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# Barriers to treatment adherence in physiotherapy outpatient clinics: A systematic review

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## Abstract

Poor adherence to treatment can have negative effects on outcomes and healthcare cost. However, little is known about the barriers to treatment adherence within physiotherapy. The aim of this systematic review was to identify barriers to treatment adherence in patients typically managed in musculoskeletal physiotherapy outpatient settings and suggest strategies for reducing their impact. The review included twenty high quality studies investigating barriers to treatment adherence in musculoskeletal populations. There was strong evidence that poor treatment adherence was associated with low levels of physical activity at baseline or in previous weeks, low in-treatment adherence with exercise, low self-efficacy, depression, anxiety, helplessness, poor social support/activity, greater perceived number of barriers to exercise and increased pain levels during exercise. Strategies to overcome these barriers and improve adherence are considered. We found limited evidence for many factors and further high quality research is required to investigate the predictive validity of these potential barriers. Much of the available research has focussed on patient factors and additional research is required to investigate the barriers introduced by health professionals or health organisations, since these factors are also likely to influence patient adherence with treatment.

**Keywords:** Adherence, Barriers, Treatment, Musculoskeletal

## 1. Introduction

Adherence with treatment is an important factor which can influence the outcome of that treatment (Hayden et al., 2005). Adherent patients may have better treatment outcomes than non-adherent patients (Vermeire et al., 2001; WHO, 2003). Poor adherence to treatment has been identified across many healthcare disciplines including physiotherapy (Vasey, 1990; Friedrich et al., 1998; Campbell et al., 2001). The extent of non-adherence with physiotherapy treatment is unclear. One study found that 14% of

physiotherapy patients did not return for follow-up outpatient appointments (Vasey, 1990). Another suggested that non-adherence with treatment and exercise performance could be as high as 70% (Sluijs et al., 1993). Poor adherence has implications on treatment cost and effectiveness.

Adherence has been defined as: "the extent to which a person's behaviour… corresponds with agreed recommendations from a healthcare provider" (WHO, 2003). Within physiotherapy, the concept of adherence is multi-dimensional (Kolt et al., 2007) and could relate to attendance at appointments, following advice, undertaking prescribed exercises, frequency of undertaking prescribed exercise, correct performance of exercises or doing more or less than advised. Many factors related to the patient, the healthcare provider and the healthcare organisation are thought to influence patient adherence with treatment (Miller et al., 1997). Within physiotherapy it is not clear which factors act as barriers to adherence.

Identification of barriers may help clinicians identify patients at risk of non-adherence and suggest methods to reduce the impact of those barriers thereby maximising adherence. The aim of this review is twofold. Firstly, to identify important barriers to adhering with musculoskeletal outpatient treatment. Secondly, to discuss strategies that may help clinicians to overcome these barriers.

## 2. Methods

### 2.1. Literature search

The following databases were searched from their inception to December 2006: AMED, CINAHL, EMBASE, MEDLINE, PUBMED, PSYCINFO, SPORTDISCUSS, the Cochrane Central Register of Controlled Trials and PEDro. The following keywords were used: 'barriers', 'prognostic', 'predictor', 'adherence', 'compliance', 'concordance', 'therapy', 'physical', 'physiotherapy', 'osteopath', 'chiropractor', 'sports', 'pain', 'joint', 'muscle', 'musculoskeletal', and 'outpatients'. The references of primary studies identified were scanned to identify further relevant citations. Internet searches of Google and Google Scholar were conducted.

### 2.2. Study selection

Studies were included if they: (1) were RCTs, prospective studies, CCTs or cross-sectional surveys which were peer-reviewed and published in the English language, (2) investigated patients with mechanical musculoskeletal dysfunctions, (3) related to treatment or therapeutic exercise administered by physical or exercise therapists and (4) identified barriers or predictors of adherence.

Studies were excluded if they investigated non-attendance at initial appointments, asymptomatic populations, in-patient populations, life threatening conditions/reduced mortality, non-musculoskeletal conditions or systemic musculoskeletal conditions being managed primarily by drug therapy or a multidisciplinary team approach.

A three phase screening strategy was used to identify relevant articles. Firstly, one investigator (KJ) identified potentially relevant studies by scanning their titles and abstracts. Secondly, remaining citations were examined independently by two investigators (KJ & SMc) and agreement reached on articles which did not meet the selection criteria. Finally, both investigators (KJ & SMc) independently reviewed the full text of remaining articles against the selection criteria and consensus was reached for their inclusion in the review. In the event of disagreement, a third reviewer (JKM) arbitrated.

### 2.3. Quality assessment of studies

The quality tool used in this review was modified from tools used in previous systematic reviews (Borghouts et al., 1998; Scholten-Peeters et al., 2003). Since adherence was the focus of this study, "loss to follow-up" was eliminated as an item of assessment from the quality tool. Therefore the quality assessment tool consisted of 13 criteria (see Table 1). The standard of information required to meet each

criterion was set a-priori. Criterion meeting the quality standard were given a score of 1, while those not meeting the standard were given a zero score. Studies scoring ≥7 were considered 'high quality', while those scoring <7 were considered 'low quality' (Borghouts et al., 1998; Scholten-Peeters et al., 2003). Multiple publications derived from a single cohort were awarded one quality score based on the information available from all the publications (Scholten-Peeters et al., 2003). Two reviewers (KJ & SMc) independently assessed and scored the included studies. Where there was disagreement a third reviewer (EG) made the final decision.

### 2.4. Data extraction and synthesis

A standardised template was used to extract data regarding the study population, study design, predictor variables, outcome measures, study quality, data analysis and results.

Inter-observer agreement of quality assessment was determined by calculating percentage agreement and a kappa co-efficient (Viera and Garrett, 2005). Information extracted is presented in table format to highlight methodological quality, similarities and differences between the studies. Narrative summaries of the results are provided. Qualitative conclusions are based on levels of evidence (see Table 2) which have been used in previous reviews (Karjalainen et al., 2001; Verhagen et al., 2004).

Where possible, the significance of factors affecting adherence and the levels of evidence were derived from multivariate analyses. Significant associations of $p < 0.05$ or relevant estimated odds ratios or risk ratios were used; these were defined as meaningful when ≤0.5 or ≥2.0 (Ariens et al., 2000).

## 3. Results

Fig. 1 shows the process of study selection. Initial searching identified 833 citations. Following the first screening, 745 articles were excluded and 88 citations were retained for the second screening. Using inclusion and exclusion criteria a further 24 articles were excluded. Of the remaining 64 articles, four were unavailable. Initial disagreement over the selection of 18 papers occurred. Following discussions, six of these were included, with two further papers referred to the third reviewer (EG) for arbitration. In total, 22 articles reporting on 20 independent cohort studies were selected for the review.

### 3.1. Methodological quality

The reviewers scored 286 items and disagreed on 29 items (10%). The overall inter-observer agreement ($\kappa = 0.72$) represents substantial agreement between the reviewers (Viera and Garrett, 2005). Consensus was not achieved on 2 items. In each case the third reviewer (EG) made the final decision. The results of the quality assessment are shown in Table 3. Articles relating to the same cohort, e.g. Dobkin et al. (2005, 2006) and Brewer et al. (2000, 2003), had their quality assessment scores combined to prevent bias in assessing the levels of evidence. The quality scores ranged from six to 11 indicating that all but one study were of high quality. The most common methodological shortfalls related to description of the source population (item A), the study size (item D) and failing to present univariate analysis (item M).

### 3.2. Study characteristics

The main characteristics of the study populations, barriers and outcome measures for each cohort are outlined in the Supplementary electronic file. Of the 20 studies, seven recruited from osteoarthritis/rheumatoid arthritis populations attending physiotherapy (Stenstrom et al., 1997; Schoo et al., 2005), part of a health organisation (Shaw et al., 1994; Castenada et al., 1998), post-surgical patients (Fekete et al., 2006) or exercise trials (Minor and Brown, 1993; Rejeski et al., 1997); four studies investigating lower back pain recruited from general outpatient populations (Sluijs et al., 1993; Alexandre et al., 2002; Kolt and McEvoy, 2003) or a tertiary rehabilitation agency (Kenny, 2000); three studies recruited from a sporting population (Laubach et al., 1996; Taylor and May, 1996; Milne et al., 2005); two studies investigated fibromyalgia patients (Oliver and Cronan, 2002; Dobkin et al., 2006); one study

investigated an anterior cruciate ligament post-operative population (Brewer et al., 2003); one study recruited females suffering from urinary incontinence (Alewijnse et al., 2003); one study recruited patients with temporo-mandibular joint pain (Funch and Gale, 1986) and one study recruited patients from an upper limb rehabilitation centre (Chen et al., 1999). All studies investigated at least one aspect of treatment adherence including attendance at appointments, adherence with home exercises and in-clinic adherence. Only one study (Stenstrom et al., 1997) did not report multivariate analysis.

### 3.3. Barriers that predict poor treatment adherence

Table 4 presents a summary of the barriers to treatment adherence. There was strong evidence that low levels of physical activity at baseline (4 trials,728 participants) or in previous weeks (2 trials, 883 participants), low self-efficacy (6 trials, 1296 participants), depression (4 trials, 1367 participants), anxiety (2 trials, 159 participants), helplessness (2 trials, 792 participants), poor social support or activity (6 trials, 2286 participants), greater perceived number of barriers to exercise (3 trials, 857 participants) and increased pain levels during exercise (2 trials, 159 participants) were barriers to treatment adherence. There was also strong evidence that low in-treatment adherence with exercise (3 trials, 287 participants) was a barrier to longer term exercise adherence. There was conflicting evidence that age and greater pain at baseline were barriers to treatment adherence. Limited evidence was found for a range of other variables with one good quality study supporting each of them.

## 4. Discussion

This systematic review summarised the results from 20 high quality studies and found strong evidence that low levels of physical activity at baseline or in previous weeks, low in-treatment adherence with exercise, low self-efficacy, depression, anxiety, helplessness, poor social support or activity, greater perceived number of barriers to exercise and increased pain levels during exercise are barriers to treatment adherence. There was conflicting evidence regarding age and pain at baseline. Many other variables had limited evidence of being barriers to adherence.

The results of this review are in line with others which have found that non-adherent individuals were likely to have lower levels of prior activity, lower exercise self-efficacy, greater number of barriers and low levels of social support (Martin and Sinden, 2001; Jackson et al., 2005). These reviews vary from our own in that psychological variables such as anxiety, stress and helplessness did not emerge as predictive. In the review by Martin and Sinden (2001) few studies investigated whether psychological variables predicted adherence of non-clinical populations of older adults to exercise intervention. In the review by Jackson et al. (2005) there was conflicting evidence for depression and anxiety in patients attending Cardiopulmonary Rehabilitation (CPR). One reason for this could be that these traits are more likely to be present in women, who are less likely to be referred to CPR. Therefore these symptoms may be less likely to emerge as predictors of non-adherence in CPR (Benz Scott et al., 2002).

### 4.1. Strengths and limitations of this review

This review was conducted in accordance with guidelines from the Centre for Reviews & Dissemination (CRD, 2001), however the possibility of publication bias cannot be excluded (Altman, 1991). Unpublished studies and studies from lesser known databases or published in languages other than English may have been missed. Our review considered a range of musculoskeletal conditions and study populations. Motivation to adhere with treatment and therefore the barriers may vary between different pathology types and populations (Shaw et al., 2005). We have not attempted to analyse these differences.

### 4.2. Strengths and limitations of reviewed studies

Whilst all studies included in this review were rated as high quality, some limitations were apparent. The studies had sample sizes ranging from $n = 34$ (Laubach et al., 1996) to $n = 695$ (Sluijs et al., 1993) with only five (25%) studies exceeding 300 subjects. Whilst there are no universally agreed methods of

calculating sample sizes for multivariate analysis, smaller studies with large numbers of predictive variables may allow less confidence in the findings (Tabachnick and Fidell, 2001). Some studies included in this review may be subject to this limitation.

Many potential predictors have not been investigated by the studies in our review. For example, low socioeconomic status (SES) emerged as a predictor of non-adherence with CPR (Jackson et al., 2005) and may warrant further investigation in populations with musculoskeletal disorders. In addition, much of the research has focussed on patient factors and little research has investigated the barriers introduced by health professionals or health organisations (Miller et al., 1997). Further research to investigate potential barriers such as SES, health professional factors and health organisation factors would be appropriate.

The most commonly used measures of adherence were attendance at appointments, adherence with home programmes and in-clinic adherence. Whilst attendance at appointments is standardised it provides no information about patient attitude and behaviour towards rehabilitation e.g. adherence with home exercise programmes or within clinic adherence (Kolt et al., 2007). Patient self-reports using paper diaries were the most common measure of adherence with home programmes. However, poor real time compliance with diary completion and recall accuracy may lead to data of questionable validity (Stone et al., 2003). It is possible that the use of electronic diaries with compliance enhancing features may improve the quality and accuracy of data collected (Broderick and Stone, 2006; Green et al., 2006). The most common measure of in-clinic adherence was the therapist-rated Sports Injury Rehabilitation Adherence Scale (SIRAS). However patients and practitioners may disagree on the level of patient adherence (Donovan, 1995; Carr, 2001) and this variation between patient self-rating and therapist-rating of patient adherence leaves scope for considerable inaccuracy (Kolt and McEvoy, 2003). The use of therapist-rated adherence measures in conjunction with exercise diaries to corroborate patient self-reports (Kolt and McEvoy, 2003) may improve assessment of adherence (Shaw et al., 2005).

### 4.3. Clinical implications

**4.3.1. Pain** Worsening pain during exercise was a barrier to adherence with exercise (Minor and Brown, 1993; Dobkin et al., 2006) indicating that strategies to minimise initial pain are important. In most cases the appropriate use of simple analgesics, heat or ice coupled with passive physiotherapy treatments, e.g. acupuncture, manual therapy, etc may help to alleviate pain sufficiently to allow patients to adopt more active treatment strategies (Moffett and McLean, 2006). In the rare case of a patient with severe pain an analgesic review with their GP or consultant may be required in order to allow participation in rehabilitation.

Many people believe that activities that cause pain must be harmful. Clinicians need to gain a clear understanding of the patient's pain experience and beliefs about pain (Eccleston and Eccleston, 2004) and counter those which are mal-adaptive. Clinicians should reinforce messages which reduce fear or anxiety about pain, e.g. that the presence of pain should not prevent most patients from safely participating in therapeutic exercise (Waddell et al., 2004) and may lead to reduction in symptoms (Guzman et al., 2002), improved function and return to work (van Tulder et al., 2000). Those who participate in regular exercise are also less likely to experience progressive problems (McLean et al., 2007). Patients should be encouraged to start exercise gently and advised to progress to moderate or even high intensity levels of exercise over a period of time (Pernold et al., 2005). This evidence could counter the fears held by many pain sufferers that movement could be damaging or lead to re-injury.

**4.3.2. Physical activity levels and exercise** Low levels of physical activity at baseline (Minor and Brown, 1993; Rejeski et al., 1997; Stenstrom et al., 1997; Schoo et al., 2005) or in previous weeks (Rejeski et al., 1997; Oliver and Cronan, 2002) and low in-treatment adherence with exercise (Alewijnse et al., 2003; Schoo et al., 2005; Dobkin et al., 2006) were barriers to treatment adherence. Physiotherapists need to recognise and be ready to mitigate the many barriers to initiating and adhering to exercise

programmes; these include poor programme organisation and leadership, poor education, poor history of exercise, perceived physical frailty, perceived poor health and readiness to change (Duncan and McAuley, 1993; Courneya and McAuley, 1995; Boyette et al., 1997; Hellman, 1997; Rhodes et al., 1999).

Several strategies may be employed to improve patient adherence. Firstly providing explicit verbal instruction, checking the patient's recall and supporting this with additional written instructions may be effective at improving exercise adherence (Schneiders et al., 1998). Secondly, employing motivational techniques such as counselling sessions, positive feedback, reward, written treatment contracts and exercise diaries may also be helpful (Friedrich et al., 1998). Setting goals and drawing up action plans and coping plans which have been agreed collaboratively between the clinician and patient may be effective with patients who intend to participate in exercise (Bassett and Petrie, 1999; Evans and Hardy, 2002; Ziegelmann et al., 2006). Identifying potential barriers to exercising can support the development of action plans to initiate an exercise programme, whilst coping plans can help to overcome the difficulties that may arise over time and help patients to maintain that exercise programme (Gohner and Schlicht, 2006; Ziegelmann et al., 2006).

**4.3.3. Self-efficacy** Low self-efficacy was identified as a barrier to treatment adherence (Shaw et al., 1994; Taylor and May, 1996; Stenstrom et al., 1997; Chen et al., 1999; Oliver and Cronan, 2002; Milne et al., 2005). Poor self-efficacy could explain a patient's low confidence in their ability to overcome obstacles to initiating, maintaining or recovering from relapses in exercise (Sniehotta et al., 2005). Low self-efficacy could be identified by clinicians using simple questions such as “How confident are you that you can…” (a) “overcome obstacles to exercising?” or (b) “return to exercise, despite having relapsed for several weeks?” Strategies to address low self-efficacy should be specific to the individual's stage of exercise behaviour or perceived obstacles (Scholz et al., 2005). The use of strategies such as agreeing realistic expectations (Jensen and Lorish, 1994), setting treatment goals (Evans and Hardy, 2002), action planning (Sniehotta et al., 2005), coping planning and positive reinforcement (Gohner and Schlicht, 2006) may help increase patient self-efficacy and adherence.

**4.3.4. Anxiety, depression and helplessness** Depression (Minor and Brown, 1993; Shaw et al., 1994; Rejeski et al., 1997; Oliver and Cronan, 2002), anxiety (Minor and Brown, 1993; Dobkin et al., 2006) and helplessness (Sluijs et al., 1993; Castenada et al., 1998) were barriers to treatment adherence. Physiotherapists should be sensitive to the presence of anxiety, depression and helplessness and ensure that these patients are referred to relevant healthcare services for appropriate management as required. Simultaneously ensuring that pain is being effectively managed may be helpful in reducing anxiety or depression which is pain related. Additionally it may be helpful to reinforce the message that exercise is an effective way of countering both low mood and negative thoughts, whilst simultaneously improving pain and function (Lim et al., 2005). Greater social support and encouragement for exercise in this group of patients may provide motivation, role models and guidance that may be important (Castenada et al., 1998).

**4.3.5. Social or family support/activity** Low levels of social activity (Funch and Gale, 1986; Minor and Brown, 1993; Sluijs et al., 1993; Rejeski et al., 1997; Oliver and Cronan, 2002) and social or familial support (Shaw et al., 1994) were barriers to treatment adherence. Some patients believe they would more readily exercise if accompanied by someone else during their activity (Milroy and O'Neil, 2000; Campbell et al., 2001). The support provided by the physiotherapist, the development of the patient–practitioner relationship and positive feedback from the physiotherapist may also increase adherence (Sluijs et al., 1993; Campbell et al., 2001). Clinicians could consider organising rehabilitation programmes which incorporate social contact and support. For example group based rehabilitation, exercise referral schemes, expert patient programmes and exercise classes based in the community may be an ideal way of providing some patients with the social stimulation and long term encouragement to continue their exercise progression. For other patients, actively involving partners in the rehabilitation process to encourage and motivate the patient may help (Fekete et al., 2006).

**4.3.6. Barriers to exercise** Envisaging a greater number of barriers to participating in exercise predicted non-adherence with treatment (Sluijs et al., 1993; Alexandre et al., 2002). Barriers included transportation problems, child care needs, work schedules, lack of time, family dependents, financial constraints, convenience and forgetting. Physiotherapists need to be aware of difficulties that patients foresee in relation to adhering with a proposed treatment plan and act collaboratively with their patients to design treatment plans which are customised to the patient's life circumstances (Turk and Rudy, 1991). The addition of coping plans may help patients to overcome difficulties that may arise and allow them to maintain the treatment programme (Gohner and Schlicht, 2006; Ziegelmann et al., 2006).

**4.3.7. Research implications** There was limited evidence for many barriers and a lack of research into other potential predictors, e.g. socioeconomic status and the barriers introduced by health professionals or health organisations. Adherence has been identified as a priority in physiotherapy research (Taylor et al., 2004) therefore further high quality research is required in order to investigate the predictive validity of these barriers within musculoskeletal settings.

Poor attendance at clinic appointments is an objective measure with quantifiable cost implications to the health service. The extent to which patients actually carry out a programme of exercises recommended by a physiotherapist is an important research question which is methodologically more difficult to answer. These two different aspects of adherence may be related to different barriers and may require different strategies to overcome them, therefore these different aspects of adherence may be better addressed individually.

## 5. Conclusion

This review identified 20 studies investigating barriers which predicted non-adherence with musculoskeletal treatment. Strong evidence was found that low levels of physical activity at baseline or in previous weeks, low in-treatment adherence with exercise, low self-efficacy, depression, anxiety, helplessness, poor social support or activity, greater perceived number of barriers to exercise and increased pain levels during exercise are all barriers to treatment adherence. Identification of these barriers during patient assessments may be important in order to adopt appropriate management strategies which help to counteract their effects and improve treatment outcome. The results of this review suggest that physiotherapists should be concerned about the attitudes, beliefs and barriers facing their patients and act collaboratively with their patients to design realistic treatment plans which are customised to the patient's life circumstances. There was conflicting evidence regarding age and pain at baseline and limited evidence for many other barriers. In addition there is a lack of research investigating barriers introduced by health professionals and health organisations. Further high quality research is required to increase our understanding of all the factors which contribute to patient non-adherence.

## Footnotes

Appendix Supplementary data associated with this article can be found in the online version at doi:10.1016/j.math.2009.12.004.

## Appendix. Supplementary data

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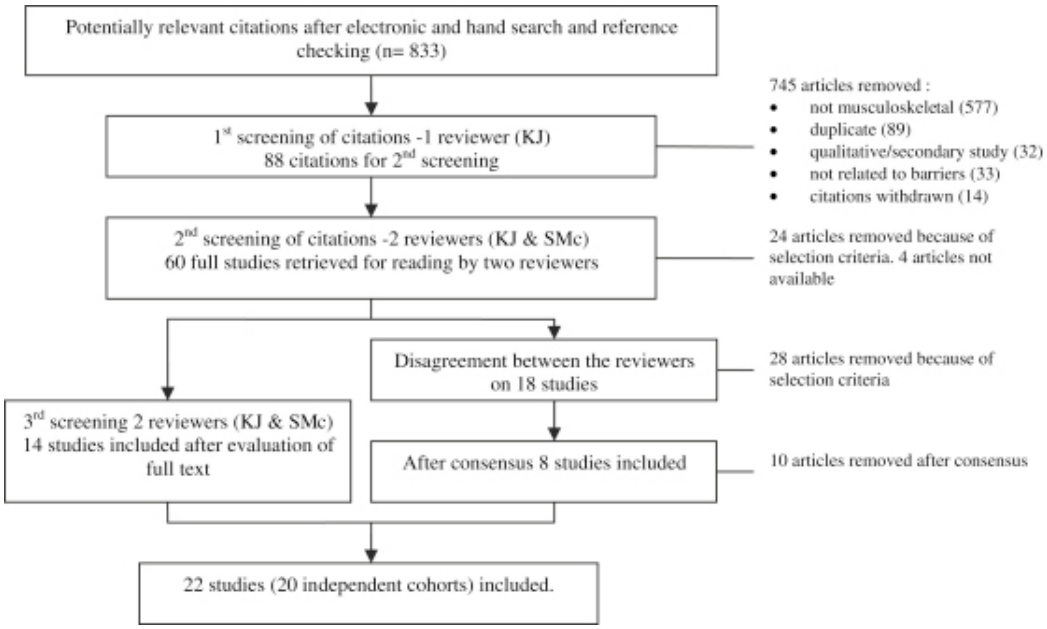
## Figures and Tables

### Fig. 1




Flow diagram of selection process of studies.

## Table 1

Quality Assessment Tool (adapted from Borghouts et al., 1998; Scholten-Peeters et al., 2003).

| Criteria | Score |
|---|---|
| Study population | |
| (A) Description of source population | +/−/? |
| (B) Description of inclusion and exclusion criteria | +/−/? |
| Study design | |
| (C) Prospective study design | +/−/? |
| (D) Study size ≥ 300 | +/−/? |
| Drop-outs | |
| (E) Information completers versus loss to follow-up/drop-outs | +/−/? |
| Prognostic factors | |
| (F) Description of potential prognostic factors | +/−/? |
| (G) Standardised or valid measurements | +/−/? |
| (H) Data presentation of most important prognostic factors | +/−/? |
| Outcome measures | |
| (I) Relevant outcome measures | +/−/? |

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[+ = positive (design/conduct adequate, scores 1 point); — = negative (design or conduct inadequate, scores 0 points); ? = unclear (item insufficiently described, scores 0 points)].

**Table 2**

Levels of evidence.

| | |
|---|---|
| Strong | Consistent findings in at least 2 high quality cohorts/RCTs |
| Moderate | Findings from 1 high quality cohort/RCT *and* consistent findings from 1 or more low quality cohorts/RCTs |
| Limited | Findings from 1 high quality cohort/RCT *or* consistent findings from 1 or more low quality cohorts/RCTs |
| Conflicting | Inconsistent findings regardless of quality |
| No Evidence | No studies found |

## Table 3

Results of methodological assessment.

| Study | A | B | C | D | E | F | G | H | I | J | K | L | M | Quality Score |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Schoo et al. (2005) | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 11 |
| Alexandre et al. (2002) | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 10 |
| Dobkin cohort[a] | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 10 |
| Fekete et al. (2006) | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 10 |
| Alewijnse et al. (2003) | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 10 |
| Stenstrom et al. (1997) | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 10 |
| Brewer cohort[b] | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 9 |
| Castenada et al. (1998) | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 9 |
| Funch and Gale (1986) | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 9 |
| Kenny (2000) | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 9 |
| Laubach et al. (1996) | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 9 |
| Rejeski et al. (1997) | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 9 |
| Shaw et al. (1994) | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 9 |
| Sluijs et al. (1993) | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 9 |
| Milne et al. (2005) | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 8 |
| Oliver and Cronan (2002) | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 8 |
| Chen et al. (1999) | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 8 |
| Taylor and May (1996) | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 8 |
| Minor and Brown (1993) | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 7 |
| Kolt and McEvoy (2003) | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 6 |

[a]Dobkin et al., 2005 and Dobkin et al., 2006.

[b]Brewer et al, 2000 and Brewer et al., 2003.

## Table 4

Physical, psychological, socio-demographic and clinical barriers to adhering with treatment.

| Barrier to adherence | Level of evidence | Studies | Comments |
|---|---|---|---|
| *Physical barriers* | | | |
| Low level of physical activity or aerobic capacity at baseline | strong | Schoo et al. (2005) | Older subjects with OA who were physically active at baseline were 14 times more likely to adhere to a home exercise programme |
| | | Stenstrom et al. (1997) | Undertaking regular range of motion exercise prior to the study predicted adherence with a one year home exercise programme in subjects with inflammatory rheumatoid disease. |
| | | Minor and Brown (1993) | In subjects with OA/RA, low aerobic capacity at baseline predicted negative exercise behaviour 3 months and 18 months after participating in an exercise class. |
| | | Rejeski et al. (1997) | In subjects with OA knee, lower baseline $VO_{2PEAK}$ predicted poor attendance at an aerobic class and less time spent undertaking aerobic exercise. |
| Low in-treatment adherence with exercise | Strong | Schoo et al. (2005) | Subjects with OA who reported adhering well to a prescribed home exercise in the first 4 weeks of the programme were 20 times more likely to report adhering with exercise in the final 4 weeks. |
| | | Dobkin cohort | In women with fibromyalgia, in-treatment adherence with stretching and aerobic exercise predicted future adherence with the stretching and aerobic programme. |
| | | Alewijnse et al. (2003) | In women with urinary incontinence, short term adherence with a pelvic floor muscle exercise programme predicted long term adherence with the programme at 1-year follow-up. |
| Low levels of | Strong | Rejeski | In subjects with OA knee, exercise behaviour 3 and 9 months post |

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Note: OA = Osteoarthritis, BMI = Body Mass Index, $VO_2$peak = maximal oxygen uptake, RA = Rheumatoid arthritis, PT/AT = Physical therapist/athletic trainer, ACL = anterior cruciate ligament, QWB = quality of well being, TMJ = Tempeoromandibular joint, LBP = Low back pain.