy and higher rates of exercise adherence during the completion of a cardiac rehabilitation programme. Self-efficacy has also been shown to predict exercise adherence behaviour by Levy et al. (2008), who found that clinic-based rehabilitation adherence ($p < .05$) and clinic attendance ($p < .01$) correlated positively with high self-efficacy levels. However, Levy et al. (2008) found that adherence to home-based exercises did not correlate with self-efficacy levels which is in contrast with the results of other research (Taylor & May, 1996). Levy et al. (2008) stated that one possible reason for there being no correlation was the measure of adherence used in the study was a self-report scale about the completion of the home-based exercise programme. As previously discussed this measure is prone to response bias and Levy et al. (2008) believed that the participants may have over reported the completion of their home-based exercise programme. Levy et al. (2008) found that high levels of home-based adherence related significantly to effective coping skills ($p < .05$), habit ($p < .05$) and high levels of social support ($p < .01$).

While people’s knowledge of their ability may not directly be affected by osteoarthritis, the level of self-efficacy of people with osteoarthritis may be decreased due to a reduction in their confidence in their ability to attempt the task as well as beliefs with regard to a reduced ability to complete a task or functional activity (Allegrante & Marks, 2003; Harrison, 2004). Lorig et al. (1989) designed a tool to measure self-efficacy in relation to exercise and treatment behaviour in people with arthritis. This test is a self-report measure which consists of three subscales; pain, function and coping. Lorig et al. (1989) tested the construct, concurrent validity and reliability of
the scale finding it was a reliable and reproducible measure of perceived function for people with arthritis.

Barriers not motivators are seen as the most significant indicators of adherence to exercise in the elderly (Fokran et al., 2006). Lower levels of self-efficacy or perceived ability to cope could therefore result in greater perceived barriers and lower functional levels (Rejeski et al., 2001; Sohl & Mayer, 2010). Enhancing self-efficacy beliefs has been associated with increased ability to cope with the barriers to exercise and subsequently greater levels of adherence (Barbour & Miller., 2008; Levy et al., 2008; Rejeski et al., 1998). High levels of self-efficacy facilitate behaviour change as people who anticipate a more positive outcome are more likely to set goals and make the changes (Conner & Norman, 2005).

2.8 Theoretical Models Grounded in Self-Efficacy Used in Adherence Research

As previously outlined, self-efficacy has proven to be a significant contributor to behaviour change and as a consequence has become a component of most behaviour change models (Conner & Norman, 2005).

_The Social Cognitive Theory_
The starting point for the social cognitive theory model is self-efficacy (Figure 2.1), with it influencing outcome expectancies, goals and socio-structural factors which in turn affect behaviour. Self-efficacy is also believed to directly affect behaviour (Bandura, 1997). The theory implies that human motivation and action are controlled by forward thought and planning (Conner & Norman, 2005). Outcome expectancy, the other key construct, is defined as consequences which are anticipated as a result of the behaviour change or actions. Outcome expectancies are understood to be influenced by physical, social and personal factors and are believed to act on goals and behaviour (Conner & Norman, 2005). The other two constructs of the social cognitive theory are goals and socio-structural factors, both of which are believed to be affected by self-efficacy. Goals impact directly on behaviour, whereas socio-structural factors do not directly affect behaviour but affect goals. It is considered that socio-structural factors and outcome expectancies impact on goals, which in turn affect behaviour.

Figure 2.1 The Social Cognitive Theory. Adapted from Bandura (1997).

There are three limitations with the use of social cognitive models to facilitate behaviour change and each will be discussed in turn. First, intentions and goals alone do not facilitate behaviour
change, nor have they the ability to maintain behaviour change. Implementation processes have been designed to bridge the gaps between intentions and goals, and behaviour change (Gollwitzer, 1993; Schwarzer et al., 2006; Weinstein, 2007). It has been found that behaviour change is more likely to be achieved if the desired behaviour is framed as being specific and measurable (Gollwitzer & Schall, 1998).

One strategy designed to facilitate behaviour change is post intentional planning which has been called ‘Implementation Intentions’ (Gollwitzer & Schall, 1998). Implementation intentions are a planning process, which describe how, when and where the desired behaviour will occur (Gollwitzer, 1993). Sniehotta et al., (2005) divided implementation intentions into action plans and coping plans to facilitate these different skills. The action plan is a description of the manner in which the behaviour change would occur, it describes the how, when, where and with whom the behaviour will occur (Sniehotta et al., 2005). For example, ‘I will cycle for 30 minutes each morning at the local gymnasium with my friend’. The coping plan is a plan that prepares the person to successfully overcome barriers to their planned activity. For example, ‘on the days that the gymnasium is closed I will go for a 30 minute walk’. Action and coping planning have been shown to be effective tools for increasing exercise adherence and programme completion in cardiac rehabilitation patients (Sniehotta et al., 2005). Sniehotta et al. (2005) divided participants into three groups, one group received action planning only, another received action and coping planning, and a control group received usual care. The group that completed the action and coping planning were shown to have completed significantly ($p < .01$) more exercises than the other two groups. In addition there was a trend towards the action planning only group completing more exercises than the control group. Sniehotta et al. (2005) concluded that the
application of a combination of both action and coping planning was effective at significantly increasing completion of exercise following discharge from cardiac rehabilitation.

A second limitation with the use of the social cognitive model is its ability to facilitate behaviour change. Behaviour change is described as a two stage process, namely planning and action (initiation and maintenance) stages (Schwarzer et al., 2006). As people go from planning the new behaviour, to changing their behaviour and maintaining this new behaviour, the type of skills required also change (Marlett et al., 1995). The social cognitive model does not describe this change in skills sets (Conner & Norman, 2005). It has also been shown the type of self-efficacy required to initiate behaviour change is different from that required to maintain behaviour change (Marlatt et al., 1995). Schwarzer et al. (2006) found that high levels of task self-efficacy correlated with effective action planning skills and high levels of maintenance or coping self-efficacy correlated with good coping planning skills.

Third, the social cognitive theory was not designed to be used as an interventional model, it was originally designed to predict behaviour not facilitate it. Stage models, such as the Health Action Process Approach (HAPA: Schwarzer et al., 2006), are better suited to the implementation of interventions (Conner & Norman, 2005).

The HAPA Model

In an attempt to overcome the limitations of the social cognitive theory Schwarzer (2004) developed the HAPA (see Figure 2.2), a two stage intervention model (a planning stage and an action stage) based on the social cognitive theory but designed to include implementation intentions (action and coping planning) to bridge the gap between goals and behaviour. The model shows risk perception influencing outcome expectancy and in turn task self-efficacy. Task
self-efficacy influences goals (behaviour change), implementation intentions (action and coping planning), initiates task or action (behaviour change), maintenance of the behaviour (coping) and recovery of the behaviour after a relapse. The HAPA model also splits self-efficacy into the three types required to complete a task, acknowledging that the type of self-efficacy required can change at different stages of the adoption of the new behaviour. For example, task self-efficacy is required for the initial behaviour change and then maintenance and recovery self-efficacy become important for coping with barriers to continuation of the behaviour.

The HAPA model has been found to predict exercise behaviour in cardiac rehabilitation (Luszczynska, 2006, Scholz et al., 2005) and orthopaedic rehabilitation (Lippke, Ziegelmann, & Schwarzer 2004). Schwarzer et al. (2006) applied the HAPA model to the data sets of the three studies described above and found that outcome expectancies, task self-efficacy, intention, action planning and recovery self-efficacy were effective predictors of exercise behaviour. However, two of the three studies (Lippke et al., 2004; Luszczynska, 2006) found
risk perception was not significantly related to either outcome expectancies or intention. Luszczynska and Schwarzer (2005) found similar results regarding a non-significant link between risk perception and outcome expectancies or intention. This led Schwarzer et al. (2006) to suggest that programmes designed to improve health behaviour should direct their resources to improving outcome expectancies and task self-efficacy and not attempting to raise risk awareness. Sniehotta et al. (2005) used the HAPA model to implement action and coping planning as an intervention to improve exercise completion in people attending cardiac rehabilitation and found that the group that completed the action and coping planning completed significantly more physical activity ($p < .01$) than participants who received action planning only or no planning skill.

### 2.9 Summary

Osteoarthritis is a significant health problem in New Zealand. Exercise therapy has been shown to be an effective management strategy, but its full potential is limited due to poor adherence. It is believed that adherence is limited by perceived barriers to the exercise programmes. If these barriers were overcome it is probable that adherence rates would improve. Action and coping planning have been shown to be an effective strategy to improve adherence to long term exercise programmes for cardiac disorders but thus far not osteoarthritis. These planning strategies could be implemented through the HAPA model into an exercise therapy programme for people with osteoarthritis of the hip or knee. This increase in adherence and subsequent exercises may in turn improve both perceived functional performance of functional performance. Therefore this
feasibility study will compare the use of action and coping plans, as derived from the HAPA model, with not using plans on adherence to an exercise programme for osteoarthritis of the hip and/or knee joints.

REFERENCES


