Patient adherence to physiotherapist-prescribed self-management strategies

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THESIS

Declarations

Statement of originality

I hereby certify that to the best of my knowledge and belief this thesis is my own work and contains no material previously published or written by another person except where due references and acknowledgements are made. It contains no material which has been previously submitted by me for the award of any other degree or diploma in any university or other tertiary institution.

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I hereby certify that this thesis is in the form of a series of *papers. I have included as part of the thesis a written statement from each co-author, endorsed in writing by the Faculty Assistant Dean (Research Training), attesting to my contribution to any jointly authored papers. (*Refer to clause 39.2 of the Rules Governing Research Higher Degrees for acceptable papers).

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List of papers included as part of this thesis

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Peek, K., Carey, M., Mackenzie, L. & Sanson-Fisher, R. "An observational paper of Australian private practice physiotherapy consultations to explore the prescription of self-management strategies." *Musculoskeletal Care.* (2017)
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Paper 2

Peek, K., Carey, M., Sanson-Fisher, R. & Mackenzie, L. "Physiotherapists' perceptions of patient adherence to physiotherapist prescribed self-management strategies: A national survey." *Disability and Rehabilitation* (2016)
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Paper 3

Peek, K., Carey, M., Mackenzie, L. & Sanson-Fisher, R. "Predictors of high levels of patient adherence to physiotherapist-prescribed self-management strategies" (submitted- Physiotherapy)

Paper 4

Peek, K, Sanson-Fisher, R, Mackenzie, L. & Carey, M. "Patient adherence to physiotherapist prescribed self-management strategies: A critical review"; *International Journal of Therapy and Rehabilitation*. 22.11 (2015) 535-543.
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Paper 5

Peek, K., Carey, M., Mackenzie, L. & Sanson-Fisher, R. Patient adherence to an exercise program for chronic low back pain measured by patient-report, physical therapist perception and observational data (submitted- Physiotherapy Theory and Practice).

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Peek K., Sanson-Fisher R., Mackenzie L., & Carey, M. Interventions to aid patient adherence to physiotherapist prescribed self-management strategies: A systematic review. *Physiotherapy.* (2016); 102(2):127-35.
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Peek, K., Carey, M., Sanson-Fisher, R. & Mackenzie, L. “Aiding patient adherence to physiotherapist-prescribed self-management strategies: An evidence-based behavioural model in practice.” *Physical Therapy Reviews* 21.2 (2016): 124-130.
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Conference Presentations

Peek, K., Carey, M., Mackenzie, L. & Sanson-Fisher, R. "Predictors of high levels of patient adherence to physiotherapist-prescribed self-management strategies." Oral presentation, Australian Physiotherapy Association Conference, Sydney 2017.

Peek, K., Carey, M., Sanson-Fisher, R. & Mackenzie, L. "Aiding patient adherence to physiotherapist-prescribed self-management strategies: An evidence-based behavioural model in practice." Oral presentation, World Conference in Public Health, Melbourne 2017.

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Peek, K., Carey, M., Sanson-Fisher, R. & Mackenzie, L. "Patient adherence to physiotherapist-prescribed self-management strategies." Three Minute Thesis oral presentation, University of Newcastle 2016.

Peek, K., Carey, M., Mackenzie, L. & Sanson-Fisher, R. "Barriers and enablers affecting patient adherence to physiotherapist-prescribed self-management strategies." Poster presentation, International Congress of Behavioural Medicine, Melbourne 2016.

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Abstract

Self-management strategies including exercise and advice are important components of physiotherapy treatment plans. However, a paucity of research currently exists regarding the prescription of self-management strategies in physiotherapy private practice in Australia. Further, it is widely accepted that the effectiveness of self-management strategies is dependent upon patient adherence. This is an important area to address because evidence suggests that levels of patient adherence to self-management strategies is currently sub-optimal. However, if physiotherapists do not perceive patient adherence to be an issue then methods to aid adherence may not be readily incorporated into routine practice. In addition, there is little consensus in the literature on the characteristics which might be associated with high levels of adherence to prescribed self-management strategies, the types of interventions that can be utilised in physiotherapy to aid patient adherence and how adherence can be accurately measured.

This thesis includes seven papers which aimed to address these gaps in the literature by exploring: physiotherapist prescription of self-management strategies in private practice; the perceptions of practising physiotherapists; the levels and characteristics associated with patient-reported adherence; the methods used to measure adherence; and interventions to aid adherence to physiotherapist prescribed self-management strategies. A behavioural model to aid patient adherence is also presented.

The results of this thesis support that self-management strategies are an integral component of private physiotherapy practice. However, the levels of patient adherence to all physiotherapist-prescribed self-management strategies in private practice are low. Patient adherence may be aided by the use of supplementary written information, asking the patient to repeat the self-management instructions and the use of activity monitors. Finally, there is a need to develop a multi-faceted measure of patient adherence to all self-management strategies which accurately captures all the elements of adherence.

Overview

This thesis by publication makes an important contribution to the physiotherapy literature as it addresses a number of gaps related to self-management prescription in Australian private practice. Seven papers will be presented which will report on: the prescription habits of Australian physiotherapists in private practice; the views of practising physiotherapists related to the importance of patient adherence for improving patient outcomes; the levels and factors associated with patient adherence; the methods used to assess patient adherence; effectiveness of interventions to aid patient adherence; and the presentation of a behavioural model.

This thesis is comprised of an introduction, seven chapters (comprising five peer-reviewed publications and two which are under editorial review at the time of thesis submission) and a discussion which provides an overview of the main findings, strengths and limitations of the included papers, and the implications of this thesis for clinical practice and future research.

The overall objectives of this thesis are to:

1) Explore the prescription of self-management strategies by physiotherapists in Australian private practice, which includes:
    a. The number and type of strategies prescribed.
    b. The length of consultation time allocated to self-management (paper one).

2) Explore the perceptions of private practice physiotherapists in Australia regarding the:
    a. Importance of patient adherence to physiotherapist prescribed self-management strategies in improving patient outcomes.
    b. Perceived rate of patient adherence to prescribed self-management strategies encountered in their practice.
    c. Importance of methods employed to increase patient adherence to self-management strategies and the barriers to employing these methods (paper two).

3) Explore the:

   a. Level of patient-reported adherence to self-management strategies prescribed in Australian private practice, and;

   b. Extent to which patient, physiotherapist, consultation and prescription characteristics are associated with patient-reported high levels of adherence (paper three).

4) Examine the:

   a. Number of studies published in peer-reviewed journals in the last 20 years related to patient adherence to physiotherapist prescribed self-management strategies, and;

   b. Types of adherence measures used to assess patient adherence in intervention and non-intervention based studies and the reported accuracy of those measures (paper four).

5) For patients prescribed home-based exercises by physiotherapists in private practice, to:

   a. Compare patient-reported levels of adherence with physiotherapists' perceptions of patient adherence; and

   b. Explore the proportion of patients who could both recall and demonstrate accurately their exercises to an independent researcher (paper five).

6) Examine the effectiveness of interventions to aid patient adherence to all physiotherapist-prescribed self-management strategies (paper six).

7) Present a behavioural model based on current evidence on how best to aid patient adherence to physiotherapist-prescribed self-management strategies (paper seven).

To achieve these overall objectives, this thesis will present the findings of seven papers.

The **Introduction** outlines evidence regarding the importance of self-management strategies prescribed by physiotherapists in improving patient outcomes. It provides an overview of the issues related to the measurement of patient adherence as well as the current evidence supporting interventions to aid patient adherence.

Paper one (published in *Musculoskeletal Care*), "An observational study of Australian private practice physiotherapy consultations to explore the prescription of self-management strategies", reports on a cross-sectional observation paper of 113 physiotherapist-patient consultations in Australian private physiotherapy practice. This paper presents the self-management prescription habits of physiotherapists including type and number of self-management strategies prescribed and the length of consultation time allocated to self-management (overall, by consultation type and injury location). The results indicate that physiotherapists regularly spend time prescribing a range of self-management strategies to patients receiving treatment for a number of different injury locations. These findings suggest that self-management is considered an important component of physiotherapy in private practice.

Paper two (published in *Disability and Rehabilitation),* "Physiotherapists' perceptions of patient adherence to physiotherapist prescribed self-management strategies: A national survey", reports on a cross-sectional web-based survey of n = 298 practising physiotherapists across Australia. This paper presents the views of practising physiotherapists related to the importance of self-management strategies in improving patient outcomes; their perceived level of patient adherence to prescribed strategies; the importance of methods employed to increase patient adherence and the barriers to employing these methods. The results of this paper suggest that physiotherapists perceive that patient outcomes can be positively impacted by improved patient adherence to a range of strategies. However, levels of patient adherence are currently perceived as sub-optimal. Therefore, physiotherapists should be encouraged to utilise methods to aid patient adherence.

Paper three (under review at time of thesis submission), "Predictors of high levels of patient adherence to physiotherapist-prescribed self-management strategies", reports on a cross-sectional observational paper of a consecutive sample of 113 patients (being treated by 14 physiotherapists from four private practices). Paper three presents patient-reported levels of adherence to physiotherapist-prescribed self-management strategies and the characteristics associated with high levels of adherence. The findings of this paper suggest that to improve patient-reported levels of adherence to prescribed self-management strategies, physiotherapists should be encouraged to confirm patient understanding by asking them to repeat back details of each strategy as well as providing them with printed information.

Paper four (published in *International Journal of Therapy and Rehabilitation),* "Patient adherence to physiotherapist prescribed self-management strategies: A critical review", reports on the quantity and quality of adherence literature in physiotherapy as well as the evidence to support the accuracy of measures used to assess patient adherence to physiotherapist-prescribed self-management strategies. The results indicate that despite a trend towards intervention-based studies and reviews over the last 20 years, the methodological quality of studies on patient adherence could be improved. The findings also suggest that accurate and standardised measures of patient adherence are needed.

Paper five (under review at time of thesis submission), "Patient adherence to an exercise program for chronic low back pain measured by patient-report, physical therapist perception and observational data", is a cross-sectional observation paper conducted within six Australian physiotherapy private practices involving 15 physiotherapists and 61 patients. This paper is believed to be the first to compare three measures of adherence: patient-report, physiotherapist-perception and an observational measure, for patients receiving exercises for chronic low back pain. The results indicate exercise adherence measurement accuracy may be improved by the use of multi-faceted measures which include an observational component.

Paper six (published in *Physiotherapy),* "Interventions to aid patient adherence to physiotherapist prescribed self-management strategies: A systematic review", is a systematic review which reports on the interventions used to aid patient adherence to all physiotherapist-prescribed self-management strategies. The results indicate that despite a number of randomised controlled trials presenting interventions which were shown to positively influence patient adherence, there is currently insufficient data to endorse their use in clinical practice.

Paper seven (published in *Physical Therapy Reviews),* "Aiding patient adherence to physiotherapist-prescribed self-management strategies: An evidence-based behavioural model in practice", presents a six-step behavioural model to guide physiotherapists during the self-management prescription process. Each step of this model is based on current evidence on how best to aid or 'nudge' patient adherence to each prescribed strategy.

The **Discussion** of this thesis summarises the seven main findings across all seven papers. Firstly, this is the first body of work to demonstrate, using data derived from clinical observations that prescribed self-management strategies are an integral component of private practice physiotherapy treatment plans. Physiotherapists were observed to routinely prescribe from a range of nine different strategies to their patients (paper one). However, the second main finding is that patient adherence to prescribed strategies could be improved based on the low levels of adherence reported in papers two, three and five. The third main finding of this thesis derived from the results of papers four and five, which is that different methods of measuring adherence provide different estimates of adherence. Therefore, the fourth main finding suggests that adherence measurement accuracy may be improved by the use of a multi-faceted measure which is able to capture all the elements of adherence to self-management (paper five). The fifth main finding of this thesis is that physiotherapists perceive that there are a number of important methods to aid patient adherence to physiotherapist-prescribed self-management strategies (paper two). The sixth main finding reports on the prescription characteristics which were associated with higher levels of patient-reported adherence such as the use of printed information and asking the patient to repeat the details of the self-management plan, which could be easily incorporated into routine patient care. Paper three is the first known study to report predictors of adherence at 'strategy' level with the results providing important insight into how physiotherapists could adapt the prescription process to potentially aid adherence. Finally, the seventh main finding of this thesis is that evidence based strategies from the broader healthcare literature on adherence may also be applicable to physiotherapy practice as reported in the presentation of a behavioural model in paper seven.

The main findings are then followed by a discussion of the seven included papers' strengths and limitations which are reported in relation to the type of study design used for each paper. These include the generalisability of results for the survey study (paper two) and the data-based studies (papers one, three and five), the exclusion of unpublished or grey literature from the reviews (papers four and six) and the need to test the behaviour model before it can be endorsed in clinical practice (commentary-paper seven).

Clinical implications are then discussed which include the need to assess patient adherence and considering the use of adherence aiding interventions which could easily be incorporated into routine physiotherapy practice.

Recommendations for future research are then presented. These include research related to the issues surrounding patient recall and its impact on adherence, the need to develop an accurate measure of adherence to physiotherapy self-management and the development of a well-designed RCT to test the effectiveness of the behavioural model proposed in paper seven.

Finally, the discussion concludes by summarising the take home messages of each paper and the overall thesis.

INTRODUCTION

Physiotherapy profession

What is physiotherapy?

Physiotherapy (also referred to as physical therapy) is an essential component of a holistic healthcare system [1, 2]. Physiotherapists primarily assess, treat and prevent disorders of human movement caused by injury or disease [2]. These disorders often impact on a person's capacity to perform their usual activities such as those related to employment or recreation, and often show a high rate of recurrence [3, 4]. According to the World Confederation of Physical Therapists, the scope of physiotherapist practice is not limited to direct patient care, but also includes: public health strategies, advocating for patients and for health, supervising and delegating to others, leading, managing, teaching, research and developing and implementing health policy at the local, national and international levels [5].

What is the scale of the international physiotherapy workforce?

Physiotherapy is an internationally recognised profession [5]. For example, data derived from a number of European countries reported that in 2015 there were 181,572 physiotherapists practising in the United Kingdom (UK), 207,789 practising in France and 13,075 practising in Ireland [6]. The United States' Department of Labor's - Bureau of Labor Statistics, reports that there were approximately 210,900 physiotherapists employed in the United States in 2014 [7]. The most recent report on the number of physiotherapists with general (unlimited) registration prepared by the Physiotherapy Board of Australia reports that there were 27,865 physiotherapists registered to practice in Australia in 2016 [8].

What qualifications are required to practise?

Physiotherapy may only be practised by qualified, registered or licensed individuals [1]. According to data collected from 80 member organisations of the World Confederation of Physical Therapists, 64% of physiotherapists require a Bachelor degree in physiotherapy to legally practise in their country of residence (24% need a diploma, 8% need a post-graduate diploma, 3% need a Master's degree and 1% require a professional doctorate) [9]. In 2013 there were 1947 physiotherapy entry level education programs, up from 1826 in 2011 [9]. In Australia, entry level qualifications include a Bachelor, Master's Degree or Doctor of Physiotherapy, with an annual declaration by each individual physiotherapist affirming adherence to policies related to continuing professional development and recency of practice necessary to maintain registration [10-12]. A similar approach to maintenance of registration is adopted in many countries worldwide including the UK, Ireland, Netherlands, New Zealand and United States [12].

<u>Physiotherapy in the Australian healthcare system</u>

Australian public healthcare system

The federal government of Australia funds and administers the national public health insurance schemes known as the Medicare Benefits Scheme (MBS) and the Pharmaceutical Benefits Scheme (PBS) [13]. The federal government (along with states/territories) also fund public hospitals and population health programs; regulates much of the health system including private health insurance, pharmaceuticals, and medical services; and has the main funding and regulatory responsibility for government-subsidised residential care facilities [13]. Medicare provides universal health coverage for citizens and permanent residents of Australia, as well as automatic coverage for people with temporary visas from countries with whom Australia has reciprocal arrangements [13]. Universal health coverage means that inpatient care in public hospitals is free (under the National Health Act 1953). Medicare provides free or subsidised access to most medical services and some allied health services such as the Chronic Disease Management program which allows a maximum of five medical practitioner referred services including physiotherapy [14]. However, people may choose to pay for private care in either public or private hospitals, or to access ancillary (out-of-hospital) services (including physiotherapy) either independently or through private health insurance funds [13]. Australians often elect to access ancillary physiotherapy services privately due to the limited or restricted availability of publicly funded physiotherapy services.

In Australia, most ancillary physiotherapy services are subsidised by private health insurance funds. Data released by Australian Prudential Regulation Authority in February 2017 demonstrated that 55.4% of the population had private health insurance for ancillary services including physiotherapy [15]. During the December 2016 quarter, insurers paid $88 million for physiotherapy services which equates to 2,560,594 episodes of physiotherapy (ranked third behind dental 10,154,733 and optical services 3,289,094) [15].

Australian physiotherapy workforce

In Australia, physiotherapy is delivered in both public and private healthcare settings. Data from Health Workforce Australia suggests that the largest percentage of employed physiotherapists in Australia work in either a group (25.9%) or solo private practice (12.7%) [16]. This compares to 20.9% of physiotherapists who are employed in a hospital setting [16]. In addition, there appears to be an increasing number of physiotherapists employed in private practice with 6.4% more physiotherapists employed in private practice in Australia in 2012 than 2011 [16]. Whereas the number of physiotherapists employed within a hospital setting decreased by 15.8% over the same time period [16]. As of June 2010, private physiotherapy practices were in operation in over 5000 locations Australia-wide, delivering an average of 796 services/consultations per physiotherapist annually [17]. Given that private practice is the major employment setting for Australian physiotherapists, this thesis will primarily focus on private practice.

<u>There is increasing demand for physiotherapy for musculoskeletal conditions</u>

High prevalence of musculoskeletal conditions

Chronic diseases impose a large burden on human health worldwide [18]. Furthermore, the number of adults affected with at least one chronic disease is expected to rise substantially in the coming decades due to an increasing world population aged 60 years and older; with chronic diseases disproportionately affecting this age group [18]. About half of all Australians have at least one chronic disease, with around 20% reporting two or more chronic diseases, according to data released by the Australian Institute of Health and Welfare [19, 20]. Therefore, demand for healthcare services in Australia is increasing, both as a result of the ageing population and the increased prevalence of chronic diseases [21]. The World Health Organisation reported that two of the most prevalent chronic diseases worldwide are those of a musculoskeletal nature including low back pain and osteoarthritis [21, 22]. Over one in four Australians (28%) reported having at least one musculoskeletal condition in 2011–12 with the most prevalent conditions being low back pain, osteoarthritis, osteoporosis and rheumatoid arthritis [23]. Common sites of musculoskeletal pain treated by physiotherapists in private practice include the lower back, shoulder, neck, and knee [24] which are often the result of acute injury, or of a more chronic nature such as arthritis. In Australia, musculoskeletal physiotherapy is practised more widely than any other scope of practice (such as neurology or cardiorespiratory) [16]. Data from 2014 reported that approximately half (53%) of all employed clinical physiotherapists in Australia listed that their primary scope of practice was treating conditions of musculoskeletal origin [16].

Global and national burden of musculoskeletal conditions

The United Nations and World Health Organisation report that four of the most burdensome chronic musculoskeletal conditions worldwide are osteoarthritis, rheumatoid arthritis, osteoporosis and low back pain [22]. Musculoskeletal conditions cause more functional limitations in the adult population in most welfare states than any other group of disorders and they are a major cause of years lived with disability in all continents and economies [22].

Low back pain, for example, is now considered one of the leading causes of disability globally, ahead of 290 other conditions including diabetes, breast cancer and asthma [25]. Chronic low back pain was estimated to be responsible for 58.2 million years lived with disability in 1990, increasing to 83 million in 2010, with the likelihood that this will continue to grow [25]. The direct cost of low back pain related to healthcare delivery in Australia is estimated at AU$1.02 billion annually [26]. Direct costs include the cost of primary care medical practitioners, allied health professionals, specialist appointments, hospital in- and out-patient admissions, radiology and imaging, prescription and over-the counter medications and community care [27].

Similar to low back pain, chronic neck pain is also becoming more common [28]. According to one systematic review, the reported worldwide prevalence of neck pain has ranged from 6-22%, increasing to 39% in adults aged 65 years and older [29]. In Australia, the associated direct and indirect healthcare costs related to the treatment of neck pain reaches almost $1.14 billion annually [30].

Given the high costs associated with musculoskeletal conditions, it is important for physiotherapists and other healthcare professionals to determine which treatment interventions are not just the most effective in improving patient symptoms, but also those which are cost-effective and time efficient [31]. For example, it has been reported that symptom severity of musculoskeletal conditions commonly treated with physiotherapy may be reduced, and recurrence delayed or avoided, by enhancing patient self-management between physiotherapy consultations [4]. This thesis will primarily focus on musculoskeletal conditions given musculoskeletal physiotherapy is the primary scope of practice for the majority of physiotherapists working in private practice in Australia [16]. It was also decided to focus on musculoskeletal conditions more broadly to capture the prescription of self-management strategies to patients regularly treated by physiotherapists in private practice given the paucity of research in this area. This may then provide a foundation on which to focus more specifically on a particular musculoskeletal condition such as patients with knee or neck pain.

Self-management is an important component of physiotherapy treatment

Physiotherapy treatment usually consists of a ‘hands on’ component which may take the form of manual therapy, stretching and supervised exercise, which is then combined with a self-management treatment plan [1]. The World Confederation for Physical Therapy considers patient self-management to be an integral aspect of physiotherapy treatment approaches [5]. Self-management is defined for the purpose of this thesis as any strategy prescribed by the physiotherapist for the patient to complete independently away from the supervised environment. These self-management strategies are usually monitored and progressed by the physiotherapist. This definition differs from the term ‘self-care’ which requires an element of self-monitoring to facilitate a patient’s autonomy in making daily decisions to manage a long-term health condition [32]. For example, a self-maintained log of blood glucose levels in diabetes management which directly influences the self-administration of insulin. This thesis does not discuss self-management strategies adopted by patients independent of the health care provider or in this case, physiotherapist.

Self-management is concerned with handling the day-to-day impact of a condition or disorder, which in some cases may have long-term implications [32]. Self-management applies to all conditions treated by physiotherapists to facilitate recovery and avoid exacerbation of symptoms. Self-management of acute conditions may prevent them from progressing into chronic, long-term conditions [4]. In the UK, primary-care guidelines for the management of acute low back pain encourage early referral to a physiotherapist [33] with the aim of treating symptoms promptly, given that chronic low back is more challenging and costly to treat [34]. Self-management of chronic musculoskeletal conditions is important for managing the long-term consequences of a condition related to physical pain and disability, emotional issues and reduced social participation [35].

The terms “self-management”, “home-based physiotherapy/ treatment programs” and “home-based strategies” are used interchangeably to describe these unsupervised between-consultation treatment approaches described in this thesis.

<u>What self-management strategies do physiotherapists prescribe in private practice?</u>

Common self-management strategies prescribed by physiotherapists include advice, home exercise, use of ice, knee and elbow braces, taping and orthotics [36-40]. Advice ranked as the most commonly provided supplement to clinic-based treatment provided to patients with chronic low back pain by physiotherapists [39]. Self-management advice is usually tailored to the individual needs of the patient [36]. A review of clinical guidelines for the management of low back pain including national guidelines from 13 countries and two international clinical guidelines from Europe, recommend the use of exercise but note that there is no evidence that one form of exercise is superior to another [41]. However, European guidelines advise against exercise that requires expensive training and machines and therefore, exercise which can be self-managed may be the preferred approach [41]. One study which surveyed physiotherapist-reported prescription of exercise reported that 90% of the 97 physiotherapist respondents prescribed home-based exercises to their patients with chronic low back pain [42].

What is the evidence for self-management strategies in improving physiotherapy treatment outcomes?

Self-management programs have been shown to be as effective or in some cases more effective, than clinic based physiotherapy for improving patient outcomes for a range of conditions including osteoarthritis [43]. An overview of systematic reviews reported that weight loss advice, braces and heel wedges decrease pain and improve function in knee osteoarthritis [44]. An earlier randomised controlled trial demonstrated that the use of removable bracing in the treatment of tennis elbow, resulted in no clinical difference between the use of a brace or clinic-based physiotherapy [40]. However, most earlier studies have focused on the benefits of home-based exercise. It has been reported that because most patients with osteoarthritis receive exercise as part of their physiotherapy treatment, this has led to an increased focus on the evidence to support this modality [44]. An overview of systematic reviews located high-quality evidence from nine reviews to support the use of exercise for reducing pain and improving function for knee osteoarthritis [44]. Furthermore, a number of systematic reviews including a Cochrane review have supported the inclusion of exercise programs for the treatment of low back pain [45-47]. Similarly, a systematic review found 16 studies with findings that support the use of active strengthening exercises for improving treatment outcomes for patients with neck pain [30]. A narrative review concluded that exercise programs were beneficial for patients with chronic musculoskeletal pain as long as they were individually tailored with the emphasis on symptom flare-ups [48]. Consequently with level one evidence [49] to support the benefits of exercise in improving patient outcomes in physiotherapy, home-based programs are often prescribed as an adjunct treatment to in-clinic physiotherapy management [50]. However, the evidence base to support the prescription of self-management strategies in physiotherapy practice for patients with musculoskeletal conditions more broadly is still an emerging area. Therefore, this research is timely in examining the prescription habits of physiotherapists which may then lead to further research to investigate the effectiveness of what is prescribed.

How do physiotherapists prescribe self-management approaches in day-to day practice?

A questionnaire of 419 members of the Irish Society of Chartered Physiotherapists reported that advice and exercise, respectively, were the most frequently reported self-management approaches used to treat low back pain [39]. Similarly a questionnaire of 267 registered physiotherapists with the Indian Physiotherapy Association reported that all physiotherapists in their study responded that they gave some form of advice and exercise to patients receiving treatment for low back pain [38]. However, one limitation of much of this earlier self-management research is the reliance upon physiotherapist-reported practice data collected via surveys [38, 39]. The use of descriptive studies utilising clinical observations are important in informing practice habits using a measure that is less subject to social desirability bias [51, 52]. There is also a paucity of research describing the range of self-management strategies prescribed by physiotherapists as part of a treatment plan for a range of musculoskeletal conditions (rather than limited to back pain). The generalisability of these earlier studies may also be limited and not reflect the prescription of self-management strategies by Australian physiotherapists. Clinical observation of Australian physiotherapist-patient consultations to explore the number and type of self-management strategies prescribed in private physiotherapy practice will be presented in paper one.

Adherence to self-management strategies is essential to achieving clinical benefit

The effectiveness of any prescribed self-management strategy is related to whether a patient does it as recommended or not, known as adherence. The World Health Organisation defines adherence as “the extent to which a person’s behaviour…corresponds with agreed recommendations from a healthcare provider” p.13 [53]. It is typical of physiotherapy intervention studies to report that approximately 60% of participants did not fully adhere to recommended home-based physiotherapy programs [54-56]. Research suggests that improved patient adherence with physiotherapist-prescribed self-management strategies may lead to better treatment outcomes; while non- adherence can increase risk of injury and lead to poorer outcomes. A systematic review on adherence to therapeutic splint wear in adults with acute upper limb injuries, reported relatively high adherence rates (> 75%) [57]. However, the risks associated with non-adherence for these patients included tendon ruptures and additional surgery which may have provided added incentives to adherence [57]. The authors concluded that poor adherence to splinting can lead to worse outcomes for the patient with increased costs to the healthcare system [57]. Similarly, in a review of patient adherence to exercise and advice for patients with chronic low back pain, it was reported that recurrent or persistent episodes could have been reduced or avoided if patients adhered to their home treatment regimens [58].

A secondary benefit of improved patient adherence could be related to a reduction in associated healthcare costs [57, 59]. For example, adherence to self-management strategies prescribed by physiotherapists assumes importance because it may bring about potential savings for the patient [60]. One study demonstrated that patients with low back pain who adhered to evidence-based physiotherapy treatment plans benefited from cost savings for both themselves and the health system via a reduction in medication usage, physician/specialist appointments and hospital admissions [59]. Furthermore, adherence to home-based exercises has been shown to reduce the number of physiotherapy clinic appointments and consequently a reduction in the costs associated with these visits for patients [59].

How can adherence to self-management strategies be assessed?

There is currently no 'gold standard' for the measurement of patient adherence to physiotherapist-prescribed self-management strategies. Therefore, patient adherence to physiotherapist prescribed self-management strategies has been measured in many different ways. This includes three main methods: patient self-report, physiotherapist perceptions of patient adherence and observational measures [61-63]. However, each of these methods have their own limitations.

Patient self-report measures

Patient self-report measures include prospective diaries, or retrospective reporting via questionnaires and interviews. Self-report measures are generally easy for patients to complete as well as generally being low cost for research purposes. Self-report diaries typically involve recording on a daily basis whether or not a strategy is completed. Whereas questionnaires [64] may ask patients questions about the regularity in which they performed their exercises over a defined period of time (e.g. in the last month) as well as any barriers or enablers to adherence. Likert Scales such as the five-point Likert scale (1=none to 5=all) used by Bassett et al [56] have been used to rate the extent of patient adherence to a self-management strategy. However, all of these self-report measures may over- or under-estimate the actual carrying out of these strategies at home [52]. Replies to questions asked about adherence may reflect what the patient feels is the desired response rather than the true appraisal of their adherence behaviour [62].

Physiotherapist perceptions

Another approach is to ask physiotherapists for their perceptions of patient adherence. This approach was used in an earlier study where physiotherapists were asked at the conclusion of physiotherapy treatment, whether they thought patients had adhered to their home exercise program or not [65]. However, the use of this type of measure may need to be limited to patients still attending in-clinic physiotherapy for the same condition and may not be a useful measure of long-term adherence once patients have been discharged. This method of measuring adherence is also subject to reporting biases where physiotherapists may under- or over-estimate a patient's level of adherence.

Observational measures

Direct observation may include the use of electronic recording devices such as a hidden video counter, tally counters and pedometers. However, these measures have their own limitations, as the act of monitoring by external observers/devices may change adherence behaviour for the length of the monitoring process, but not long-term adherence attitudes and behaviours [63]. This tendency of participants who know that they are being observed to temporarily change their behaviour is known as the Hawthorne effect [66]. In addition, electronic recording devices do have the potential to be unreliable due to wear and tear or not being used correctly, leading to incomplete data. These devices can be expensive and may be outside the realm of the average patient and physiotherapy practice [67]. In addition, adherence to some self-management strategies are also difficult to capture using electronic recording devices [68] such as activity monitors, which record movement, but do not enable assessment of whether the correct type of exercise was performed as prescribed.

Few studies have reported on the levels of patient adherence measured using physiotherapist-perspectives and observational methods. Such a study would further enhance physiotherapists' understanding of the strengths and limitations regarding the use of these different methods to measure patient adherence to self-management. Paper five aims to address this gap in the literature.

<u>How accurate are current measures of adherence to physiotherapy?</u>

There have been a variety of self-report and observational methods to measure patient adherence in the physiotherapy literature. A systematic review of measures of self-reported adherence to unsupervised home-based exercise programs conducted by Bollen et al. [62] identified 61 measures of adherence including 29 self-report questionnaires, 29 patient report logs/diaries and three observational approaches (two observer-reported scales and one tally counter). However, this review focussed only on adherence measures to home-based exercise, and not all self-management strategies provided by physiotherapists. A further systematic review of measurement tools for adherence to non-pharmacologic self-treatment for chronic musculoskeletal conditions found 47 different measures of adherence with no measure used in more than a single study [36]. This review located 31 home-diaries, 11 multi-item questionnaires and 7 single item questionnaires, with all measures varying in terms of the type of information requested and scoring method [36]. The authors concluded that patient adherence is usually measured on an ad hoc basis, with the lack of homogeneity in measurement leading to issues surrounding interpretation of the literature and whether interventions to aid adherence can be reliably shown to work [36]. This lack of consensus in the measurement of adherence may be reflective of the lack of attention patient adherence has received in physiotherapy research [36, 69]. It is important to develop an understanding of the accuracy of specific measures of adherence to physiotherapy self-management to be able to select the most useful for determining patient outcome measures in clinical practice, or the effectiveness of interventions used in research. No reviews have looked at the accuracy of measures of adherence to physiotherapist-prescribed self-management strategies for strategies other than exercise. Paper four presents a critical review of the types of measures used to assess patient adherence to physiotherapist-prescribed self-management strategies and the reported accuracy of those measures.

What factors may influence adherence?

Descriptive studies which look at correlational evidence can provide insights into which factors should be targeted during intervention research, as well as identifying the circumstances in which adherence is more or less likely. A number of earlier studies have reported predictors of adherence to either exercise only [70, 71] or have been restricted in their focus to very specific patient populations such as patients with: cystic fibrosis [63, 72]; meniscal tears and osteoarthritis [70]; bronchiectasis [73]; back pain [74]; or urinary incontinence [71, 75]. A summary of the physiotherapy literature in relation to the factors that have been shown to influence patient adherence are described below.

1) *Patient characteristics:*

    i. *Patient cognitive and behavioural factors*

Since the primary goal of improving patient adherence is to change behaviour, an understanding of the behaviour change process is essential if adherence aiding strategies are to succeed [76]. Human behaviour and particularly health behaviour is complex and not always easy to understand, therefore many theories have been devised in an attempt to explain behaviour [76]. Several general theoretical frameworks from the health psychology literature may be useful in understanding adherence in physiotherapy; health belief model; cognitive behavioural theory; social cognitive theory; and self-efficacy theory [77, 78]. These cognitive-behavioural theories share common assumptions that people are able to use cognitive processes, such as fore-sight, planning and decision-making, to affect behaviour [77]. These assumptions also emphasise the active role played by the patient particularly in self-regulating their behaviour [77]. These theories have some commonalities, with particular factors perceived as influencing behaviour. These include, but are not limited to: skills and knowledge of how and when to perform a behaviour; confidence in one's ability to perform a behaviour; positive beliefs and attitudes toward the behaviour (i.e. motivation); as well as opportunity to engage in the behaviour [76]. Some of the factors identified in cognitive and behavioural theories of behaviour have been explored in descriptive physiotherapy research on adherence.

Physiotherapy research supports the reciprocal relationship between self-efficacy (or the person's belief that they have the ability to implement change) and adherence to physiotherapy rehabilitation [79]. A prospective cross-sectional study of 90 injured individuals demonstrated a moderate to strong relationship between patients reporting high levels of self-efficacy and adherence to an exercise program [79]. Furthermore, the identification of barriers to adherence and ways in which these can be overcome can increase the likelihood of self-management adherence [80]. A systematic review of 20 high-quality RCTs, controlled clinical trials, prospective studies and cross-sectional surveys reported strong evidence that poor patient adherence to out-patient physiotherapy treatment was associated with a greater number of patient-perceived barriers, low patient self-efficacy, depression, anxiety, poor social support and helplessness [80]. These results suggest that physiotherapists should be concerned about the attitudes, beliefs and barriers perceived by their patients and act collaboratively with their patients to design realistic treatment plans which are customised to the patient's life circumstances [80]. The number of exercises prescribed may also be a barrier to adherence with programs containing more than six exercises being associated with lower patient-reported levels of adherence [81]. Therefore, physiotherapists may be able to increase patient adherence by prescribing fewer home-based exercises to their patients to aid both recall and reduce the complexity of the program.

Paper seven has been designed to explore how knowledge gained from a number of cognitive-behavioural theories applied in physiotherapy and wider healthcare research can be used to aid patient adherence to physiotherapist-prescribed self-management strategies.

ii. Patient sociodemographic characteristics

Studies exploring how patient sociodemographic characteristics are associated with adherence can provide useful insights into the relationship between individual patient factors and adherence. An American study published in 2016 involving 351 patients with meniscal tears and osteoarthritis of the knee reported on a number of non-modifiable patient characteristics which were associated with patient-reported non-adherence [70]. This study reported that patients earning less than US$29,000 per year were more likely to be non-adherent to home-based exercise than patients earning >$100,000 per year [70]. However, the inclusion criteria of this study were very narrow: patients aged 45 years with a meniscal tear or osteoarthritic changes of the knee on imaging, which limits the generalisability of their results to other patient populations [70]. A systematic review of nine studies related to patient adherence to exercise programs for older adults reported that factors associated with greater adherence include: higher socioeconomic status, living alone, better health status and fewer depressive symptoms [82]. An exploratory prospective cohort study of 128 patients with low back pain reported that male patients were more adherent than females to their home-exercise program and the watching of back education videos [74]. Furthermore, married patients were more adherent to their treatment program compared to unmarried patients [74].

However, patient-level factors such as gender and marriage status are non-modifiable characteristics which the physiotherapist can have no impact on. On the other hand, physiotherapists are well placed to influence a number of modifiable characteristics including the number and type of self-management strategies prescribed or how much of the consultation time is devoted to promoting self-management. These characteristics are discussed under the sub-headings of physiotherapist, consultation and prescription characteristics below:

2) *Physiotherapist, consultation and prescription characteristics – the missing piece of the puzzle?*

    i. *Physiotherapist characteristics*

No studies were located which examined physiotherapist characteristics such as the possession of post-graduate qualifications and the relationship with higher level of patient adherence. However, a cross-sectional on-line survey of 170 physiotherapists practising in New Zealand reported that physiotherapists with post-graduate qualifications were more likely to report using low back pain treatment guidelines to inform clinical decisions [83]. This might imply that physiotherapists with post-graduate qualifications may be more knowledgeable of best-practice physiotherapy literature in general but whether this translates to patient adherence is unknown.

    ii. *Consultation characteristics*

No studies were located which examined the relationship between physiotherapy consultation characteristics such as the number of previous consultations for the same condition, or the amount of time devoted to the prescription of self-management strategies. However, one American exploratory prospective cohort study of 128 patients with low back pain reported a statistically significant association between the duration of physiotherapy (reported in terms of the number of weeks patients have been attending treatment for) and higher patient-reported adherence to home-based exercise [74]. Patients in this study were more adherent when they had been attending for physiotherapy for a period of two-three weeks than those who had been attending for five-six weeks [74]. The number of treatment sessions that patients received over this time period was not reported but it may be reasonable to assume that patients attending physiotherapy for two-three weeks had a fewer number of consultations than those attending over a longer time period.

iii. Prescription characteristics

Prescriptions characteristics can include the number and type of self-management strategies prescribed and the methods of instruction used by physiotherapists use during the self-management prescription process. One Spanish cross-sectional cohort study of 184 patients with chronic neck or back pain looked at factors associated with adherence to home-based exercise [81]. Results of multivariate analysis of patient-reported adherence demonstrated that patients given one-three exercises were reportedly more adherent than those given more than six exercises to complete at home [81]. The same might be true regarding the number of strategies with patients more likely to adhere when fewer strategies are prescribed. However, the relationship between patient adherence and the number of different self-management strategies prescribed has not yet been explored.

A literature review of 16 randomised controlled trials and descriptive studies undertaken to identify the most effective components of physiotherapist-prescribed exercise reported that patients should be instructed on the frequency of exercise completion (F), intensity of exercise (I), length of time (T) to be spent exercising and the type (T) of exercise to be completed; known as the FITT principle [30]. This level of instruction detail is also important to promote patient adherence [30]. In the same way that medication is prescribed in required dosages, prescriptions of home-based exercise should also include details regarding 'dose' [30], otherwise a patient may be doing the right exercise at home but doing too much or too little, or with less effort than is required to receive a therapeutic effect [77]. However, the association between provision of instructions related to 'dose' and adherence to self-management strategies including exercise has not been explored in the physiotherapy literature. Other methods recommended to enhance adherence to prescribed self-management strategies include providing a rationale for the strategy and the provision of supplementary material [84]. A qualitative study consisting of seven focus groups with a total of 34 patients with chronic neck or back pain reported that patients felt more motivated to adhere with home-based exercises when they received an explanation from their physiotherapist about their clinical condition and when an accurate, understandable and convincing rationale to complete their exercise program was provided [85]. Furthermore, according to patients in this study, negative factors to adherence included inadequate exercise instruction and the physiotherapist not observing their exercise technique within clinic time [85].

Physiotherapists are well positioned to modify the instructional methods they use when prescribing self-management strategies to individual patients to facilitate adherence. However, this relationship has received minimal attention in the physiotherapy literature. No studies were located which examined the association between prescription characteristics and high levels of patient-reported adherence to all types of self-management strategies prescribed by physiotherapists in private practice (i.e. not limited to a particular self-management strategy such as exercise or patient condition). Paper three aims to address this gap in the literature.

<u>Need to understand physiotherapists' views on methods to aid patient adherence</u>

A number of studies have demonstrated that patient adherence to physiotherapy is currently suboptimal [56, 86]. However, if it is not perceived as such by the primary clinical physiotherapist, methods to aid adherence may not be implemented, which may ultimately have a negative impact on patient outcomes. A qualitative study of nine patients with low back pain and using eight physiotherapists, reported on an interpretative phenomenological analysis of patients' and physiotherapists' perceptions of adherence to therapeutic exercise, and focussed on assisting patients to prioritise and manage time in order to establish a routine to exercise [87]. However, given the small number of participants, it is unlikely that these results can be generalised to other patient populations or settings [88]. No quantitative studies were located in either Australia or the wider international physiotherapy literature which explored practising physiotherapist views regarding the methods to aid patient adherence. Paper two, a large-scale quantitative cross-sectional survey of practising physiotherapists will explore physiotherapists' views of patient adherence to provide some insight into the willingness of Australian physiotherapists to integrate adherence aiding interventions into routine practice.

What evidence underlies the use of adherence aiding interventions in physiotherapy?

Descriptive, observational studies are an important contributor to the adherence literature in physiotherapy as they can provide correlational data. However, a limitation of descriptive research is that they cannot infer causation [89]. Randomised controlled trials are designed specifically to establish causation and are therefore able to provide robust evidence to support the effectiveness of an intervention [90]. Systematic reviews which synthesise all of the available evidence on a particular topic are considered the highest level of evidence [49].

Currently there is a paucity of evidence related to adherence aiding interventions to self-management strategies more broadly. However, there is a growing body of research suggesting that physiotherapists can improve patient adherence to home-based exercise [69, 91]. A Cochrane review on interventions to improve patient adherence to physiotherapist-prescribed exercise (both supervised and home-based programs) for chronic musculoskeletal pain reported that out of 42 randomised controlled trials included in their review, 18 showed positive effects on patient exercise adherence [69]. The most promising adherence aiding interventions included individualised exercise programs, refresher or follow up sessions, the provision of supplementary materials such as written material, audiotapes or videotapes of exercises, and those that are based on graded activity [69].

A systematic review by McLean et al. [91] also looked at the effectiveness of interventions aimed at enhancing adherence with musculoskeletal out-patient physiotherapy treatment [91]. Three out of five included studies provided moderate evidence that a motivational cognitive–behavioural program can improve attendance at exercise-based clinic sessions [91].

A further review reported on the evidence surrounding the provision of video or DVD technology to promote patient adherence to home-based exercise or health programs. This review did not limit the inclusion criteria to only musculoskeletal conditions and therefore the patient population was more diverse, including those with heart failure, sleep apnoea, orthopaedic surgery and burns [92]. This review reported that despite the mainly positive effects on adherence shown in the 11 included studies, methodological weaknesses of the studies limit the ability to draw strong conclusions about the effectiveness of video or DVD technology [92].

These past reviews on interventions to aid patient adherence have focussed on adherence to out-patient physiotherapy treatment [91], exercise only (both supervised and self-managed) [69], or a targeted intervention such as DVDs [92]. Study six will present a systematic review to further expand the knowledge related to adherence aiding interventions to all physiotherapist-prescribed self-management strategies, including but not limited to home-based exercise.

How does this thesis extend the existing literature?

This thesis sets out to address some identified gaps in the physiotherapy literature related to patient adherence to physiotherapist-prescribed self-management strategies. The studies that make up this thesis will take a broader approach to this topic than past work, focusing on all prescribed self-management strategies targeting a range of musculoskeletal conditions.

A series of studies focused on the Australian private practice physiotherapy setting were designed to meet the following thesis objectives:

The overall objectives of this thesis are to:

1) Explore the prescription of self-management strategies by physiotherapists in Australian private practice, which includes:
   a. The number and type of strategies prescribed.
   b. The length of consultation time allocated to self-management (paper one).

2) Explore the perceptions of private practice physiotherapists in Australia regarding the:
   a. Importance of patient adherence to physiotherapist prescribed self-management strategies in improving patient outcomes.
   b. Perceived rate of patient adherence to prescribed self-management strategies encountered in their practice.
   c. Importance of methods employed to increase patient adherence to self-management strategies and the barriers to employing these methods (paper two).

3) Explore the:
   a. Level of patient-reported adherence to self-management strategies prescribed in Australian private practice, and;
   b. Extent to which patient, physiotherapist, consultation and prescription characteristics are associated with patient-reported high levels of adherence (paper three).

4) Examine the:

   a. Number of studies published in peer-reviewed journals in the last 20 years related to patient adherence to physiotherapist prescribed self-management strategies, and;

   b. Types of adherence measures used to assess patient adherence in intervention and non-intervention based studies and the reported accuracy of those measures (paper four).

5) For patients prescribed home-based exercises by physiotherapists in private practice, to:

   a. Compare patient-reported levels of adherence with physiotherapists' perceptions of patient adherence; and

   b. Explore the proportion of patients who could both recall and demonstrate accurately their exercises to an independent researcher (paper five).

6) Examine the effectiveness of interventions to aid patient adherence to all physiotherapist-prescribed self-management strategies (paper six).

7) Present a behavioural model based on current evidence on how best to aid patient adherence to physiotherapist-prescribed self-management strategies (paper seven).

To achieve these overall objectives, this thesis will present and discuss the findings of seven papers of which five are published and two are under editorial review in relevant peer-reviewed international journals. As this thesis is comprised of seven stand-alone papers reporting on different aspects of patient adherence to physiotherapist-prescribed self-management strategies, there may be some unavoidable redundancy within some of the content presented across the papers.

References:

1. Higgs, J., K. Refshauge, and E. Ellis, *Portrait of the physiotherapy profession.* J Interprof Care, 2001. **15**(1): p. 79-89.

2. Australian Institute of Health and Welfare., *Australian Institute of Health and Welfare. Allied healthworkforce 2013*, in *National health workforce series no.5*. 2013, AIHW: Canberra.

3. Bell, J.A. and A. Burnett, *Exercise for the primary, secondary and tertiary prevention of low back pain in the workplace: a systematic review.* J Occup Rehabil, 2009. **19**(1): p. 8-24.

4. Sluijs, E.M., *A checklist to assess patient education in physical therapy practice: development and reliability.* Phys Ther, 1991. **71**: p. 561-569.

5. World Confederation for Physical Therapy, *Policy statement: Description of physical therapy*. 2014, World Confederation for Physical Therapy: London UK.

6. Eurostat. *Health personnel (excluding nursing and caring professionals)*. 2016 12th April 2017]; Available from: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=hlth_rs_prs1&lang=en).

7. United States Department of Labor Bureau of Labor Statistics, *Physical Therapists. Occupational Outlook Handbook.* . 2015, United States Department of Labor Bureau of Labor Statistics. : USA.

8. Physiotherapy Board of Australia, *Physiotherapist registrants data: September 2016*. 2016, Australian Health Practitioner Regulatory Agency: Melbourne, Australia.

9. World Confederation of Physical Therapists. *Physical Therapy: A global profile*. 2015 12th April 2017]; Available from: http://www.wcpt.org/sites/wcpt.org/files/files/cds/WCPTDataInfographic-2.pdf.

10. Physiotherapy Board of Australia, *March Newletter. Available at: http://www.physiotherapyboard.gov.au/News/Newsletters/March-2016.aspx*. 2016.

11. Struber, J.C., *Physiotherapy in Australia-where to now?* Internet J Allied Health Sci Prac, 2003. **1**(2): p. 5.

12. French, H.P. and J. Dowds, *An overview of Continuing Professional Development in physiotherapy.* Physiother, 2008. **94**(3): p. 190-197.

13. Thomson, S., et al., *International profiles of healthcare systems 2012: Australia, Canada, Denmark, England, France, Germany, Iceland, Italy, Japan, the Netherlands, New Zealand, Norway, Sweden, Switzerland, and the United States*, in *The Commonwealth Fund*. 2012, The Commonwealth Fund: USA.

14. Department of Health. *Chronic Disease Management - Individual Allied Health Services under Medicare - Provider Information*. 2014 12th April 2017]; Available from: http://www.health.gov.au/internet/main/publishing.nsf/content/health-medicare-health_pro-gp-pdf-allied-cnt.htm.

15. Australian Prudential Regulation Authority., *Private health insurance quarterly statistics: December 2016*, P.H.I. Statistics, Editor. 2017, APRA: Sydney.

16. Health Workforce Australia, *Australia's Health Workforce Series – Physiotherapists in Focus*. 2014, Health Workforce Australia: Adelaide, Australia.

17. Engel, R.M., et al., *The provision of chiropractic, physiotherapy and osteopathic services within the Australian private health-care system: a report of recent trends.* Chiropr Man Ther, 2014. **22**(1): p. 3.

18. World Economic Forum., *The Global Economic Burden of Non-Communicable Diseases. World Economic Forum, Harvard University. USA. Available at: http://www.weforum.org/reports/global-economic-burden-non-communicable-diseases* 2011.

19. Australian Institute of Health and Welfare. *1 in 5 Australians affected by multiple chronic diseases*. 2015 25th April 2015]; Available from: http://www.aihw.gov.au/media-release-detail/?id=60129552034.

20. Australian Institute of Health and Welfare, *Chronic diseases and associated risk factors in Australia.* 2006: Canberra: AIHW, 2006. (AIHW Cat. No. PHE 81.) http://www.aihw.gov.au/publications/phe/cdarfa06/cdarfa06-c00.pdf

21. Australian Institute of Health and Welfare., *Physiotherapy labour workforce 1998*, N.H.L. Force, Editor. 2001, AIHW: Canberra.

22. Woolf, A.D. and B. Pfleger, *Burden of major musculoskeletal conditions.* Bulletin WHO, 2003. **81**: p. 646-656.

23. Australian Bureau of Statistics., *Australian Health Survey: First Results, 2011–12. ABS cat. no. 4364.0.55.001. Canberra: ABS.* 2012. .

24. Picavet, H. and J. Schouten, *Musculoskeletal pain in the Netherlands: prevalences, consequences and risk groups, the DMC 3-study.* Pain, 2003. **102**(1): p. 167-178.

25. Buchbinder, R., et al., *Placing the global burden of low back pain in context.* Best Pract Res Clin Rheumatol, 2013. **27**(5): p. 575-589.

26. Walker, B., R. Muller, and W. Grant, *Low back pain in Australian adults: the economic burden.* Asia Pac J Public Health, 2003. **15**(2): p. 79-87.

27. Maniadakis, N. and A. Gray, *The economic burden of back pain in the UK.* Pain, 2000. **84**(1): p. 95-103.

28. Falla, D., *Unravelling the complexity of muscle impairment in chronic neck pain.* Man Ther, 2004. **9**(3): p. 125-33.

29. Fejer, R., K.O. Kyvik, and J. Hartvigsen, *The prevalence of neck pain in the world population: a systematic critical review of the literature.* Euro Spine J, 2006. **15**(6): p. 834-848.

30. O'Riordan, C., et al., *Chronic Neck Pain and Exercise Interventions: Frequency, Intensity, Time, and Type Principle.* Arch Phys Med Rehabil, 2014. **95**(4): p. 770-783.

31. Verhagen, A.P., et al., *Conservative treatments for whiplash.* Cochrane Database Syst Rev, 2007(2): p. CD003338.

32. Anderson, K., Burford, O. and Emmerton, L. Mobile health Apps to facilitate self-care: A qualitative study of user experiences. Plos One, 2016. 11(5): e0156164

33. Higginson, G., *Clinical Standards Advisory Group,.* Quality in Healthcare, 1994. **S 12-15**.

34. Liddle, S.D., G.D. Baxter, and J.H. Gracey, *Exercise and chronic low back pain: what works?* Pain, 2004. **107**(1-2): p. 176-90.

35. Sadler, E., et al., *Exploring stroke survivors' and physiotherapists' views of self-management after stroke: a qualitative study in the UK.* BMJ open, 2017. **7**(3): p. e011631.

36. Hall, A.M., et al., *Measurement Tools for Adherence to Non-Pharmacologic Self-Management Treatment for Chronic Musculoskeletal Conditions: A Systematic Review.* Arch Phys Med Rehabil, 2014. **31;96(3):552-62.**

37. Page, C.J., R.S. Hinman, and K.L. Bennell, *Physiotherapy management of knee osteoarthritis.* Int J Rheum Dis, 2011. **14**(2): p. 145-51.

38. Fidvi N, M.S., *Physiotherapy management of low back pain in India- a survey of self-reported practice.* Physiother Res Int, 2010. **15**: p. 150-159.

39. Liddle SD, Baxter GD, and G. JH, *Physiotherapists' use of advice and exercise for the management of chronic low back pain: A national survey.* Man Ther, 2009. **14**: p. 189-196.

40. Struijs, P.A., et al., *Cost effectiveness of brace, physiotherapy, or both for treatment of tennis elbow.* Br J Sports Med, 2006. **40**(7): p. 637-43; discussion 643.

41. Koes, B.W., et al., *An updated overview of clinical guidelines for the management of non-specific low back pain in primary care.* Eur Spine J, 2010. **19**(12): p. 2075-2094.

42. Daulat, A., *A physiotherapy survey to investigate the use of exercise therapy and group exercise programmes for management of non-specific chronic low back pain.* Int Musculoskel Med, 2013. **35**(3): p. 106-116.

43. Novak, I., *Effective home programme intervention for adults: a systematic review.* Clin Rehabil, 2011. **25**(12): p. 1066-1085 20p.

44. Jamtvedt, G., et al., *Physical therapy interventions for patients with osteoarthritis of the knee: an overview of systematic reviews.* Phys Ther, 2008. **88**(1): p. 123.

45. Wells, C., et al., *The effectiveness of pilates exercise in people with chronic low back pain: a systematic review.* Plos one, 2014. **9**(7): p. e100402.

46. Hayden, J.A., M.W. van Tulder, and G. Tomlinson, *Systematic review: strategies for using exercise therapy to improve outcomes in chronic low back pain.* Ann Intern Med, 2005. **142**(9): p. 776-85.

47. Saragiotto, B.T., et al., *Motor Control Exercise for Non-specific Low Back Pain: A Cochrane Review.* Spine (Phila Pa 1976), 2016.

48. Daenen, L., et al., *Exercise, not to exercise, or how to exercise in patients with chronic pain? Applying science to practice.* Clin J Pain, 2015. **31**(2): p. 108-114.

49. Sackett DL, et al., *Evidence-based Medicine – How to practice and teach EBM (2nd edn).* 2000, Oxford: Churchill Livingstone,.

50. Peek, K., et al., *Physiotherapists' perceptions of patient adherence to prescribed self- management strategies: A cross-sectional survey of Australian physiotherapists.* Disabil Rehabil, 2016 **available at: http://dx.doi.org/10.1080/09638288.2016.1212281**.

51. Gorber, S.C., et al., *A comparison of direct vs. self-report measures for assessing height, weight and body mass index: a systematic review.* Obesity Rev, 2007. **8**(4): p. 307-326.

52. Prince, S.A., et al., *A comparison of direct versus self-report measures for assessing physical activity in adults: a systematic review.* Int J Behav Nutr Phys Act, 2008. **5**(1): p. 56.

53. World Health Organisation, *Adherence to long-term therapies: evidence for action*, in *WHO library*. 2003: Switzerland.

54. Sluijs, E.M., G.J. Kok, and J. van der Zee, *Correlates of exercise compliance in physical therapy.* Phys Ther, 1993. **73**(11): p. 771-782.

55. Taylor, A.H. and S. May, *Threat and coping appraisal as determinants of compliance with sports injury rehabilitation: An application of Protection Motivation Theory.* J Sports Sci, 1996. **14**(6): p. 471-482.

56. Bassett, S.F. and H. Prapavessis, *A test of an adherence-enhancing adjunct to physiotherapy steeped in the protection motivation theory.* Physiother Theory Pract, 2011. **27**(5): p. 360-372.

57. O'Brien, L., *Adherence to therapeutic splint wear in adults with acute upper limb injuries: a systematic review.* J Hand Ther 2010. **Mar 15**(1): p. 3-12.

58. Middleton, A., *Chronic Low Back Pain: Patient Compliance With Physiotherapy Advice and Exercise, Perceived Barriers and Motivation.* Phys Ther Rev, 2004. **9**(3): p. 153-160.

59. Hanney, W.J., et al., *The Influence of Physical Therapy Guideline Adherence on Healthcare Utilization and Costs among Patients with Low Back Pain: A Systematic Review of the Literature.* PLoS ONE, 2016. **11**(6): p. 1-18.

60. Schneiders, A., Zusman, M, Singer, K, *Exercise therapy compliance in acute low back pain patients.* Man Ther, 1998. **3**(3): p. 147-152.

61. Campbell, R., et al., *Why don't patients do their exercises? Understanding non-compliance with physiotherapy in patients with osteoarthritis of the knee.* J Epidemiol Comm Health, 2001. **55**(2): p. 132-138.

62. Bollen, J., et al., *A systematic review of measures of self-reported adherence to unsupervised home-based rehabilitation exercise programmes, and their psychometric properties.* BMJ open, 2014. **4**.

63. Kettler, L.J., et al., *Determinants of adherence in adults with cystic fibrosis.* Thorax, 2002. **57**(5): p. 459-64.

64. Lysack, C., et al., *A compliance and satisfaction with home exercise: a comparison of computer-assisted video instruction and routine rehabilitation practice.* J Allied Health, 2005. **34**(2): p. 76-82.

65. Baker, M.K., et al., *Efficacy and feasibility of a novel tri-modal robust exercise prescription in a retirement community: a randomized, controlled trial.* J Am Geriatr Soc 2007. **55**(1): p. 1-10.

66. Holden, J., *Hawthorne effects and research into professional practice.* J Eval Clin Pract, 2001. **7**: p. 65-70.

67. Bassett, S., *The assessment of patient adherence to physiotherapy rehabilitation.* NZ J physiother, 2003. **31**(2): p. 60-66.

68. Newman-Beinart, N.A., et al., *The development and initial psychometric evaluation of a measure assessing adherence to prescribed exercise: the Exercise Adherence Rating Scale (EARS), In Press. available at: http://dx.doi.org/10.1016/j.physio.2016.11.001.* Physiother, 2016. .

69. Jordan JL, H.M., Mason EEJ, Foster NE, *Interventions to improve adherence to exercise for chronic musculoskeletal pain in adults (review).* Cochrane Database Syst Rev, , 2010(1).

70. Tuakli-Wosornu, Y.A., et al., *Predictors of Exercise Adherence in Patients With Meniscal Tear and Osteoarthritis.* Arch Phys Med Rehabil, 2016. **97**(11): p. 1945-1952.

71. Alewijnse, D., et al., *Predictors of long-term adherence to pelvic floor muscle exercise therapy among women with urinary incontinence.* Health Educ Res, 2003. **18**(5): p. 511-524.

72. Abbott, J., et al., *Treatment compliance in adults with cystic fibrosis.* Thorax, 1994. **49**(2): p. 115-20.

73. McCullough, A.R., et al., *Predictors of adherence to treatment in bronchiectasis.* Respir Med, 2015. **109**(7): p. 838-45.

74. Alexandre, N.M., et al., *Predictors of compliance with short-term treatment among patients with back pain.* Rev Panam Salud Publica, 2002. **12**(2): p. 86-94.

75. Borello-France, D., et al., *Adherence to Behavioral Interventions for Stress Incontinence: Rates, Barriers, and Predictors.* Phys Ther, 2013. **93**(6): p. 757-773.

76. Egger, G., et al., *Health promotion strategies and methods*. 1999: McGraw-Hill Sydney.

77. Sirur, R., et al., *The role of theory in increasing adherence to prescribed practice.* Physiother Can, 2009. **61**(2): p. 68-77.

78. Hurley, D.A., et al., *Theory-driven group-based complex intervention to support self-management of osteoarthritis and low back pain in primary care physiotherapy: Protocol for a cluster randomised controlled feasibility trial (SOLAS).* BMJ Open, 2016. **6**(1).

79. Wesch, N., et al., *Self-efficacy, imagery use, and adherence during injury rehabilitation.* Scand J Med Sci Sport, 2012. **22**(5): p. 695-703.

80. Jack, K., et al., *Barriers to treatment adherence in physiotherapy outpatient clinics: a systematic review.* Man Ther, 2010. **15**(3): p. 220-8.

81. Medina-Mirapeix, F., et al., *Predictive factors of adherence to frequency and duration components in home exercise programs for neck and low back pain: an observational study.* BMC Musculoskel Disord, 2009. **10**(1): p. 155.

82. Picorelli, A.M., et al., *Adherence of older women with strength training and aerobic exercise.* Clin Interv Aging, 2014. **9**: p. 323-31.

83. Hendrick, P., et al., *Therapist knowledge, adherence and use of low back pain guidelines to inform clinical decisions--a national survey of manipulative and sports physiotherapists in New Zealand.* Man Ther, 2013. **18**(2): p. 136-42.

84. Schoo, A.M.M., M.E. Morris, and Q.M. Bui, *The effects of mode of exercise instruction on compliance with a home exercise program in older adults with osteoarthritis.* J Physiother, 2005. **91**(2): p. 79-86.

85. Escolar-Reina, P., et al., *How do care-provider and home exercise program characteristics affect patient adherence in chronic neck and back pain: a qualitative study.* BMC Health Services Research, 2010. **10**: p. 60.

86. Bassett, S., *Bridging the intention-behaviour gap with behaviour change strategies for physiotherapy rehabilitation non-adherence.* NZ J Physiother, 2015. **43**: p. 105-111 7p.

87. Dean, S.G., et al., *Managing time: An interpretative phenomenological analysis of patients' and physiotherapists' perceptions of adherence to therapeutic exercise for low back pain.* Disabil Rehabil, 2005. **27**(11): p. 625-636.

88. McPherson, K.M. and N.M. Kayes, *Qualitative research: its practical contribution to physiotherapy.* Phys Ther Rev, 2012. **17**(6): p. 382-389.

89. Grimes, D.A. and K.F. Schulz, *Descriptive studies: what they can and cannot do.* Lancet, 2002. **359**(9301): p. 145-149.

90. Ebell, M.H., et al., *Strength of recommendation taxonomy (SORT): a patient-centered approach to grading evidence in the medical literature.* J Am Board Fam Pract, 2004. **17**(1): p. 59-67.

91. McLean, S.M., et al., *Interventions for enhancing adherence with physiotherapy: a systematic review.* Man Ther, 2010. **15**(6): p. 514-21.

92. Kingston, G., M.A. Gray, and G. Williams, *A critical review of the evidence on the use of videotapes or DVD to promote patient compliance with home programmes.* Disabil Rehabil: Assist Tech, 2010. **5**(3): p. 153-163.

PAPER ONE

An observational study of Australian private practice physiotherapy consultations to explore the prescription of self-management strategies.

Physiotherapist-prescribed self-management strategies are a regular component of physiotherapy treatment. However, most previous data related to the prescription of self-management strategies are derived from physiotherapist-reported surveys which may be affected by recall bias. There is a dearth of prior research that has examined self-management strategy prescribing practices via observational methods. Paper one was developed to address this gap by examining the self-management prescription practices of physiotherapists in private practice. Therefore, paper one, which utilised a cross-sectional, observational study design, aimed to explore the types of self-management strategies prescribed, the number of self-management strategies prescribed (overall, by consultation type and by injury location) and; the length of time allocated to self-management strategy prescription (overall, by consultation type and by injury location) in private practice physiotherapy consultations.

The findings of this paper form the basis for further studies undertaken as part of this thesis.

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An observational study of Australian private practice physiotherapy consultations to explore the prescription of self-management strategies.

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An observational study of Australian private practice physiotherapy consultations to explore the prescription of self-management strategies.

Abstract

Objective: To explore the types of self-management strategies prescribed; the number of strategies and length of time allocated to self-management prescription, overall, by consultation type and by injury location, in physiotherapy consultations.

Methods: Cross-sectional, observational study of 113 physiotherapist-patient consultations was undertaken. Regression analyses were used to determine whether consultation type and injury location were associated with the number of strategies prescribed and length/fraction of time spent on self-management.

Results: 108 patients (96%) were prescribed at least one self-management strategy; commonly exercise and advice. Mean length of time spent on self-management was 5.80 minutes. Common injury locations were neck (n=40) and lower back (n=39). No statistically significant associations were observed between consultation type or injury location for either outcome (number of strategies and the length/fraction of time allocated to self-management prescription).

Conclusion: Physiotherapists regularly spend time prescribing self-management strategies such as exercise, advice, the use of heat or ice, to patients receiving treatment linked to a range of injury locations; suggesting that self-management is considered an important adjunct to in-clinic physiotherapy.

Practice Implications: Clinicians should reflect on how self-management strategies can be used to maximise patient outcomes; and whether the allocation of consultation time to self-management is likely to optimise patient adherence to each strategy.

Key words: Self-management, Physiotherapy, Consultation Time, Adherence

Introduction

The main goal of physiotherapy is to restore (or maintain) optimal physical functioning and therefore, physiotherapists routinely treat patients with a wide range of injuries (1). In many countries, physiotherapy is delivered in both public and private healthcare settings. In Canada, 42% of physiotherapists work in private practice (2) and approximately 25% of UK physiotherapists work outside of the National Health Service (3). In Australia, private physiotherapy practices are in operation in over 5000 locations nationally, with approximately 53.5% of registered physiotherapists working in the private sector (4). In Australia, it has been estimated that physiotherapists working in private practice deliver an average of 796 consultations per physiotherapist annually (4). The median number of physiotherapy consultations per patient has been reported as 15; with the largest number of days between consultations being 5.4 days (5). This consultation frequency places physiotherapists in an ideal position to initiate and follow-up with patients about their role in injury self-management.

Self-management refers to any strategy that is specifically intended for the patient to complete independently to manage their condition (6, 7). Self-management strategies may be considered an important adjunct to in-clinic care because patients will spend more time away from the therapists than receiving 'hands-on' treatment (8). There is high quality evidence that home based self-management strategies can be as effective as physiotherapist-provided therapy (9). Key clinical findings from a systematic review reported that equal gains can be made from either a home program or expert-provided therapy for improving function and strength following anterior cruciate ligament reconstruction; improving symptom management for patients with knee osteoarthritis; improving exercise adherence for obese patients; and improving exercise tolerance in patients with rheumatoid arthritis (9). In addition, there is evidence that home programs may lead to improved treatment outcomes for patients following arthroscopic knee surgery, and patients with patellofemoral pain syndrome (9).

Despite evidence suggesting the effectiveness of self-management strategies for a range of injuries (9, 10), to the authors' knowledge, there is limited research about self-management prescription in physiotherapy. A national survey of Irish physiotherapists, practising in both the public and private health sectors, reported that advice and exercise were the most frequently provided treatments for chronic low back pain (11). The frequent use of advice and exercise is supported by a survey of Indian physiotherapists (12). However, neither of these two studies differentiated between treatment strategies which were provided by physiotherapists during clinic time and those intended as self-management (11, 12). Results of these studies are limited, however, as they relied on physiotherapist self-report (11, 12), rather than more objective methods, such as observation. Understanding which types of self-management strategies are prescribed can provide an indication of the extent to which physiotherapists are incorporating self-management within their overall treatment plan.

Physiotherapists and other rehabilitation professionals play an important role in health promotion, injury prevention and rehabilitation (13). Despite this, there are currently no published studies regarding the amount of consultation time physiotherapists in out-patient settings spend on prescribing patient self-management strategies, and the types and numbers of strategies prescribed during this time. The amount of consultation time that physiotherapists devote to self-management could provide an indicator as to the relative importance placed upon self-management. These data could also provide a benchmark regarding the time private practitioners spend on self-management prescription; leading clinicians and researchers to develop strategies as to how best this time can be utilised to encourage patient participation and adherence.

Objectives

In order to broaden knowledge about physiotherapist-patient communication in Australian private practice, the objectives of this observational study were to explore, in physiotherapy consultations, the:

1) Types of self-management strategies prescribed,

2) Number of self-management strategies prescribed (overall, by consultation type and by injury location) and;

3) Length of time allocated to self-management strategy prescription (overall, by consultation type and by injury location).

Methods

Study Design:

A cross-sectional, observational study of physiotherapist-patient consultations was utilised to provide a more robust data collection methodology than relying on physiotherapist's self-reported behaviour. It was undertaken and reported in guidance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines (14). Ethics approval for this research project was granted through the University of Newcastle (Australia) Human Research Ethics Committee.

Setting and participants:

Physiotherapists working in private practice within 50km of two large cities within Australia were located via Australian Physiotherapy Association 'find a physio' web-link (available at: http://www.physiotherapy.asn.au/apawcm/controls/findaphysio.aspx.). Physiotherapists were sent an invitation e-mail to participate in this study with an attached 'Participant Information Statement'. Eligibility criteria included only physiotherapists who worked in private practice and saw a general case mix of patients. Study participation required written consent from both private physiotherapy practice owners as well as individual physiotherapists.

Patient participants comprised of a consecutive sample of patients attending for either an initial or follow up consultation (regardless of injury location or condition) with an eligible physiotherapist at a consenting practice. Patient inclusion criteria included those aged 18 years and older who were physically, mentally and possessed sufficient understanding of English to be able to give informed consent.

Eligible patients were identified by the practice receptionist at the time of their attendance for their physiotherapy consultation. Patients were then approached by the researcher (a physiotherapist with 18 years of clinical experience including seven years in private practice) to discuss participation in the study. Patients were given written information about the study prior to giving informed consent.

Data collection:

Data were collected between May and October 2015.

Physiotherapist Demographics: Physiotherapists were asked to complete a demographic survey which included characteristics such as gender, location of practice, country in which they obtained their physiotherapy qualification and post-graduate qualifications.

Observational data collected during physiotherapist- patient consultations: The research physiotherapist observed up to 10 physiotherapist-patient consultations for each participating physiotherapist. The number of observed consultations was limited to 10 patients per physiotherapist to reduce the burden of study participation for each physiotherapist. A coding checklist and guideline for the observation component of this study was developed specifically for this study by a team of experienced researchers for use during the physiotherapist-patient consultations. During the observed consultations the research physiotherapist recorded the number and type of self-management strategy prescribed in each consultation; the total consultation time (calculated to the nearest whole minute from the recorded start and finish time of each consultation); and the amount of time spent prescribing self-management strategies as per the coding checklist (recorded to the nearest whole minute using a digital watch). See Appendix 1.3. For this study, self-management strategies were defined as "any strategy that the physiotherapist prescribed to the patient specifically for them to complete independently, away from the clinic". This is consistent with the definition used in previous studies (6, 7, 15, 16). Examples included independent exercises; recommendations to use a heat pack; giving the patient a brace to wear. Advice was recorded only when it related to a specific activity or action which the physiotherapist requested the patient to complete, such as advice 'I want you to get up and walk around after sitting for 60 minutes whilst at work'. If the advice was non-specific or conversational this was not recorded, such as 'may be a sit-stand desk would help, we can discuss this next time'. Two mock clinical vignettes were used to pilot test the observation checklist by the study's research physiotherapist and a second experienced physiotherapist. Inter-rater reliability was substantial (Kappa = 0.92)(17). In an attempt to minimise reactivity (i.e. change in patient and/or physiotherapist behaviour due to being observed), the coding checklist was not accessible to patients or physiotherapists prior to study completion. Therefore, although patients and physiotherapists were made aware prior to giving consent that their consultation was to be observed, neither were informed of which specific aspects of the consultation was of interest to the researcher.

Patient sociodemographic and treatment characteristics: The following data were obtained from the treating physiotherapist for each consenting patient: age, gender, injury location, whether the consultation was an initial or follow-up and number of previous physiotherapy consultations.

Data analysis:

Data analysis was conducted using the statistical software package, Stata® 14 (USA). Descriptive statistics (proportions means and/or medians) were calculated for participant characteristics, number and types of self-management strategies prescribed and duration and types of consultation. For each consultation, the total consultation time and total time spent on self-management strategies was documented. These data were then used to calculate the mean percentage of the total consultation time spent on self-management strategies as well as the mean time spent per strategy. The median is reported as well as the mean where data distributions were skewed (18).

Multivariable regression analyses were performed to assess associations between factors. Poisson regression was used to explore the associations between number of prescribed self-management strategies (dependent variable) and the independent variables: type of consultation (initial or follow-up) and injury location (due to small numbers of some injury locations, injury locations were combined into three categories: lower limb; spine, and upper limb), total consultation time was accounted for as an offset in the model. Over-dispersion of the data was assessed by inspecting the residual deviance divided by the degrees of freedom. When exploring associations between time spent prescribing self-management strategies as a fraction of the total consultation time (dependent variable) and type of consultation (initial or follow-up) and injury location (independent variables) a Gamma regression analysis (with a log link) was used. Parameter estimates from this model when exponentiated reflect a multiplicative difference in the outcome. Statistical significance was set at $p=0.05$ for all analyses.

Results:

Participants:

A total of 14 physiotherapists from four private physiotherapy practices in two large cities within Australia were recruited, of whom eight (57%) were female. Twelve (86%) physiotherapists obtained their physiotherapy qualification in Australia and two (14%) had a post-graduate physiotherapy qualification. The mean number of hours worked per week was 34.

The total number of patients screened for eligibility was 119, of which 114 patients were eligible (insufficient English to be able to give consent n=1; younger than 18 years n=4). Of these, 113 consented to participate; consent rate 99% (mean number of eight patients per physiotherapist). Patient participant characteristics are summarised in Table 1.1. All 113 patients attended for physiotherapy treatment of a musculoskeletal condition. With regard to the location of patient injury, 73% of patients (n=82) attended for physiotherapy of spinal origin (Table 1.1).

Table 1.1. Sociodemographic and injury characteristics of patient participants (n = 113)

Patient Characteristic	***Mean; Median; Range***
Age	52; 50; 25-95 (years)
Number of previous physiotherapy consultations	10; 5; 0-130
	Frequency (%)
Gender:	
• **Female**	77 (68%)
• **Male**	36 (32%)
Attendance for initial consultation	19 (17%)
Location of injury:	
Lower limb	
• **Ankle**	3 (3%)
• **Knee**	14 (12%)
• **Hip**	4 (4%)
Spine	
• **Lower back**	39 (34%)
• **Upper back**	3 (3%)
• **Neck**	40 (35%)
Upper limb	
• **Shoulder**	8 (7%)
• **Elbow**	2 (2%)

Types of self-management strategies prescribed in physiotherapy consultations:

Figure 1.1 shows the number of patients prescribed with each type of self-management strategy. After exercise (n = 105), advice was the most common strategy (n = 91). The type of advice given to patients was categorised using the following sub-headings which included advice to rest or refrain from a particular activity (n = 30); postural advice (n = 30); ergonomic advice (n = 5); advice to increase physical activity at home (n = 17); pelvic floor advice (n = 3); advice to complete exercises/walking in water (n = 4); and advice about mobility aid use (n = 2). The least frequently observed strategies were self-taping and self-mobilisation (n = 2; 2% each) (figure 1.1). Exercise was the only self-management strategy prescribed in isolation; all other strategies were prescribed to patients in combinations of two or more strategies. The largest range of self-management strategies were prescribed to patients attending with a neck or lower back complaint; with 79 patients receiving prescriptions from a total of seven different strategies; including exercise, advice, heat, self-massage, self-mobilisation, lumbar roll and self-taping. In addition, physiotherapists were observed to provide supplementary printed information to 59 of the 108 patients (55%) who were prescribed with a self-management strategy, most frequently related to exercise (n=38).

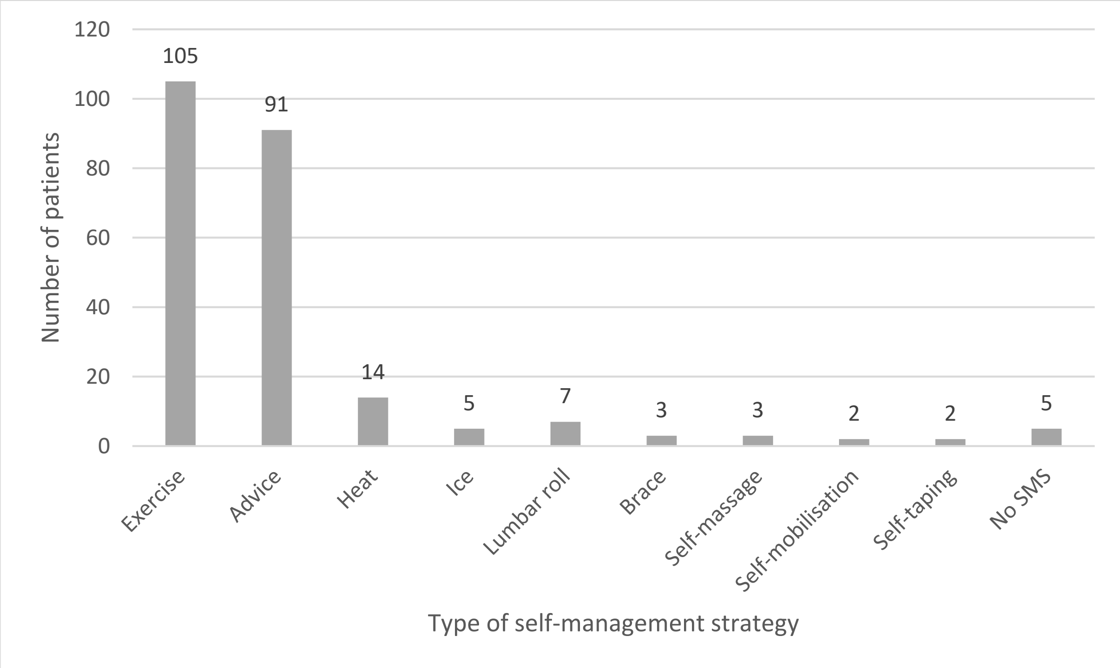

Figure 1.1: Number of patients prescribed with each type of self-management strategy. Key: SMS: Self-management strategy.

Number of self-management strategies prescribed in physiotherapy consultations

Overall, 108 patients were prescribed at least one self-management strategy (96%). A total of 232 self-management strategies were prescribed to these patients (mean n = 2.15 strategies per patient, SD = 1.05). Of the 108 patients who received a self-management strategy; 32 patients received only one self-management strategy (all in the form of exercise); 50 patients received two self-management strategies, most commonly in the form of exercise and advice (n=40); 16 patients received three strategies (commonly observed combinations included exercise, advice, heat or lumbar roll); and 10 patients received four strategies (from a combination of exercise, advice, heat, ice and brace). Five patients were not observed to receive a self-management strategy.

By consultation type:

The average number of self-management strategies prescribed in initial consultations was 2.74 (SD =1.19), and in follow-up consultations was 1.86 (SD =0.80). However, there was no statistically significant association between consultation type (initial versus follow-up) and number of self-management strategies prescribed when controlling for injury location, time spent prescribing self-management strategies and overall consultation time (IRR = 0.86, p=0.29).

By injury location:

When broken down by injury location, the five patients who were not prescribed a self-management strategy, all had attended for physiotherapy of their lower back, (Table 1.2). All three patients who attended for physiotherapy of their upper back received only one self-management strategy (exercise). The largest number of prescribed self-management strategies were to patients attending for treatment of knee, lower back and neck issues (n=4).

When injury locations were grouped into three body regions (lower limb, spine and upper limb), the average number of self-management strategies prescribed to individuals being treated for lower limb injuries was 2.29 (SD = 1.14), for injuries to the spine was 2.01 (SD = 1.09), and injuries to upper limbs was 2.62 (SD = 0.52). Despite these observations, there was no statistically significant association between the number of self-management strategies and injury location (lower limb [reference category], spine [IRR = 0.85, p = 0.14], upper limb [IRR = 1.22, p = 0.08]) when controlling for consultation type (initial versus follow-up), and overall consultation time.

Time spent on self-management strategies:

The overall length of consultation time varied from 60 minutes for an initial consultation down to 17 minutes for a follow-up consultation, with consultations being an average of 26 minutes long (SD = 9.22). Table 1.2 shows that overall; an average of 5.80 minutes per consultation was spent on self-management strategies (22% of total consultation time). The mean consultation time spent per strategy was 2.71 minutes. When patients were prescribed exercises only (n = 32), physiotherapists spent a mean time of 4.23 minutes prescribing exercises to their patients. However, when physiotherapists prescribed exercise in combination with one or more self-management strategy, the total mean time physiotherapists spent on self-management strategies was 6.53 minutes (including the time spent to prescribe the exercises).

Table 1.2: Time spent on self-management strategies; number of prescribed self-management strategies; and time spent per self-management strategy (by injury location and overall).

Location of injury	**Time (minutes) spent on self-management strategies Mean (range)**	**Number of self-management strategies provided Mean (range)**	**Time (minutes) spent per self-management strategy Mean**
Ankle	4.3 (4-5)	1.7 (1-2)	2.5
Knee	5.9 (2-10)	2.7 (1-4)	2.2
Hip	6.5 (1-15)	1.5 (1-3)	4.3
Lower back	6.1 (0-30)	1.9 (0-4)	3.2
Upper back	1.0 (1)	1.0 (1)	1.0
Neck	5.9 (1-15)	2.1 (1-4)	2.8
Shoulder	4.8 (1-13)	2.4 (2-3)	2.0
Elbow	4.0 (4)	3.0 (3)	1.3
Overall	***5.8 (0-30)***	***2.0 (0-4)***	***2.7***

By consultation type:

The observed consultation time that physiotherapists spent prescribing self-management strategies varied greatly between patients. One physiotherapist was observed to spend 30 minutes (or 50% of total consultation time) of an initial consultation prescribing self-management strategies. The least amount of time spent prescribing a self-management strategy in an initial consultation was one minute (3% of total consultation time). During follow-up consultations, the most amount of time observed on self-management strategies was 15 minutes (50% of consultation time); with the least being 0 minutes (0% of consultation time). However, on average physiotherapists spent approximately 9.31 minutes (SD = 7.91) on self-management strategies during an initial consultation (25% of the total consultation time) and 5.10 minutes (SD = 3.89) during a follow-up consultation (21% of total consultation time). Results from the Gamma regression model indicated that there was no statistically significant association between consultation type (initial versus follow-up) and the fraction of time spent on self-management strategies, when controlling for injury location (a 14% increase in the fraction of time spent on prescription of self-management plans for physiotherapists, p=0.43).

By injury location:

Table 1.2 shows the mean amount of consultation time spent on self-management strategies overall and per strategy for each injury location. When considering self-management prescription time allocations by injury location, the most amount of time spent per strategy was with patients presenting with hip injuries, where physiotherapists spent over four minutes per strategy; these patients also received a small number of strategies (three patients received exercise only and one patient received exercise and advice). Patients presenting with injuries of their upper back received only one minute of exercise prescription prescribing the patient exercise.

When injury locations were grouped into three body regions the amount of consultation time spent on self-management strategies for lower limb injuries was 6.23 minutes (SD = 3.20), for injuries to the spine was 5.81 minutes (SD = 5.54), and injuries to upper limbs was 4.71 minutes (SD = 3.39). Despite these observations, there was no statistically significant association between injury location (lower limb [reference category], spine [p = 0.25], upper limb [p = 0.20]) and the amount of consultation time spent on self-management strategies when controlling for consultation type (initial versus follow-up).

Discussion

Clinical practice requires a complex interplay between experience and training, research, guidelines and judgement; and should not only be informed by randomised controlled trials, but also by pragmatically designed studies that better reflect real-life clinical practice (19). Our data were derived from clinical observations, and is therefore more likely to reflect real world physiotherapist-patient consultations compared to self-reported surveys which can be subject to reporting bias (8, 20).

An overwhelming majority of patients (96%) received a self-management strategy, with physiotherapists observed to prescribe from a range of nine different strategies to their patients. This prescribed range has been supported to varying degrees in the literature, with exercise and heat commonly being prescribed to patients with lower back pain (21); as well as advice (11), splints (22), heel lifts (23), ice (24) and braces (10). Given the range and frequency of self-management prescription by physiotherapists in past research (16) and the current study, it could be argued that physiotherapists consider self-management strategies to be an important part of the overall patient treatment plan.

Exercise was prescribed in 93% of consultations indicating that it has a central role in physiotherapy practice. All patients in our study, regardless of injury location, were given home exercise with the exception of eight patients with lower back or knee injuries. Thirty-two patients (28%) were prescribed exercise only. This observation is not unexpected given that research relating to the effectiveness of home exercise is abundant (25-30).

Advice was the second most observed strategy followed by the use of heat. Advice has been self-reported by physiotherapists as the most commonly prescribed supplement to clinic-based care for patients with back pain (11). The observed frequency of heat versus ice may be more related to the chronicity of the injury although time since injury was not recorded. Least commonly prescribed self-management strategies were self-mobilisation, self-taping and self-massage.

It is encouraging that physiotherapists are integrating the prescription of self-management strategies into routine practice, particularly given the presence of supportive research regarding the effectiveness of a number of strategies (9). However, more high-quality research is needed to support the effectiveness of a number of strategies; in particular physiotherapeutic advice, which can vary in content between clinicians. Therefore, although self-management strategies could be considered an important treatment adjunct, clinicians should refer to injury location-specific best-practice evidence when prescribing self-management strategies to their patients.

In our study, patients received a mean of two self-management strategies per observed consultation, most commonly in the form of exercise and advice. This number of strategies is supported by a qualitative study on patients with chronic low back pain (21). However, 26 patients received three or more self-management strategies most commonly in the form of exercise, advice and heat. Patients attending for physiotherapy of their neck and lower back received the greatest range of self-management strategies. The effectiveness of a range of management approaches for these injury locations has been reported (31-33).

Patients were observed to receive more self-management strategies during an initial consultation (n = 2.74) compared with a follow-up consultation (n = 1.86). The clinical rationale for this might be to provide patients with a larger number of self-management strategies at the outset of treatment to facilitate patient recovery. However, when multiple treatment approaches are used concurrently it can be difficult to determine which one/s have been effective. The provision of multiple strategies may also have implications for patient adherence, particularly when a patient may already be overwhelmed with other information related to their injury and prognosis. There is evidence that providing more complex information results in poorer recall of information provided in healthcare consultations (34, 35). This suggests that providing multiple self-management strategies may adversely impact on recall, and hence, adherence to the prescribed strategies.

Physiotherapists spent a mean time of 5.80 minutes on self-management strategies (inclusive of initial and follow-up consultations). This represents a mean of 22% of consultation time. However, the adequacy of this time might vary depending on the whether the physiotherapist has prescribed the strategy before; how complex the strategy is and whether the patient understands what they are being asked to do. A systematic review of interventions to aid patient adherence to physiotherapist prescribed self-management strategies reported a mean rate of adherence of 67% (15). It would be interesting to explore whether patient adherence is impacted by the number of prescribed strategies and the overall time physiotherapists spend prescribing self-management strategies during a physiotherapist-patient consultation. In our study, patients attending for treatment of knee injuries were prescribed approximately three self-management strategies each (above the overall study mean) with physiotherapists spending about two minutes per strategy (below the overall study mean). This suggests that clinicians need to be careful that quantity of self-management prescription does not adversely impact on overall prescription time; as this may potentially diminish the quality of self-management prescription, potentially impacting on treatment plan adherence and outcomes.

It has been reported that the more individual exercises contained within an exercise program, the less patients are likely to adhere to them (35). Therefore, the same might be true of the number of individual self-management strategies prescribed. Although the relationship between time spent on prescribing self-management strategies and patient adherence and outcomes has not been explored in physiotherapy, there is research into information provision from other areas of healthcare practice suggesting that “less may be more”. General practice consultation time has been reported as averaging between 18-23 minutes (36), which is not dissimilar to physiotherapy. Research suggests that general practitioners with longer consultation times prescribe less; offer more advice on lifestyle and other health promoting activities, and that longer consultation time is associated with a range of better patient outcomes (37). Therefore, it may be more appropriate for physiotherapists and other healthcare professionals to prescribe fewer self-management strategies and spend more time on promoting adherence to a single strategy to encourage optimisation of patient outcomes.

Limitations:

Although this observational study is novel in researching physiotherapist use of prescribed self-management strategies in private practice settings, some limitations exist. Generalisability may have been limited by patients only being recruited from four private physiotherapy practices in two Australian cities. A consecutive sample of patients was utilised to reduce selection bias; however, some bias is still present due to convenience sampling. As with any observational research, it is possible that physiotherapists and patients altered their behaviour due to the presence of the researcher. The researcher did, however, attempt to minimise this bias by providing minimal details about the study’s aims to both physiotherapists and patients during recruitment.

Research Implications:

Given the frequency with which self-management strategies are prescribed, more research is required to support the efficacy of these strategies. The allocation of consultation time to self-management prescription and its impact on patient adherence and outcome also requires further investigation.

Conclusion:

Australian private practice physiotherapists were observed to regularly prescribe self-management strategies to their patients; most frequently in the form of exercise and advice. The largest range of strategies was prescribed for patients presenting with neck and lower back injuries (the most commonly treated patient injury areas). These results suggest that self-management strategies such as exercise, advice and the use of heat/ ice are considered an important treatment adjunct to in-clinic care. However, clinicians should reflect on which self-management strategy is the most appropriate for each patient based on individual need, and allocate consultation time appropriately to maximise patient adherence and treatment outcomes.

Practice implications:

Physiotherapists and other healthcare professionals, in their pursuit of evidence-based practice, should critically evaluate their clinical decisions regarding patient self-management strategies. Clinicians need to ensure that they are selecting the most appropriate strategy for each patient based on empirical research findings and be encouraged to consider a number of factors when determining how many strategies to prescribe. This may include whether prescription of multiple strategies will result in poorer adherence and hence compromise patient outcomes. Clinicians also need to reflect on the most appropriate use of patient consultation time when prescribing self-management strategies given that there are other competing priorities such as assessment and 'hands-on' treatment. Physiotherapists and other healthcare professionals should be encouraged to invest time in prescribing self-management as an extension to in-clinic treatment whereby potentially improving patient outcomes.

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Conflicts of interest:

The authors have no conflicts of interest to declare.

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References

1. Fransen, M., *When is physiotherapy appropriate?* Best Pract Res Clin Rheum, 2004. **18**(4): p. 477-89.

2. Perreault, K., et al., *Physiotherapy practice in the private sector: organizational characteristics and models.* BMC Health Serv Res, 2014. **14**(1): p. 1-13.

3. Beddow, A., *Physiotherapy workforce review*. 2010, Centre for workforce intelligence: UK. p. 1-12.

4. Engel, R.M., et al., *The provision of chiropractic, physiotherapy and osteopathic services within the Australian private health-care system: a report of recent trends.* Chiropr Man Therap, 2014. **22**(1): p. 3.

5. Grimmer-Somers, K., et al., *Number and Frequency of Physiotherapy Services for Motor Vehicle-induced Whiplash: Interrogating Motor Accident Insurance Data 2006 & 2009.* J Rehabil Med, 2012. **44**(9): p. 774-780.

6. Hall, A.M., et al., *Measurement Tools for Adherence to Non-Pharmacologic Self-Management Treatment for Chronic Musculoskeletal Conditions: A Systematic Review.* Arch Phys Med Rehabil, 2014. **31;96(3):552-62.**

7. Lorig, K.R. and H. Holman, *Self-management education: history, definition, outcomes, and mechanisms.* Ann Behav Med, 2003. **26**(1): p. 1-7.

8. Peek, K., et al., *Patient adherence to physiotherapist prescribed self-management strategies: A critical review.* Int J Ther Rehabil, 2015. **22**(11): p. 535-543.

9. Novak, I., *Effective home programme intervention for adults: a systematic review.* Clin Rehabil, 2011. **25**(12): p. 1066-1085 20p.

10. Page, C.J., R.S. Hinman, and K.L. Bennell, *Physiotherapy management of knee osteoarthritis.* Int J Rheum Dis, 2011. **14**(2): p. 145-51.

11. Liddle SD, Baxter GD, and G. JH, *Physiotherapists' use of advice and exercise for the management of chronic low back pain: A national survey.* Man Ther, 2009. **14**: p. 189-196.

12. Fidvi N, M.S., *Physiotherapy management of low back pain in India- a survey of self-reported practice.* Physiother Res Int, 2010. **15**: p. 150-159.

13. McGrane, N., et al., *Motivational strategies for physiotherapists.* Phys Ther Rev, 2014. **19**(2): p. 136-142.

14. Vandenbroucke, J.P., et al., *Strengthening the Reporting of Observational Studies in Epidemiology (STROBE): explanation and elaboration.* Epidemiol, 2007. **18**(6): p. 805-35.

15. Peek, K., et al., *Interventions to aid patient adherence to physiotherapist prescribed self-management strategies: A systematic review.* Physiother, 2016. **102**(2): p. 127-135.

16. Peek, K., et al., *Physiotherapists' perceptions of patient adherence to prescribed self- management strategies: A cross-sectional survey of Australian physiotherapists.* Disabil Rehabil, 2016 **available at: http://dx.doi.org/10.1080/09638288.2016.1212281**.

17. Cohen, J., *A power primer.* Psych Bulletin, 1992. **112**(1): p. 155-9.

18. de Nijs, R. and T.L. Klausen, *On the expected difference between mean and median.* Electron J App Stat Anal, 2013. **6**(1): p. 110-117.

19. Price, D., et al., *Real-world research and its importance in respiratory medicine.* Breathe, 2015. **11**(1): p. 26-38 13p.

20. Kettler, L.J., et al., *Determinants of adherence in adults with cystic fibrosis.* Thorax, 2002. **57**(5): p. 459-64.

21. Crowe, M., et al., *Self-management and chronic low back pain: a qualitative study.* J Adv Nurs, 2010. **66**(7): p. 1478-86.

22. Sandford, F., N. Barlow, and J. Lewis, *A Study to Examine Patient Adherence to Wearing 24-Hour Forearm Thermoplastic Splints after Tendon Repairs.* J Hand Ther, 2008. **21**(1): p. 44-53.

23. Goss, D.L. and J.H. Moore, *Compliance wearing a heel lift during 8 weeks of military training in cadets with limb length inequality.* J Ortho Sports Phys Ther, 2004. **34**(3): p. 126-131.

24. Bassett, S.F. and H. Prapavessis, *A test of an adherence-enhancing adjunct to physiotherapy steeped in the protection motivation theory.* Physiother Theory Pract, 2011. **27**(5): p. 360-372.

25. Clijsen, R., J. Fuchs, and J. Taeymans, *Effectiveness of Exercise Therapy in Treatment of Patients With Patellofemoral Pain Syndrome: Systematic Review and Meta-Analysis.* Phys Ther, 2014. **94**(12): p. 1697-1708 12p.

26. Hayden, J.A., et al., *Exercise therapy for treatment of non-specific low back pain.* Cochrane Database Syst Rev, 2005(3): p. CD000335.

27. National Institute for Health and Clinical Excellence., *Physical activity: exercise referral scheme*, P.h. guideline, Editor. 2014, NICE: UK. p. 1-49.

28. Smidt, N., et al., *Effectiveness of exercise therapy: a best-evidence summary of systematic reviews.* Aust J Physiother, 2005. **51**(2): p. 71-85.

29. Taylor, N.F., et al., *Therapeutic exercise in physiotherapy practice is beneficial: a summary of systematic reviews 2002-2005.* Aust J Physiother, 2007. **53**(1): p. 7-16.

30. Tunwattanapong, P., R. Kongkasuwan, and V. Kuptniratsaikul, *The effectiveness of a neck and shoulder stretching exercise program among office workers with neck pain: a randomized controlled trial.* Clin Rehabil, 2016. **30**(1): p. 64-72.

31. Otoo, S.K.W., P. Hendrick, and D.C. Ribeiro, *The comparative effectiveness of advice/education compared to active physiotherapy (manual therapy and exercise) in the management of chronic non-specific low back pain.* Phys Ther Rev, 2015. **20**(1): p. 16-26 11p.

32. Searle, A., et al., *Exercise interventions for the treatment of chronic low back pain: a systematic review and meta-analysis of randomised controlled trials.* Clin Rehabil, 2015. **29**(12): p. 1155-1167 13p.

33. van der Velde, G., et al., *Which interventions are cost-effective for the management of whiplash-associated and neck pain-associated disorders? A systematic review of the health economic literature by the Ontario Protocol for Traffic Injury Management (OPTIMa) Collaboration.* Spine 2015. **available at: http://dx.doi.org/10.1016/j.spinee.2015.08.025**.

34. DiMatteo, M.R., K.B. Haskard-Zolnierek, and L.R. Martin, *Improving patient adherence: a three-factor model to guide practice.* Health Psych Rev, 2012. **6**(1): p. 74-91.

35. Henry, K.D. and C. Rosemond, *Effect of Number of Home Exercises on Compliance and Performance in Adults Over 65 Years of Age.* Phys Ther, 1999. **79**(3): p. 270.

36. Patwardhan, A., et al., *Comparison of Waiting and Consultation Times in Convenient Care Clinics and Physician Offices: A Cross-Sectional Study.* Prim Care Comm Health, 2013. **4**(2): p. 124-128.

37. Freeman, G.K., et al., *Evolving general practice consultation in Britain: issues of length and context.* BMJ, 2002. **324**(7342): p. 880-882.

PAPER TWO

Physiotherapists' perceptions of patient adherence to prescribed self-management strategies: a cross-sectional survey of Australian physiotherapists

Paper one demonstrated that the prescription of self-management strategies is a core component of physiotherapy in Australian private practice settings. However, self-management strategies can only be effective if patients adhere to them. Exploring the views and attitudes of clinical physiotherapists towards patient self-management and levels of patient adherence is an important foundation on which to build future research studies. Physiotherapists may be more likely to incorporate adherence aiding interventions into routine patient care if they perceive adherence to be an issue based on past and current experience. However, limited research reporting physiotherapists' perceptions on patient adherence to prescribed self-management currently exists.

Paper two, a cross-sectional survey of practicing physiotherapists aimed to assess physiotherapists' perceptions regarding the importance of patient adherence to physiotherapist prescribed self-management strategies in improving patient outcomes; rate of patient adherence to a physiotherapist prescribed self-management strategy encountered in their practice; importance of methods employed to increase patient adherence to a physiotherapist prescribed self-management strategy and the barriers to employing methods to aid adherence.

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Physiotherapists' perceptions of patient adherence to prescribed self- management strategies: A cross-sectional survey of Australian physiotherapists.

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Physiotherapists' perceptions of patient adherence to prescribed self- management strategies: A cross-sectional survey of Australian physiotherapists.

Abstract

Purpose: Physiotherapists often prescribe self-management strategies for their patients. However, the effectiveness of these strategies in improving patient outcome is related to the rate of patient adherence. The aims of this study were to explore physiotherapists' views on the importance and perceived rates of patient adherence to physiotherapist prescribed self-management strategies; the perceived importance of methods physiotherapists can employ to aid patient adherence and the barriers to employing these methods.

Method: A cross-sectional web-based survey was emailed to 808 physiotherapist members of the Australian Physiotherapy Association. To maximise response rates, two reminder emails were utilised.

Results: In total 352 physiotherapists completed the survey (response rate 44%). A majority of physiotherapists (89%) believed that patient self-management strategies were important in improving patient outcomes; however, the mean perceived rate of patient adherence across all strategies was only 67%. Physiotherapists reported that there were a number of important methods which can be employed to aid patient adherence such as providing patient education and allowing time for patient practice; with minimal perceived barriers to employing these methods.

Conclusions: Results indicate that physiotherapists perceive that patient outcomes can be positively impacted by patient adherence to a range of self-management strategies. Physiotherapists should be encouraged to implement into their routine clinical practice evidence-based methods to aid patient adherence.

Key words: Patient compliance, self-care, physical therapy, physiotherapy, survey, Australia

Background

The World Confederation for Physical Therapy state that physiotherapists are required to make recommendations for patient self-management (1). Self-management refers to "the ability of the individual, in conjunction with family, community, and healthcare professionals, to manage symptoms, treatments, lifestyle changes, and psychosocial, cultural, and spiritual consequences of health conditions" p.261 (2). Physiotherapist prescribed self-management strategies including exercise can contribute to improved patient outcomes (3, 4).

A review of motor accident insurance data reported that the median number of physiotherapy services for whiplash patients was 15 consultations (5). Therefore, frequent contact with patients ideally place physiotherapists to initiate and follow-up with patients regarding their own role in injury management. It has been suggested that physiotherapists should encourage self-management early in the rehabilitative process to reduce treatment dependency (5). However, if evidence-based self-management strategies are to improve treatment outcomes, patients must adhere to them (6-9).

Adherence refers to " the extent to which a person's behaviour… corresponds with agreed recommendations from a healthcare provider" (10). The impact of poor treatment adherence is considered an important issue across a number of healthcare disciplines which includes physiotherapy (6). Systematic reviews have suggested that only 30-67% of patients were completely adherent to their home physiotherapy programmes (8, 11).

A further systematic review identified a range of factors which may influence adherence including: the lack of positive feedback from the therapist; low patient self-efficacy; presence of depression; poor social support or activity and; greater number of perceived barriers to adherence (12). The authors concluded that physiotherapists should be concerned about the attitudes, beliefs and barriers facing their patients and act collaboratively with them to design realistic treatment plans which are customised to patients' life circumstances (12). Due to the multi-dimensional nature of non-adherence, the interventions to improve patient adherence with physiotherapy treatment are likely to be broad in spectrum (6). Therefore, physiotherapists should be aware of a wide range of interventions which may help to optimise patient adherence (6, 8).

Self-management strategies prescribed by physiotherapists include advice, exercise, knee and elbow braces, taping and orthotics (4, 13-15). However, there is a paucity of research examining physiotherapists' perceptions of the importance of self-management strategies in improving patient outcomes and the impact of poor patient adherence. Unless physiotherapists perceive self-management strategies to be an important treatment adjunct and consider patient adherence to be an essential outcome determinant then the results of adherence research may be of little value clinically.

The aims of this study were to assess physiotherapists' perceptions regarding the:

1. Importance of patient adherence to physiotherapist prescribed self-management strategies in improving patient outcomes;
2. Rate of patient adherence to a physiotherapist prescribed self-management strategy encountered in their practice;
3. Importance of methods employed to increase patient adherence to a physiotherapist prescribed self-management strategy and the;
4. Barriers to employing methods to aid adherence.

Methods

Study Design

We conducted a cross sectional web-based survey among practising physiotherapist members of the Australian Physiotherapy Association (APA). Ethics approval for the survey was granted through the University of Newcastle, (Australia), Human Research Ethics Committee.

Participants

The APA 'find a physio' web-link was used to identify potential participants (available at: http://www.physiotherapy.asn.au/apawcm/controls/findaphysio.aspx.). The APA is a national, professional organisation representing the interests of physiotherapists within Australia which maintains a publicly accessible electronic database of physiotherapists.

Previous national survey research has accessed representative samples of physiotherapists via the professional registration databases associated with state-based physiotherapy boards in Australia (16). With the recent move to a single national Physiotherapy Board of Australia (PhysioBA), accessing member mailing lists or initiating survey delivery through the PhysioBA now breaches privacy regulations. These changing administrative processes mean that, alternative approaches to accessing representative views of physiotherapists were required in Australia (17). Survey distribution through the professional association, APA, was seen as a way forward (18). Eligible physiotherapists included any physiotherapist regardless of scope of practice, who were located within 150km radius of each Australian state and territory capital city. These parameters were chosen to locate the broadest range of listed members, with the minimal inputs required by the search engine being postcode, state/territory and radius. We selected the post code for the capital city (to make this uniform across all states/ territories) and 150km was the furthest radius that was accepted by the search engine. Eligible physiotherapists were also required to work clinically more than 15 hours during an average week, and who had an adult caseload of 80% or greater.

Materials

An electronic survey method was developed for this study based on response rates of previous electronic survey studies (14, 19, 20). A survey method was used in preference to focus groups or interviews to capture the views of a large nationally representative sample of physiotherapists (21, 22).

The survey questions were identified and developed by a team of health professionals experienced in health behaviour research, including survey studies (23-25). The survey was then pilot tested for acceptability and feasibility using an expert panel of health behaviour researchers and physiotherapists before the final survey was sent to participants.

The survey included socio- demographic questions and a number of additional questions regarding:

Perceived importance of self-management strategies. Physiotherapists were asked to indicate the extent to which they agreed or disagreed with statements about the perceived importance of patient self-management strategies (including exercise, self-taping, removable bracing and advice). Physiotherapists responded using a four point Likert scale (strongly agree, agree, disagree, strongly disagree).

Perceived adherence: Physiotherapists were asked to consider the last 10 patients to whom they prescribed exercise; self-taping; removable bracing; advice. They were then asked how many of these 10 patients they believed had adhered to more than 80% of this strategy (response options included; 0 to 10; or ‘have never prescribed this strategy’).

Perceived importance of factors that affect adherence: Physiotherapists were provided with a list of factors which may affect patient adherence including patient characteristics, modifiable and non-modifiable; physiotherapist characteristics; characteristics of the self-management strategy; and social factors. Physiotherapists were then asked to rank these factors in order of importance (1 as most important and 5 as least important).

Perceived importance of methods used to aid patient adherence: Physiotherapists were provided with a list of methods to aid patient adherence including patient education, individualising the self-management strategy, patient practise, monitoring of adherence, social support, professional support and communication. Physiotherapists were then asked to rank these factors in order of importance (from 1 most important to 8 least important).

Perceived barriers to employing methods to aid patient adherence: Physiotherapists were provided with a list of statements such as “I don’t have enough time to assess patient adherence”; “I have limited access to resources such as patient education materials”; Physiotherapists were asked to indicate the extent to which they agreed or disagreed with these statements using a four point Likert scale (strongly agree, agree, disagree, strongly disagree). A four point Likert scale (without a middle ‘neutral’ option) was used in preference to a five point scale in order to minimise neutral opinions; this technique is sometimes referred to as a ‘forced choice’ scale (26).

Procedure

The APA, ‘find a physio’ web-link was used to generate a list of potentially eligible physiotherapists that included their practice name, telephone number and e-mail address. Physiotherapists were contacted via e-mail to request completion of an online survey. The e-mail included a participant information statement with a web-link to the survey. Submitting the survey implied informed consent. All responses were anonymous. The invitation e-mail was followed by two blanket reminder emails sent at two and four weeks after the initial contact. Participants could request a paper based survey if preferred.

Data analysis

Data analysis was conducted using the statistical software package, Stata® 14 (USA). Descriptive statistics (proportions and means) were calculated for the survey sample socio-demographics, and compared to Australian physiotherapy workforce data using one sample Pearson's chi-square tests.

"Agree" and "Strongly agree" responses to the closed questions of the survey were combined and reported as frequencies and percentages with 95% confidence intervals (95%CI).

Rank order data are reported as frequency and percentage (95%CI) of first rank, and the mean score of importance (calculated by the overall total number of points awarded per item divided by the number of responses).

Results

Response rate

Of the 2261 physiotherapists who met the initial geographical inclusion criteria 1250 were excluded; 524 physiotherapists had no e-mail address listed; 221 physiotherapists were listed more than once due to working at two or more practices; and 505 who only had practice/ generic e-mail addresses listed. Therefore, in total 1011 physiotherapists were e-mailed an invitation to complete the survey. Of these, 203 e-mails were returned as undeliverable. Three hundred and fifty four physiotherapists returned surveys of which 352 were completed (response rate 44%). The first two questions of the survey were screening questions to exclude those physiotherapists who did not meet the study's inclusion criteria. Twenty-eight physiotherapists were excluded because they did not work clinically more than 15 hours per week; and 26 physiotherapists were excluded because adult patients did not represent more than 80% of their clinical case load. Therefore, 298 completed surveys were included in the data analysis.

Physiotherapist sample

Survey respondents had a similar socio-demographic profile to national physiotherapist workforce data collated by the Physiotherapy Board of Australia (27) and Health Workforce Australia (28) with respect to gender, domestic physiotherapy qualification and distribution of survey respondents from each state and territory (Table 2.1). However, compared to national data, a larger percentage of the survey respondents had post-graduate qualifications and worked in a metropolitan private practice.

Table 2.1: Comparison of socio-demographic characteristics of physiotherapist survey sample (n=352) to Australian physiotherapy workforce datasets

	Survey sample	**Dataset source, date**			**One-sample Pearson chi square**	
		HWA, 2012	**PhysioBA, 2014**	**APA, 2014**	**Coefficient**	***p* value**
% female	64%	69%	69%	69%	0.004	0.948
% working > 15 hrs/week	92%	-	-	87%	0.011	0.916
Mean years since qualification	21-30 years	-	-	-	-	-
% graduated Australia	82%	85%	-	85%	0.028	0.866
% with post-graduate qualifications	48%	22%	-	25%	0.168	0.681
% working in private practice	81%	41%	37%	63%	0.770	0.380
State/territories:						
NSW	28%	29%	29%	-	0.064	1.000
Vic	20%	26%	25%			
Qld	19%	19%	15%			
SA	12%	8%	8%			
WA	13%	12%	12%			
Tas	4%	2%	2%			
NT	2%	1%	1%			
ACT	2%	2%	2%			
Not stated			4%			
% metropolitan	95%	80%	-	85%	0.160	0.689

NB. The survey data was compared to data collected by the Physiotherapy Board of Australia (PhysioBA)(27), however, where this data was unavailable, data was compared to Health Workforce Australia (HWA) (28) or in the case of working hours to the Australian Physiotherapy Association (APA) (29) data.

Key: – represents data that was not available from this source.

Perceived importance of patient adherence to physiotherapist prescribed self-management strategies and the perceived rate of adherence.

More than 89% (95%CI 83-95%) of physiotherapists strongly agreed or agreed that adhering to physiotherapist prescribed self-management strategies was important in positively influencing patient outcomes (Table 2.2). Physiotherapists were invited to add any additional self-management strategies which they felt also positively impacted on treatment outcomes. Responses included self-massage (n=2), postural advice (n=5), cognitive-behavioural advice (n=1), walking/ general fitness programs (n=4), follow up management (n=1), weight management (n=1), increasing physical activity (n=1), group exercise (n=1) and other general well-being programs (n=2).

The mean perceived rate of patient adherence for exercise programs was 70% (95%CI 61-79%), self-taping was 64% (95%CI 55-73%), removable braces was 75% (95%CI 67-83%) and following advice was 58% (95%CI 48-68%).

Table 2.2: Frequency and percentage of physiotherapists who agree or strongly agree that treatment outcomes can be positively impacted by patient adherence to a range of physiotherapist prescribed self-management strategies (n=298).

Treatment outcomes can be positively impacted by patients adhering to:	**Frequency (n)**	**Percentage (95%CI)**
Independent exercise programs	295	99% (97-100%)
Independent self-taping	265	89% 83-95%)
Use of removable bracing	283	95% (91-99%)
Verbal or written advice	292	98% (95-100%)

Physiotherapists ranked in order of importance, factors which they perceived as determining patient adherence to physiotherapist-prescribed self-management strategies. Table 2.3 presents the frequency with which each factor was ranked as the most important. Modifiable patient characteristics were endorsed by the largest proportion of physiotherapists as the most important, followed by physiotherapist characteristics, characteristics of the self-management strategy and social factors including family support. Physiotherapists perceived non-modifiable patient characteristics to be the least important factor determining patient adherence to physiotherapist-prescribed self-management strategies.

Table 2.3: Physiotherapists' (n = 298) perceptions of the most important characteristic determining patient adherence to physiotherapist prescribed self-management strategies; listed by first rank frequency and percentage; and overall mean rank of importance out of 5.

Characteristics determining patient adherence to physiotherapist prescribed self-management strategies	**Frequency (n)**	**Percentage (95%CI)**	**Overall mean rank of importance**
Patient characteristics – modifiable: including self-motivation, self-confidence, belief the exercises will help, willingness to exercise	98	33% (23-43%)	2.2
Physiotherapist characteristics: Including communication skills, use of reminders, time devoted to prescribing strategy, monitoring of adherence, skill and knowledge of physiotherapist	95	32% (23-41%)	2.3
Characteristics of the self-management strategy: including ease to complete, individualised to patient, lack of pain when completing, flexibility of strategy	63	21% (16-26%)	2.7
Social factors: Including emotional support / encouragement from family / friends, work place support, assistance with household tasks (if needed) from family/ friends	24	8% (7-9%)	3.6
Patient characteristics – non-modifiable: Including age, gender, ethnicity, presence of co-morbidities	18	6% (5-7%)	4.1

Note: 1 is considered most important and 5 is considered least important.

Perceived importance of methods employed to increase patient adherence to a physiotherapist prescribed self-management strategy.

Physiotherapists ranked in order of importance methods to improve patient adherence to physiotherapist-prescribed self-management strategies (Table 2.4). It was perceived that the more important methods included individualising the self-management strategy to the patient; providing patient education including clear rationale for the strategy, and practising the strategy within the consultation.

Table 2.4: Physiotherapists' perceptions (n=298) of the most important method for aiding patient adherence to physiotherapist prescribed self-management strategies; listed by first rank frequency and percentage; and overall mean rank of importance out of 8.

Methods to aid patient adherence to physiotherapist prescribed self-management strategies	**Frequency (n)**	**Percentage (95%CI)**	**Overall mean rank of importance**
Individualising the self-management strategy to the patient (e.g. reduction in complexity, tailoring to patient lifestyle, modification for pain response, individually tailored information)	125	42% (30-54%)	2.2
Providing patient education (either printed or verbal) including providing clear rationale for the strategy, expected outcomes, supportive materials or links to additional information	86	29% (21-37%)	2.8
Practising the strategies within the consultation including physiotherapist demonstration, patient practice and feedback, checking the patient understands the instructions	57	19% (15-23%)	3.0
Physiotherapist communication skills, including active listening and being more empathetic or persuasive with the patient	12	4% (3-5%)	3.8

Providing professional support to the patient including motivational support/counselling, questioning the patient about barriers to adherence and ways to overcome these	7	2% (1-3%)	4.8
Monitoring of patient adherence, including use of reminders, follow up (face to face or via telephone), use of exercise diaries	5	2% (1-3%)	5.4
Addressing the general health of the patient, including referral to GP or Allied Health colleague regarding issues which may impact on adherence such co-morbidities, medication or diet	4	1% (1-2%)	5.8
Involvement of the patient's support person, such as including them in the consultation, showing them how to assist with use of strategy (e.g. donning/ doffing brace), exercising alongside the patient.	2	1% (1-2%)	6.4

Note: 1 is considered most important and 8 is considered least important.

Barriers to employing methods to aid patient adherence.

Almost all physiotherapists [98% (n = 292; 95%CI 95-100%)] believed that they could change their patients' adherence rate. However, 89% (n=265; 95%CI 83-95%) of physiotherapists responded that they believed patient adherence was a problem with their patients and that improving patient adherence was relevant to their clinical practice (99%- n=295/298; 95%CI 97-100%).

Physiotherapists reported they had time to assess adherence (83%- n=247; 95%CI 76-90%); time to use methods to aid adherence (82%- n= 244; 95%CI 74-90%); had sufficient knowledge/ skills in assessing patient adherence (84%- n=250; 95%CI 77-91%) and; employing methods to aid adherence (92%- n=274; 95%CI 87-97%). All physiotherapist respondents had access to patient education material (100%- n=298; 95%CI 100%) and 87% reported that their patients received continuity of care by the same physiotherapist (n=259; 95%CI 80-94%).

Discussion

The principle findings of this national survey provide new evidence that physiotherapists believe that patient self-management strategies are important, that the rates of adherence could be improved and that there are a number of methods that physiotherapists can employ to positively influence patient adherence.

Physiotherapists overwhelmingly agreed that exercise, self-taping, removable braces, advice and other self-management strategies were important in improving treatment outcomes. This view is supported by earlier research with regard to exercise (3, 4), taping (30), removable braces (31) and advice (32).

Although physiotherapists agreed self-management strategies were important, they also reported less than optimal adherence rates. The perceived mean rate of patient adherence in this study ranged from 58% for advice to 75% for removable braces. It is typical of physiotherapy studies to report adherence rates of approximately 67-73% for exercise (7, 8, 33, 34), with varying rates of adherence for other self-management strategies including mitten wear in stroke (74%) (35), wearing of heel lifts (38%) (36) and splinting regimes (33%) (37). A qualitative study on non-adherence to home physiotherapy programs for osteoarthritis reported that there was a high degree of concordance between the physiotherapist assessments of adherence with the patient's self-report of adherence (38). This suggests that physiotherapists may have a reasonably accurate perception of the likely level of adherence by their patients. Poor patient adherence has been linked to poor treatment outcomes (3, 4, 8). Therefore, the challenge for physiotherapists, who acknowledge less than optimal rates of patient adherence, is to research methods that they can integrate into clinical practice to aid adherence.

Poor adherence may be due to a number of factors. Modifiable patient characteristics such as self-confidence and motivation were the most commonly reported factors affecting patient adherence in our study. This is supported by a systematic review which reported that low patient self-efficacy, depression, anxiety, greater perceived number of barriers to adherence and increased pain levels during exercise all had a negative impact on patient adherence (12). A qualitative study found that patients with a positive attitude towards exercise had greater motivation and adherence; while those who perceived the self-management strategy as effective were more likely to continue adhering (38).

Respondents also perceived that physiotherapist characteristics can be an important influence on patient adherence. This is supported by studies which showed that initial levels of adherence can relate to the relationship between the patient and physiotherapist particularly with regard to high levels of trust and a desire not to let the physiotherapist down (38, 39). It has been suggested that communication which enhances the physiotherapist-patient relationship is vital for achieving the desired treatment outcome (40). Therefore, physiotherapists should review the evidence related to best-practice communication skills.

In addition, other studies have indicated the importance of characteristics of the self-management strategy in determining adherence. For example, it has been reported that the most common reasons for non-adherence to exercise and chest clearance techniques was the time taken to complete the strategy (41, 42). Therefore, it is important for physiotherapists to consider the characteristics of the self-management strategy when prescribing this to patients to promote adherence. Physiotherapists and patients should work collaboratively to evaluate individual considerations, identify barriers to adherence and design a patient-specific program that is acceptable and feasible (42).

The survey results indicate that physiotherapists perceive that adherence could be improved by patient education including clear rationale for the strategy, expected outcomes and supportive materials. This is supported by a study on patients' perceptions of self-management of chronic low back pain which reported that the provision of education and support may improve patients' ability to self-manage their condition (43). It was also perceived by a majority of respondents that physiotherapist characteristics such as their communication skills, time devoted to patient self-management and expert knowledge were important determinants of patient adherence. Consistent with this, a systematic review on patient-centred communication identified a number of communication skills to help clinicians engage better with patients such as listening more, asking questions and showing sensitivity to patients' emotional concerns leading to increased patient participation in their care (44).

One of the most encouraging findings of our study is that the majority of physiotherapists do not perceive that a lack of time, limited adherence knowledge, inability to discuss adherence, lack of continuity of care or limited resources as barriers to implementing methods to aid adherence. Physiotherapists overwhelmingly perceived that they could alter their patient's ability to adhere and that it is relevant to physiotherapy practice. However, given that a majority of physiotherapists surveyed responded that adherence is a problem with their patients' further research is needed to investigate whether methods to improve adherence are being implemented, and if so, why these are not positively influencing adherence.

Limitations

The main limitations of our study relate to sampling methods. We acknowledge that the survey distribution method excluded physiotherapists who were not members of the APA or with a listed e-mail address. The inclusion criteria may have restricted access to physiotherapists working in more rural locations. We were prevented on collecting data regarding non-responders due to limitations respecting the anonymity of the survey responders. However, we examined sample representativeness by comparing our survey sample with Australian workforce data from a range of sources (Table 2.1). The generalisability of results may be limited due to the majority of respondents being employed in a metropolitan area and almost half having post graduate qualifications. In addition, due to the percentage of APA members working in private practice (Table 2.1) the data is slightly skewed towards the perceptions of private physiotherapy practitioners (although this was not statistically significant). Although we did not assess participants' scope of practice, given that the majority of the physiotherapists worked in private practice, it is likely that a large proportion of the sample worked in the treatment of musculoskeletal injuries, rather than cardio-respiratory or neurological conditions.

Conclusions

Results suggest physiotherapists perceive that patient outcomes can be positively impacted by patient adherence to a range of self-management strategies. However, physiotherapists perceive that the rates of patient adherence could be improved. Therefore, physiotherapists should be encouraged to assess patient adherence and implement evidence-based methods to aid adherence during routine clinical practice.

This survey provides a good foundation in which future adherence research can be developed.

Implications for physiotherapy practice

The results of our survey provide new evidence that physiotherapists do consider a range of patient self-management strategies as important for improving patient treatment outcomes. However, the effectiveness of these strategies is dependent on patient adherence. Physiotherapists in our study perceive that patient rates of adherence could be improved which adds further support that clinical physiotherapists should review and incorporate best-practice adherence research into practice. These findings are consistent with a critical review on patient adherence which concluded that the assessment of patient adherence should be integrated into routine clinical practice (9). Physiotherapists should assess patients for barriers to adherence related to modifiable patient characteristics such as motivation and willingness to carry out the self-management strategy; as well as those related to the self-management strategy itself so that patients can easily incorporate it into their everyday lifestyles. Physiotherapists may be able to positively influence patient adherence by using methods to aid adherence such as patient education, supportive written material, and professional support in addition to the use of good communication skills and motivational techniques. If physiotherapists can adopt a collaborative approach with their patients to address barriers to adherence, patients may be more able to adhere leading to improved patient outcomes.

Implications for physiotherapy research

Further research should focus on the extent to which physiotherapists address patient adherence to self-management strategies during routine patient consultations, to investigate whether there is consistency between the perceptions of physiotherapists as reported in our study and what physiotherapists actually do in practice. Research into medicine adherence has indicated that patient adherence can be aided by using a frank, non-judgemental and open approach to asking about adherence; acknowledging how common non-adherence is; exploring barriers and facilitators to adherence; providing verbal and written evidence-based information without medical jargon; tailoring communication to suit the patient’s preferences for the quantity and style of communication; and a patient-centred approach with shared decision making as well as recognising that patient's decisions may ultimately not be in accord with medical recommendations (45, 46). Given the positive attitudes towards methods to aid adherence demonstrated in this study, there is a need to examine the extent to which such methods are effective in physiotherapy practice, and whether or not they are used routinely by physiotherapists.

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References

1. World Confederation for Physical Therapy. World Confederation for Physical therapy. Policy statement. Description of physical therapy London, UK: WCPT; 2011 [cited 2015 7th May]. Available from: http://www.wcpt.org/sites/wcpt.org/files/files/PS_Description_PT_Sept2011_FORMATTED_edit2013.pdf.

2. Richard AA, Shea K. Delineation of self-care and associated concepts. J Nurs Scholarsh. 2011;43(3):255-64.

3. Taylor NF, Dodd KJ, Shields N, Bruder A. Therapeutic exercise in physiotherapy practice is beneficial: a summary of systematic reviews 2002-2005. Aust J Physiother. 2007;53(1):7-16.

4. Page CJ, Hinman RS, Bennell KL. Physiotherapy management of knee osteoarthritis. Int J Rheum Dis. 2011;14(2):145-51.

5. Grimmer-Somers K, Milanese S, Kumar S, Brennan C, Mifsud I. Number and Frequency of Physiotherapy Services for Motor Vehicle-induced Whiplash: Interrogating Motor Accident Insurance Data 2006 & 2009. J Rehabil Med. 2012;44(9):774-80.

6. McLean SM, Burton M, Bradley L, Littlewood C. Interventions for enhancing adherence with physiotherapy: a systematic review. Man Ther. 2010;15(6):514-21.

7. Kolt GS, McEvoy JF. Adherence to rehabilitation in patients with low back pain. Man Ther. 2003;8(2):110-6.

8. Peek K, Sanson-Fisher R, Mackenzie L, Carey M. Interventions to aid patient adherence to physiotherapist prescribed self-management strategies: A systematic review. Physiother. 2016;102(2):127-35.

9. Peek K, Sanson-Fisher R, Mackenzie L, Carey M. Patient adherence to physiotherapist prescribed self-management strategies: A critical review. Int J Ther Rehabil. 2015;22(11):535-43.

10. World Health Organisation. Adherence to long-term therapies: evidence for action. WHO library. Switzerland2003.

11. Beinart NA, Goodchild CE, Weinman JA, Ayis S, Godfrey EL. Individual and intervention-related factors associated with adherence to home exercise in chronic low back pain: a systematic review. Spine J. 2013;13(12):1940-50.

12. Jack K, McLean SM, Moffett JK, Gardiner E. Barriers to treatment adherence in physiotherapy outpatient clinics: a systematic review. Man Ther. 2010;15(3):220-8.

13. Liddle SD, Baxter GD, JH G. Physiotherapists' use of advice and exercise for the management of chronic low back pain: A national survey. Man Ther. 2009;14:189-96.

14. Fidvi N MS. Physiotherapy management of low back pain in India- a survey of self-reported practice. Physiother Res Int. 2010;15:150-9.

15. Struijs PA, Korthals-de Bos IB, van Tulder MW, van Dijk CN, Bouter LM, Assendelft WJ. Cost effectiveness of brace, physiotherapy, or both for treatment of tennis elbow. Br J Sports Med. 2006;40(7):637-43; discussion 43.

16. Chipchase LS, Williams MT, Robertson VJ. A national study of the availability and use of electrophysical agents by Australian physiotherapists. Physiother Theory Pract. 2009;25(4):279-96.

17. Hall AE, Sanson-Fisher RW, Lynagh MC, Threlfall T, D'Este CA. Format and readability of an enhanced invitation letter did not affect participation rates in a cancer registry-based study: a randomized controlled trial. J Clin Epidemiol. 2013;66(1):85-94.

18. McKiernan SC, P. Warren-Forward, H. A survey of diagnostic ultrasound within the physiotherapy profession for the design of future training tools. Radiography. 2011;17:121-5.

19. Parr S, May S. Do musculoskeletal physiotherapists believe the NICE guidelines for the management of non-specific LBP are practical and relevant to their practice? A cross sectional survey. Physiother. 2014;100(3):235-41.

20. Denscombe M. Web-Based Questionnaires and the Mode Effect: An Evaluation Based on Completion Rates and Data Contents of Near-Identical Questionnaires Delivered in Different Modes. Social Sci Comp Rev. 2006;24(2):246-54.

21. Grieve R, Palmer S. Physiotherapy for plantar fasciitis: a UK-wide survey of current practice. Physiother. 2016.

22. Milne N, Choy NL, Leong GM, Hughes R, Hing W. Child obesity service provision: a cross-sectional survey of physiotherapy practice trends and professional needs. Aust J Prim Health. 2016;22(2):140-6.

23. Passey ME, Sanson-Fisher RW. Provision of Antenatal Smoking Cessation Support: A Survey With Pregnant Aboriginal and Torres Strait Islander Women. Nicotine Tob Res. 2015;17(6):746-9.

24. Carey M, Turon H, Goergen S, Sanson-Fisher R, Yoong SL, Jones K. Patients' experiences of the management of lower back pain in general practice: use of diagnostic imaging, medication and provision of self-management advice. Aust J Prim Health. 2015;21(3):342-6.

25. Mackenzie LJ, Sanson-Fisher RW, Carey ML, D'Este CA. Radiation oncology outpatient perceptions of patient-centred care: a cross-sectional survey. BMJ Open. 2013;3(2; e001265. doi:10.1136/bmjopen-2012-001265).

26. Froman RD. The Ins and Outs of Self-Report Response Options and Scales. Res Nurs Health. 2014;37(6):447-51 5p.

27. Physiotherapy Board of Australia. Physiotherapy registrant data: December 2014 Melbourne, Australia2014 [cited 2015 7th May]. Available from: http://www.physiotherapyboard.gov.au/About/Statistics.aspx.

28. Health Workforce Australia. Australia's Health Workforce Series – Physiotherapists in Focus. Adelaide, Australia: Health Workforce Australia; 2014.

29. Dripps M. Utilising private sector capacity in clinical training- challenges and opportunities. 2014 [cited 2015 5th May]. Available from: http://www.slideshare.net/informaoz/marcus-dripps-australian-physiotherapy.

30. Someeh M, Norasteh AA, Daneshmandi H, Asadi A. Immediate effects of Mulligan's fibular repositioning taping on postural control in athletes with and without chronic ankle instability. Phys Ther Sport. 2015;16(2):135-9.

31. Kemler E, van de Port I, Backx F, van Dijk CN. A systematic review on the treatment of acute ankle sprain: brace versus other functional treatment types. Sports Med. 2011;41(3):185-97.

32. Michaleff ZA, Maher CG, Lin C-WC, Rebbeck T, Jull G, Latimer J, et al. Comprehensive physiotherapy exercise programme or advice for chronic whiplash (PROMISE): a pragmatic randomised controlled trial. The Lancet. 2014;384(9938):133-41.

33. Groeneveldt L, Mein G, Garrod R, Jewell AP, Van Someren K, Stephens R, et al. A mixed exercise training programme is feasible and safe and may improve quality of life and muscle strength in multiple myeloma survivors. BMC Cancer. 2013;13:31-5.

34. Mailloux J, Finno M, Rainville J. Long-Term Exercise Adherence in the Elderly with Chronic Low Back Pain. Am J Phys Med Rehabil. 2006;85(2):120-6.

35. Burns A, Burridge J, Pickering R, Turk R. Does the use of a constraint mitten to encourage use of the hemiplegic upper limb improve arm function in adults with subacute stroke? Clin Rehabil. 2007;21(10):895-904.

36. Goss DL, Moore JH. Compliance wearing a heel lift during 8 weeks of military training in cadets with limb length inequality. J Ortho Sports Phys Ther. 2004;34(3):126-31.

37. Sandford F, Barlow N, Lewis J. A Study to Examine Patient Adherence to Wearing 24-Hour Forearm Thermoplastic Splints after Tendon Repairs. J Hand Ther. 2008;21(1):44-53.

38. Campbell R, Evans M, Tucker M, Quilty B, Dieppe P, Donovan JL. Why don't patients do their exercises? Understanding non-compliance with physiotherapy in patients with osteoarthritis of the knee. J Epidemiol Comm Health. 2001;55(2):132-8.

39. Melander Wikman A, Fältholm Y. Patient empowerment in rehabilitation: "Somebody told me to get rehabilitated". Adv Physiother. 2006;8(1):23-32.

40. Hiller A, Guillemin M, Delany C. Exploring healthcare communication models in private physiotherapy practice. Patient Educ Couns. 2015;98(10):1222-8.

41. Myers LB, Horn SA. Adherence to chest physiotherapy in adults with cystic fibrosis. J Health Psychol. 2006;11(6):915-26.

42. Quinn L, Busse M, Khalil H, Richardson S, Rosser A, Morris H. Client and therapist views on exercise programmes for early-mid stage Parkinson's disease and Huntington's disease. Disabil Rehabil. 2010;32(11):917-28.

43. Cooper K, Smith B, Hancock E. Patients' perceptions of self-management of chronic low back pain: evidence for enhancing patient education and support. Physiother. 2009;95:43-50.

44. Pinto RZ, Ferreira ML, Oliveira VC, Franco MR, Adams R, Maher CG, et al. Patient-centred communication is associated with positive therapeutic alliance: a systematic review. J Physiother. 2012;58(2):77-87.

45. National Institute for Health and Clinical Excellence. Medicines adherence (CG76); 2009. [cited 2015 27th November]. Available from: http://publications.nice.org.uk/medicines-adherence-cg76.

46. Butow P, Sharpe L. The impact of communication on adherence in pain management. Pain. 2013;154 Suppl 1:S101-7.

PAPER THREE

Predictors of high levels of patient-reported adherence to physiotherapist-prescribed self-management strategies

Paper one demonstrated that physiotherapists regularly prescribe self-management strategies to their patients in private practice. Results of paper two indicated that physiotherapists perceive that patient adherence to prescribed self-management strategies is important for improving patient outcomes, but that patient adherence levels are sub-optimal. Studies which explore predictors of adherence can make a useful contribution to the physiotherapy literature. The long term clinical success of a self-management strategy can be adversely affected by poor patient adherence. Therefore exploring modifiable and non-modifiable predictors of patient adherence can assist in the development of adherence aiding interventions.

A number of studies have looked at predictors of adherence to exercise using very specific patient populations but no published studies were located which examined predictors of high levels of adherence to all self-management strategies prescribed in Australian private practice. Additionally, no studies have focused on physiotherapist, consultation and prescription characteristics associated with higher adherence levels. Paper three aimed to address this gap by exploring the level of patient-reported adherence to physiotherapist-prescribed self-management strategies and the extent to which patient, physiotherapist, consultation and prescription characteristics are associated with high levels of adherence to these strategies.

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Predictors of high levels of patient-reported adherence to physiotherapist-prescribed self-management strategies

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Predictors of high levels of patient-reported adherence to physiotherapist-prescribed self-management strategies

Abstract

Objective To explore the level of patient-reported adherence to physiotherapist-prescribed self-management strategies in private practice, and the extent to which patient, physiotherapist, consultation and prescription characteristics are associated with high levels of adherence to these prescribed strategies.

Design and setting Cross-sectional observational study of 14 physiotherapists from four private practices involving a consecutive sample of 113 patients.

Methods Data were collected in two stages. The first stage involved a research physiotherapist observing one physiotherapist-patient consultation per patient to collect data related to physiotherapist prescription of self-management strategies. The second stage involved a follow-up telephone interview with each patient within 10-14 days of the observed consultation to record the patient-reported level of adherence to each prescribed strategy.

Results Prescribed strategies where physiotherapists were observed to ask patients to repeat the details of the self-management plan, were 6.54 times (95% CI 2.91-14.98) more likely to be highly adhered to then strategies where the physiotherapist did not do this. In addition, prescribed strategies which were accompanied by printed information were 2.73 times (95% CI 1.24-6.00) more likely to be highly adhered to than strategies which were not. Advice (OR = 0.18; 95% CI 0.08-0.40) and other self-management strategies (OR = 0.30; 95% CI 0.12-0.78) were less likely to be highly adhered to when compared to home-based exercise programs.

Conclusion To improve patient-reported adherence to physiotherapist-prescribed self-management strategies, physiotherapists should be encouraged to provide supplementary printed information and ask the patient to repeat the details of the prescribed strategy.

Keywords Compliance, rehabilitation, exercise, physical therapy

Introduction

Patient self-management is an important component of physiotherapy practice (1, 2); with high levels of patient adherence linked to improved patient outcomes (3-5). Patient adherence has been defined as the extent to which a patient's behaviour corresponds to agreed clinical recommendations (3).

Studies consistently show that patient adherence to physiotherapist-prescribed self-management strategies, particularly home-based exercises, is sub-optimal (6-9). A recent systematic review of interventions to aid patient adherence to physiotherapist-prescribed self-management strategies reported a mean level of adherence of 67%; with levels across the included studies ranging from 33-93% (10).

Descriptive studies may identify factors which are associated with higher levels of adherence which can be used to inform the development of adherence aiding interventions. There is, however, a paucity of physiotherapy research exploring the extent to which patient, physiotherapist, consultation and prescription characteristics are associated with adherence to physiotherapist-prescribed self-management strategies in private practice. Previous studies have reported on predictors of adherence to either exercise only (11, 12) or have been restricted to very specific patient populations such as patients with: cystic fibrosis (13), meniscal tears and osteoarthritis (11), bronchiectasis (14), back pain (15) or urinary incontinence (12, 16).

A number of patient characteristics have been associated with high levels of adherence to self-management , these include the increasing age of the patient (11, 14) and male gender (15). Studies suggest that patients are more likely to adhere when they view their health problem as more severe (17, 18). Therefore, the reason or method of referral for patients' initial attendance for physiotherapy may have an association with high levels of adherence. Patients may be more likely to adhere during the early stages of commencing physiotherapy (15), with long-term adherence being acknowledged as more of a challenge than short-term adherence (19-21).

One study suggested that physiotherapists with post-graduate qualifications (physiotherapist characteristic) were more likely to report on the use of back pain guidelines which include self-management recommendations to inform clinical decisions (22). However, research is lacking whether there is any association between possession of a post-graduate physiotherapy qualification and high levels of patient adherence. Prescription characteristics such as the methods physiotherapists use when prescribing self-management strategies to their patients are potentially modifiable. These methods may include the physiotherapist providing a rationale for why the patient should complete the strategy at home, giving patients information on when and how to complete the strategy and asking the patient about barriers to adherence (18). However, no studies were located which investigated the association between these characteristics and patient adherence to physiotherapist-prescribed self-management strategies in private practice.

Previous studies have investigated self-management adherence at the patient level (11, 12, 14). For example, patients with bronchiectasis were considered adherent to airway clearance if they self-reported completing more than 80% of this strategy (14). However, patients are often prescribed more than one self-management strategy during their course of physiotherapy (6, 23), and thus may report different levels of adherence to different strategies. Examining adherence at strategy level may provide important insight into how physiotherapists can develop adherence aiding skills which focus on the strategy rather than the patient. This distinction is important because physiotherapists have greater control over the strategy they prescribe as opposed to the patient they prescribe them to.

This study aims to bridge these gaps by exploring the:

1. Level of patient-reported adherence to physiotherapist-prescribed self-management strategies in private practice, and;

2. Extent to which patient, physiotherapist, consultation and prescription characteristics are associated with patient-reported high levels of adherence to physiotherapist-prescribed self-management strategies.

Method

Study design and setting

This cross-sectional study was undertaken in physiotherapy private practices in two states within Australia. Observational data were collected during physiotherapist-patient consultations, with each patient participant also completing a telephone interview approximately 10-14 days after their consultation was observed. More details regarding this study can be found in a related study previously published [2]. This study is reported in line with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines (24). Ethics approval was granted through the University of Newcastle (Australia) Human Research Ethics Committee (reference number H-2015-0030).

Participants

Physiotherapists: The Australian Physiotherapy Association 'find a physio' web link was used to locate practising physiotherapists working privately within 50km radius of the central business district of two large cities from two states within Australia. Upon entering the relevant post code, the 'find a physio' web link presents a randomly ordered list of practising physiotherapists for the location of interest. The first listed physiotherapist in each city with a practice name, practice address and valid email address, was sent an initial invitation email briefly outlining the study and eligibility criteria (employed in private practice with a general caseload of predominantly adult patients). If the physiotherapist was interested in participating they were requested to contact the study's research physiotherapist to arrange a face-to-face meeting. Physiotherapists working within the same practice were also invited to attend this meeting in which the research physiotherapist outlined in detail the requirements of both physiotherapist and patient participants. Physiotherapists were given a participant information statement and consent form. Written consent was obtained from each physiotherapist as well as the practice manager/ owner prior to study commencement. Once the physiotherapist was either successfully recruited or had declined study participation, the next physiotherapist on each list was contacted until a sample of at least 10 physiotherapists had consented to participate.

Patients: A consecutive sample of patients attending for a consultation at each participating physiotherapy practice were invited to participate. Potential patient participants were first screened by the practice receptionist for the following inclusion criteria: 1) attending for a consultation with a participating physiotherapist, 2) aged 18 years or older, 3) physically and mentally able to give consent to participate, and 4) possessed sufficient English to participate in a follow-up telephone interview. Those who met all of these criteria were approached and invited to participate by the research physiotherapist before they attended their physiotherapy consultation. Verbal as well as written information about the study was provided prior to gaining written consent.

Data Collection

Data were collected between May and October 2015. For each consenting patient, the research physiotherapist observed one physiotherapist-patient consultation. A follow-up telephone interview was then conducted with each participating patient within 10-14 days of the observed consultation to indicate the level of short-term adherence to each strategy [2]. Physiotherapists also completed a once- only demographic survey.

Observation of physiotherapist-patient consultation.

Physiotherapist-patient consultations were observed by the research physiotherapist (KP) who recorded data via a data collection sheet with coding instructions. During the observed consultation, the research physiotherapist recorded the length of time (in whole minutes; recorded using a digital stop watch) spent on the prescription of self-management as well as the name of each self-management strategy prescribed to the patient. For each self-management strategy prescribed, the research physiotherapist recorded 'yes/no/not applicable' on the data collection sheet each time the physiotherapist was observed to use the following methods during the prescription of each self-management strategy (i.e. prescription characteristics): provide a rationale for the prescribed strategy; provide clear instructions on how (i.e. how many, how often) to complete the strategy; provide clear instructions on when (i.e. time of day, before, during or after a particular activity, only when in pain etc.) to complete the strategy; ask the patient about barriers to completing the strategy; demonstrate the strategy to the patient; allow time for the patient to practice the strategy; ask the patient to repeat the instruction for completing the strategy; and give the patient printed information regarding the strategy. The data collection sheet and accompanying coding instructions were devised by a team of two experienced physiotherapists (including the first author) and three health behaviour scientists. Two mock video-taped clinical vignettes were used to pilot test data coding via the data collection sheet by two experienced physiotherapists (inter-tester reliability; kappa 0.92). A copy of the coding instructions are reproduced in Appendix 3.1.

Data related to gender and age of patient, location of injury and number of previous physiotherapy consultations for the same injury were collected from the physiotherapist who was able to consult their patient records following each observed consultation.

Follow-up patient telephone interview.

During the follow up telephone interview patients were asked to:

1) Report their motivation or reason for attending physiotherapy such as referred by their doctor or recommended to attend by a family member (open-ended)

2) Report each self-management strategy given to them by their physiotherapist during the observed consultation (open ended); and

3) Report their level of adherence to each named strategy (from question 2) over the last seven days (four response options: all (100%); most (>50%); some (<49%); none (0%).

Data Analysis

Data were analysed using the statistical package Stata 14 ® (Texas, USA). Data were analysed in consultation with an experienced statistician. Descriptive statistics (mean, standard deviation, frequencies, and percentages) were used to report physiotherapist and patient socio-demographics. A one-sample Chi square test was used to compare physiotherapist characteristics between study participants and national statistics.

Only self-management strategies which were prescribed by physiotherapists during the observed consultations were included in the data analysis. 'Strategy' was chosen as the unit of analysis rather than 'patient' based on prior research suggesting patients are often prescribed more than one self-management strategy during their course of physiotherapy (i.e. there would be more strategies than patients)(6, 23). The data was re-shaped by a senior statistician to allow for 'strategy' level analysis.

Patient-reported levels of adherence to each prescribed strategy ('all' (100%), 'most' (>50%), 'some' (<49%) and 'none' (0%)) are reported using frequencies, percentages and 95% confidence intervals (CIs). Prescribed self-management strategies which were not recalled by patient participants during the follow-up patient telephone interview were automatically coded as patient completed 'none' (0%) of the strategy.

For each prescribed self-management strategy, a binary measure of patient-reported adherence (high and low) was coded: 'high level of adherence' if the patient reported completing 'all' (100%) or 'most' (>50%) of the strategy, and 'low level of adherence' if the patient reported completing 'some' (<49%) or 'none' (0%) of the strategy in the seven days prior to the follow-up interview. This adherence scale has been used in previous research (15, 25). Univariate and multiple mixed-effects logistic regression analyses were used to identify associations between patient; physiotherapist; consultation; and prescription characteristics; and the binary dependent variable, high versus low level of self-reported patient adherence to each prescribed self-management strategy. The following variables were included in the univariate analysis: patient characteristics (including age, gender, referral source/ reason for attending physiotherapy, and location of injury), physiotherapist characteristic (possession of a post-graduate qualification), consultation characteristics (including number of previous consultations and length of consultation time) and prescription characteristics (including number and type of strategy prescribed and whether the physiotherapist: provided a rationale for each strategy, questioned the patient about barriers to strategy adherence, provided clear verbal instructions on how and when to complete each strategy, demonstrated each strategy, provided an opportunity for the patient to practise each strategy, asked the patient to repeat the details of the strategy, and provided printed information). Variables with *p* values <0.25 at univariate analysis (11) were included in a multiple mixed-effects logistic regression model, and backward stepwise methods were used to exclude variables with *p* values >0.1 on the Likelihood Ratio Test (26). This analysis took into account effects of clustering between physiotherapists and patients for each variable. The Hosmer-Lemeshow goodness of fit test was used to assess the fit of the final model. Adjusted odds ratios with 95% CIs are reported, and a 5% significance level applied.

Results

Participants

Physiotherapists: From five emailed invitations, four physiotherapists contacted the study's researcher to schedule a face-to-face meeting (one physiotherapist declined participation). This led to the recruitment of 14 physiotherapists from four private physiotherapy private practices across two states in Australia. Physiotherapist sociodemographic characteristics are summarised and compared to Health Workforce Statistics (27) in Table 3.1.

Table 3.1: Physiotherapist (n=14) socio-demographic characteristics compared with Health Workforce Statistics (27)

Characteristic	**Study physiotherapists**	**Health Workforce Australia**	***p*-value**
Mean			
Age	42 years	39 years	0.74
n, %			
Female	8 (57%)	67%	0.37
Qualified in Australia	12 (86%)	85%	0.94
Post-graduate qualifications	2 (14%)	22%	0.18

Patients: In total 119 patients were screened by the practice receptionist for eligibility. Of these, five were deemed ineligible (< 18 years n=4; insufficient English n=1); 114 patients were approached by the research physiotherapist to discuss participation, of which 113 (99%) consented to participate. All participating patients were attending physiotherapy for treatment of a musculoskeletal condition. Patient participant socio-demographic characteristics are reported in Table 3.2.

Table 3.2: Patient participant socio-demographic characteristics (n=113)

Characteristic	**Patient participants**
	Mean (SD)
Age	52 years (18)
Number of previous consultations	10 (18)
	n, %
Female	77, 68%
Attendance for an initial consultation	19, 17%

Level of patient-reported adherence to physiotherapist-prescribed self-management strategies.

Physiotherapists were observed to prescribe a total of 232 self-management strategies to 108 patients, however, at follow-up telephone interview, patients only recalled 170 (73%, 95% CI: 67-78%) of these strategies. Of the 232 prescribed strategies, patients self-reported completing 'all' of 64 strategies (28%, 95% CI: 22-44%); 'most' of 67 strategies (29%, 95% CI: 23-35%), 'some' of 35 strategies (15%, 95% CI: 11-20%) and 'none' of 66 strategies (28%, 95% CI: 22-44%) in the seven days prior to the follow-up patient interview. The 66 strategies for which participants completed 'none' included all 62 strategies which patients were unable to recall being prescribed. With regard to the types of strategy, almost all prescriptions of exercise (97%) were recalled by patients compared with 52% of prescribed advice and 58% of other strategies (which included the use of heat, ice, lumbar roll, removable braces, self-taping, self-massage and self-mobilisation).

Overall, 131 (56%) of the 232 prescribed self-management strategies had a high level of patient-reported adherence (i.e. patients who reported completing 'all' (100%) or 'most' (>50%) of each prescribed strategy).

Patient, physiotherapist, consultation and prescription characteristics associated with high levels of patient-reported adherence to physiotherapist-prescribed self-management strategies.

The following characteristics were associated (*p*>0.25) with higher levels of self-reported adherence upon univariate logistic regression analysis and thus were included in the initial multiple regression model (see Appendix 3.2): physiotherapist possession of a post-graduate qualification, number of strategies prescribed to each patient in the observed consultation, type of self-management strategy prescribed (i.e. exercise, advice or other), as well as the following six methods physiotherapists used to prescribe the self-management strategy: questioning the patient about barriers to adherence; providing clear instructions on how to complete the strategy; physiotherapist demonstrating the strategy to the patient; allowing time for the patient to practise the strategy in the observed consultation; physiotherapist seeking confirmation by asking the patient to repeat the details of the strategy; and the provision of printed information regarding the strategy. No patient sociodemographic or consultation characteristics were included in the multiple mixed effects logistic regression model.

Of these characteristics, only those with *p* values ≤0.1 on the Likelihood Ratio Test were retained in the final multiple mixed effects logistic regression model. The final model indicated that prescribed strategies where physiotherapists had asked the patient to repeat the details of the strategy during the consultation, had 6.54 times (95% CI 2.91-14.98, *p* <0.001) the odds of being highly adhered to (according to patient self-report) compared to strategies where the physiotherapist did not do this. In addition, prescribed strategies which were accompanied by printed information had 2.73 times (95% CI 1.24-6.00, *p* = 0.01) the odds of being highly adhered to than strategies which were not accompanied by this information. The final model also indicated that prescribed advice had 0.18 times lower odds (95% CI: 0.08-0.40) and other self-management strategies 0.30 times lower odds (95% CI: 0.12-0.78) of being highly adhered to when compared to prescriptions of home-based exercise (*p* < 0.001). The Hosmer-Lemeshow test results indicated that the final model fit the data well (*p* = 0.838)

Discussion

Patients self-reported being completely (100%) adherent to 28% of prescribed self-management strategies; this level of adherence increases to 56% when including strategies reportedly completed ‘most’ (>50%) of the time. These levels of adherence are similar to the levels reported in earlier studies; only 30% of adults with cystic fibrosis adhered to daily self-managed chest physiotherapy (28); 49% of participants completed >80% of a home-based exercises program for low back pain and 62% of participants adhered to >50% of home-exercises for meniscal tears and osteoarthritis (11). However, it should be noted that our data is reported at strategy level rather than at the patient level. The number of completely adherent patients in our study may be lower as a number of patients who were prescribed more than one strategy and reported different levels of adherence to different strategies. Analysing the data at strategy level is important because it highlights the characteristics that physiotherapists may be able to modify when prescribing a self-management strategy to a patient in order to facilitate adherence.

Our findings indicate that the type of strategy is associated with adherence with more patients reporting high levels of adherence to home-based exercise when compared with advice and other self-management strategies. It should be noted that exercise was more frequently recalled by patients, therefore, lack of patient recall of advice and other strategies may confound this result, given that failure to recall a prescribed strategy was recoded as patient completed ‘none’ (0%) of the strategy. An exploration of factors associated with patient recall of prescribed self-management strategies would be an interesting addition to the current literature as it is possible that patient adherence can be improved through interventions that are specifically aimed to aid patient recall.

Contrary to previous studies, this study did not find any patient or physiotherapist characteristics to be significantly associated with high levels of adherence. This finding may be related to differing patient population characteristics across studies. Our study involved patients in private practice who had a range of musculoskeletal injuries from neck complaints to ankle injuries. Previous studies have been limited to more specific patient populations: osteoarthritis, bronchiectasis and low back pain (11, 14, 15). In addition, specific details about the number of physiotherapists involved in prior studies were not reported (11, 14, 15).

The methods used by physiotherapists when prescribing self-management strategies associated with high levels of adherence include the physiotherapist asking the patient to repeat details of the self-management strategy and the provision of supplementary printed information. These findings support earlier research which suggests that there are a range of communication skills that can be used to maximise patient understanding and adherence including asking the patient to summarise what has been agreed upon during the consultation (17, 18, 29, 30). Providing patients with an opportunity to summarise their self-management program allows physiotherapists to correct any misunderstandings and provide additional information required to facilitate adherence (such as how long or when to complete the strategy if these details were missed or forgotten during the initial prescription) (18). It also provides an opportunity for patients to ask questions or voice any concerns they may have regarding the strategy or their ability to integrate it into their home routine. The provision of printed information has been shown to aid adherence (7, 10). Medical literature demonstrates that poor understanding and retention of information given within a consultation is associated with patient anxiety, feeling unwell, in pain and poor health literacy (29). During simulated medical consultations, young, healthy volunteers were shown to recall less than 25% of verbally presented information (31). Therefore, providing printed self-management instructions can aid recall, and if displayed in a prominent position in a patient's home, may also act as a visual reminder or trigger to encourage strategy completion (18, 32, 33).

Implications for practice

This cross-sectional observation study is believed to be the first to examine the characteristics associated with high levels of patient-reported adherence to physiotherapist-prescribed self-management strategies for musculoskeletal injuries in private practice, particularly at strategy level. Encouragingly, findings of this study indicate that the characteristics associated with increased odds of reporting high levels of adherence are modifiable and could be incorporated into the routine practice of physiotherapists; namely asking patients to recall details of the prescribed strategy and providing printed information. Physiotherapists should be encouraged to review the literature and reflect on their own practice related to best-practice communication skills. The World Confederation of Physical Therapy states that an integral part of physiotherapy is the interaction between the therapist and the patient or caregiver to develop a mutual understanding of the treatment approach (1). Furthermore, the Australian standards of physiotherapy, encompasses "the application of verbal, nonverbal and written communication skills appropriate to physiotherapy practice" (p.23) (34). The use of prescription methods which include asking the patient to recall their self-management strategy and providing printed information could be considered as a way in which to translate this standard into practice in order to aid patient adherence to all physiotherapist-prescribed self-management strategies and improve treatment outcomes. Incorporating these prescription methods may additionally result in improved adherence to all self-management strategies through improved patient recall.

Limitations:

The generalisability of the findings are limited due to patients only being recruited from four metropolitan private physiotherapy practices. However, this is the first study that the authors are aware of that examines predictors of adherence to all self-management strategies prescribed by physiotherapists in private practice.

It is likely that the self-report measure of adherence used in the current study would have been subject to some degree of error related to recall bias or social desirability bias (35). However, without a 'gold standard' measure of adherence in physiotherapy, self-report continues to be the most commonly utilised method (36). Finally, the methods physiotherapists used when prescribing self-management strategies (prescription characteristics) were only recorded if they were observed during the physiotherapist-patient consultations in which the research physiotherapist was present. It is possible that physiotherapists used these methods in earlier consultations (i.e. the physiotherapist gave the patient supplementary printed information regarding the strategy at an earlier consultation which was thus not recorded).

Conclusion

To improve patient outcomes related to physiotherapist-prescribed self-management strategies for musculoskeletal conditions, clinicians and researchers need to firstly understand the characteristics associated with high patient-reported levels of adherence to these strategies. Adherence to prescribed strategies may be improved by encouraging physiotherapists to: ask the patient to repeat the details of the strategy; and provide printed information. The use of such methods may be particularly important for advice and other self-management strategies which are less likely to be adhered to when compared with exercise.

Clinical Messages

- Non-adherence to prescribed self-management strategies is commonly characterised by a lack of patient recall of self-management strategy prescription.
- High levels of patient-reported adherence are associated with the physiotherapist: asking the patient to repeat the specifics of the self-management strategy; and supplementing with printed information.

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Conflicts of interest:

The authors have no conflicts of interest to declare.

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References

1. World Confederation for Physical Therapy. Policy statement: Description of physical therapy. London UK: World Confederation for Physical Therapy; 2014.

2. Peek K, Carey M, Mackenzie L, Sanson-Fisher R. An observational study of Australian private practice physiotherapy consultations to explore the prescription of self-management strategies. Musculoskelet Care. 2017. Available at :https://doi.org/10.1002/msc.1181.

3. Sabaté E. Adherence to long-term therapies: evidence for action: World Health Organization; 2003.

4. Hayden JA, van Tulder MW, Tomlinson G. Systematic review: strategies for using exercise therapy to improve outcomes in chronic low back pain. Ann Intern Med. 2005;142(9):776-85.

5. Karnad P MS. Physiotherapists' perceptions of patient adherence to home exercises in chronic musculoskeletal rehabilitation. Int J Physiother & Rehabil. 2011;Nov:28-32.

6. Peek K, Carey M, Sanson-Fisher R, Mackenzie L. Physiotherapists' perceptions of patient adherence to prescribed self- management strategies: A cross-sectional survey of Australian physiotherapists. Disabil Rehabil. 2016 available at: http://dx.doi.org/10.1080/09638288.2016.1212281.

7. Schneiders A, Zusman, M, Singer, K. Exercise therapy compliance in acute low back pain patients. Man Ther. 1998;3(3):147-52.

8. White D, Stiller K, Haensel N. Adherence of adult cystic fibrosis patients with airway clearance and exercise regimens. J Cystic Fibrosis. 2007;6(3):163-70.

9. Roddey TS, Olson SL, Gartsman GM, Hanten WP, Cook KF. A randomized controlled trial comparing 2 instructional approaches to home exercise instruction following arthroscopic full-thickness rotator cuff repair surgery. J Ortho Sport Phys Ther. 2002;32(11):548-59.

10. Peek K, Sanson-Fisher R, Mackenzie L, Carey M. Interventions to aid patient adherence to physiotherapist prescribed self-management strategies: A systematic review. Physiother. 2016;102(2):127-35.

11. Tuakli-Wosornu YA, Selzer F, Losina E, Katz JN. Predictors of Exercise Adherence in Patients With Meniscal Tear and Osteoarthritis. Arch Phys Med Rehabil. 2016;97(11):1945-52.

12. Alewijnse D, Mesters I, Metsemakers J, van den Borne B. Predictors of long-term adherence to pelvic floor muscle exercise therapy among women with urinary incontinence. Health Educ Res. 2003;18(5):511-24.

13. Kettler LJ, Sawyer SM, Winefield HR, Greville HW. Determinants of adherence in adults with cystic fibrosis. Thorax. 2002;57(5):459-64.

14. McCullough AR, Tunney MM, Stuart Elborn J, Bradley JM, Hughes CM. Predictors of adherence to treatment in bronchiectasis. Respir Med. 2015;109(7):838-45.

15. Alexandre NM, Nordin M, Hiebert R, Campello M. Predictors of compliance with short-term treatment among patients with back pain. Rev Panam Salud Publica. 2002;12(2):86-94.

16. Borello-France D, Burgio KL, Goode PS, Wen Y, Weidner AC, Lukacz ES, et al. Adherence to Behavioral Interventions for Stress Incontinence: Rates, Barriers, and Predictors. Phys Ther. 2013;93(6):757-73.

17. DiMatteo MR, Haskard-Zolnierek KB, Martin LR. Improving patient adherence: a three-factor model to guide practice. Health Psych Rev. 2012;6(1):74-91.

18. Peek K, Carey M, Sanson-Fisher R, Mackenzie L. Aiding patient adherence to physiotherapist-prescribed self-management strategies: An evidence-based behavioural model in practice. Phys Ther Rev. 2016. Available at: https://doi.org/10.1080/10833196.2016.1226537.

19. Bassett S. The assessment of patient adherence to physiotherapy rehabilitation. NZ J physiother. 2003;31(2):60-6.

20. Steele BG, Belza B, Cain KC, Coppersmith J, Lakshminarayan S, Howard J, et al. A Randomized Clinical Trial of an Activity and Exercise Adherence Intervention in Chronic Pulmonary Disease. Arch Phys Med Rehabil. 2008;89(3):404-12.

21. Friedrich M, Gittler G, Halberstadt Y, Cermak T, Heiller I. Combined exercise and motivation program: effect on the compliance and level of disability of patients with chronic low back pain: a randomized controlled trial. Arch Phys Med Rehabil. 1998;79(5):475-87.

22. Hendrick P, Mani R, Bishop A, Milosavljevic S, Schneiders AG. Therapist knowledge, adherence and use of low back pain guidelines to inform clinical decisions--a national survey of manipulative and sports physiotherapists in New Zealand. Man Ther. 2013;18(2):136-42.

23. Crowe M, Whitehead L, Jo Gagan M, Baxter D, Panckhurst A. Self-management and chronic low back pain: a qualitative study. J Adv Nurs. 2010;66(7):1478-86.

24. Vandenbroucke JP, von Elm E, Altman DG, Gotzsche PC, Mulrow CD, Pocock SJ, et al. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE): explanation and elaboration. Epidemiol. 2007;18(6):805-35.

25. Van Gool CH, Penninx BW, Kempen GI, Rejeski WJ, Miller GD, Van Eijk JTM, et al. Effects of exercise adherence on physical function among overweight older adults with knee osteoarthritis. Arthritis care res. 2005;53(1):24-32.

26. Deeks JJ, Altman DG. Diagnostic tests 4: likelihood ratios. BMJ. 2004;329(7458):168-9.

27. Health Workforce Australia. Australia's health workforce series: physiotherapists in focus. In: Australia HW, editor. Adelaide: HWA; 2014. p. 1-45.

28. Myers LB, Horn SA. Adherence to chest physiotherapy in adults with cystic fibrosis. J Health Psychol. 2006;11(6):915-26.

29. Sanson-Fisher R, Campbell EM, Redman S, DJ. H. Patient-provider interactions and patient outcomes. Diabetes Educ. 1989;15:134-8.

30. Hiller A, Guillemin M, Delany C. Exploring healthcare communication models in private physiotherapy practice. Patient Educ Couns. 2015;98(10):1222-8.

31. Sandberg EH, Sharma R, Sandberg WS. Deficits in retention for verbally presented medical information. Anesthesiol. 2012;117(4):772-9.

32. Robinson L, Newton JL, Jones D, Dawson P. Self-management and adherence with exercise-based falls prevention programmes: a qualitative study to explore the views and experiences of older people and physiotherapists. Disabil Rehabil. 2014;36(5):379-86.

33. Hyland G, Hay-Smith J, Treharne G. Women's experiences of doing long-term pelvic floor muscle exercises for the treatment of pelvic organ prolapse symptoms. Int Urogynecol J. 2014;25(2):265-71.

34. Australian Physiotherapy Council. Australian standards of physiotherapy. Canberra: Australian Physiotherapy Council; 2006. p. 1-81.

35. Bollen J, Dean S, Siegert R, Howe T, Goodwin V. A systematic review of measures of self-reported adherence to unsupervised home-based rehabilitation exercise programmes, and their psychometric properties. BMJ open. 2014;4.

36. Peek K, Sanson-Fisher R, Mackenzie L, Carey M. Patient adherence to physiotherapist prescribed self-management strategies: A critical review. Int J Ther Rehabil. 2015;22(11):535-43.

PAPER FOUR

Patient adherence to physiotherapist prescribed self-management strategies: A critical review.

Given the importance of adherence to self-management to optimising clinical outcomes of physiotherapy, it is important that the field invests in research to improve understanding of adherence and adherence aiding interventions. An assessment of the quality and quantity of physiotherapy research related to patient adherence to prescribed self-management strategies can provide a metric of research activity in this area. It may also highlight whether data-based adherence research has progressed through descriptive studies (or non-intervention-based studies) to intervention-based research. Descriptive research (e.g. observational studies) includes study designs using qualitative or quantitative methods to observe the natural relationships between factors and outcomes. Intervention research includes study designs where a specific treatment or procedure is intentionally introduced by the researcher with the goal of influencing an outcome, for example, examining the effectiveness of a specific adherence aiding intervention via a randomised controlled trial. Therefore, it is common within any given research area for researchers to study correlational data collected through descriptive research and then apply these findings to look for causation through intervention-based research. Once sufficient quantity of research in any given area is produced, systematic reviews can then be conducted to critically appraise the quality of the literature on any topic, and summarise the evidence to answer a specific research question. Therefore, exploring the type and quantity of research studies published on patient adherence to physiotherapist-prescribed self-management strategies can provide an overview on the status of adherence literature in physiotherapy.

Paper four was developed to describe: 1) changes in the proportion of publications classified as a) non-data based, b) data-based, no new data, and c) data-based, new data. Data based, new data studies were further examined by the following categories i) qualitative studies, ii) non-intervention studies, and iii) intervention studies; and 2) the proportion of non-intervention and intervention based study designs which met accepted methodological criteria for design quality.

An additional aim of paper four was to describe the types of measures which were used to assess patient adherence in the non-intervention and intervention based study designs, and the reported accuracy of those measures. This is important as any intervention-based research moving forward needs to ensure that the measure of adherence used in their study has some demonstrated degree of accuracy otherwise their results may be brought into question.

Published 2015: International Journal of Therapy and Rehabilitation (Appendix 4.1)

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Patient adherence to physiotherapist prescribed self-management strategies: A critical review.

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Patient adherence to physiotherapist prescribed self-management strategies: A critical review.

Abstract

Aims: To examine the published literature on patient adherence to physiotherapist prescribed self-management strategies in order to describe changes in the proportion of publications over time; methodological quality of the non-intervention and intervention based studies; types of measures used to assess patient adherence and the reported accuracy of those measures.

Methods: A comprehensive search of eight electronic databases was conducted, covering the period from 1995 to November 2014. Data were extracted and coded for the number and proportion of papers that were 1) non-data based; reports 2) data-based, reviews and 3) data-based, new data (i) qualitative studies, (ii) non-intervention studies, and (iii) intervention studies. The methodological quality of non-intervention and intervention publications was assessed using Effective Public Health Practice Project quality assessment tool, and data were extracted regarding the type and accuracy of adherence measure/s reported in these publications.

Results: A total of 80 relevant papers were identified. Of these, 49 non-intervention and intervention quantitative study designs underwent methodological assessment; with only 14 studies (29%) assessed as being of at least moderate quality. Fifty-three different measures of patient adherence were recorded from the 49 included studies; with only five of the 49 included studies (10%) reporting statistical evidence to support accuracy of the adherence measure/s applied.

Conclusions: The results indicate that despite a trend towards intervention-based studies and reviews over the last 20 years, the methodological quality of studies on patient adherence could be improved. Accurate and standardised measures of patient adherence are needed for any future research involving patient adherence to physiotherapist prescribed self-management strategies.

Keywords: Physiotherapy, adherence, self-management, adherence measure, review

Introduction

Self-management refers to the handling of the day to day impact of a condition, which can be a life-long task (1). Self-management strategies such as advice, home exercise, application of ice and prescribing braces are important physiotherapy treatment adjuncts (2). However, the effectiveness of a self-management strategy can only be determined if the patient adheres to it in the first place (i.e. treatment fidelity). The World Health Organisation defines adherence as "the extent to which a person's behaviour…corresponds with agreed recommendations from a healthcare provider" (p.13) (3). It has been reported that approximately 60% of participants do not fully adhere to recommended home physiotherapy programs (4-6). Poor physiotherapy treatment adherence can lead to poor treatment outcomes for the patient (7, 8).

Evidence-based practice (EBP) is a process whereby clinicians integrate best research evidence with clinical experience and patient preferences to produce the most appropriate and effective treatment plan (9). Part of the EBP process is to gather and synthesise the literature on any given topic in a systematic and critical way to inform future clinical decisions (10). Given the importance of patient adherence in optimising physiotherapy treatment outcomes, it is timely to consider research activity in this area.

Both overall quantity as well as quality of specific types of studies, as measured by peer reviewed publications, can be used as metrics of research activity. Levels of evidence classify study designs according to their generally perceived capacity to minimise or eliminate bias in the effect being measured (11). Logically, research should move through a progression from measurement research, descriptive research to intervention research (12). Consequentially, the type and proportion of publications on patient adherence should show a change over time. However, it is important that the *level* of evidence is not perceived to represent the *strength* of evidence on patient adherence, to which study design is only one of several contributors which also includes an assessment of methodological quality (11).

EBP implies the systematic use of best evidence in the form of high quality clinical research to solve clinical problems (10). The *quality* of the evidence refers to the methods used by the investigators during the study to minimise bias and control confounding within a study type (i.e. how well the investigators conducted the study) (11). The homogeneity of the study sample, clinically appropriate interventions and valid, sensitive outcome measures are intrinsic to the quality of any study irrespective of design, as without these elements in place, the study will not produce evidence that is relevant to, or adopted in, clinical practice (13).

Measurement accuracy has been defined as the “closeness of agreement between a measured quantity value and a true quantity value” p.21 (14). For this review the accuracy of measures of patient adherence will focus on the included non-intervention and intervention studies which use more than one measure of patient adherence to a physiotherapist prescribed self- management strategy and in particular comparisons between an observational and self-report measure. When interpreting any research findings on adherence, consideration must be given to the accuracy of the measure used as this will affect the understanding of whether and how adherence can be influenced by an intervention and its impact on patient outcomes. This is particularly important for adherence research as there is currently no ‘gold standard’ for the measurement of patient adherence to physiotherapy self-management strategies.

Review aims:

The aims of this review were to examine the literature on patient adherence to physiotherapist prescribed self-management strategies published over the past 20 years (grouped into four equal time periods; 1995-1999; 2000-2004; 2005-2009; and 2010-2014) in order to describe:

1. Changes in the proportion of publications classified as a) non-data based, b) data-based, no new data, and c) data-based, new data. Data based, new data studies were further examined by the following categories i) qualitative studies, ii) non-intervention studies, and iii) intervention studies.
2. The proportion of non-intervention and intervention based study designs which met accepted methodological criteria for design quality.
3. Types of measures and the reported accuracy of those measures of patient adherence used in the non-intervention and intervention based study designs.

Methods

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were used as a reference for the design and reporting of this review (15, 16).

Eligibility criteria

Inclusion criteria

Published studies describing adult patient adherence to physiotherapist-prescribed self-management strategies were included. Patient self-management strategies included any strategy that was prescribed by a physiotherapist for the client to perform independently, away from the physiotherapy clinic or other supervised environment. Only studies published in a peer reviewed journal in English were included.

Exclusion criteria

Studies were excluded if they reported adherence to preventative or pre-habilitation strategies. Studies using healthy participants or paediatric populations were also excluded.

Information Sources and search strategy

A comprehensive search of eight electronic databases included CINAHL, EMBASE, MEDLINE, PUBMED, PSYCINFO, SPORTS Discus, the Cochrane Central Register of Controlled Trials and PEDro. Databases were searched for full texts for a 20 year period from January 1995 to November 2014. Initial key words used were 'physiotherapy' 'adherence' ‘self-management' and ‘compliance’. Additional terms included ‘physical therapy’ ‘exercise’ ‘tape’ ‘advice’ ‘brace’ and ‘splint’.

Reviewer one screened the titles, abstracts and full texts of potentially relevant publications. Hand searching of the reference list of all the included studies was then undertaken.

A search for unpublished studies or grey literature was not included due to the inaccessibility of these studies and their questionable ability to inform practice without having undergone peer review.

Eligibility assessment and coding was performed in a non-blinded standardised manner by reviewer one. The second reviewer independently assessed a random sample of 15% of the identified abstracts, classifying them as eligible or ineligible, and then coded the eligible abstracts as described below. A Kappa of 0.90 indicated a high level of inter-rater agreement of coding between the two reviewers.

Coding

Papers were coded under the following categories:

1. **Non-data based, this includes commentaries and opinion based papers;**

   Papers which reported on patient adherence to physiotherapist prescribed self-management strategies but did not report on any new data

2. **Data based, no new data (reviews):**

   Studies which were referred to as a review which did not contain any new data but rather collated data from previously published studies; this included systematic and critical review papers.

3. **Data based, new data**

Studies reporting new data or new analysis of data from existing sources but were not reviews using the following study designs:

i. **Qualitative study designs**

This included all qualitative study designs.

i. **Non-intervention study designs**

This included all studies using observational, descriptive or the quantitative component of a mixed methods study design.

ii. **Intervention study designs**

This included all RCTs or quasi-RCT; studies which involved an intervention and control group.

Data extraction from non-intervention and intervention based studies

Quantitative data were extracted from the non-intervention and intervention based studies using a standardised data extraction form developed specifically for this review. The form was pilot tested on ten randomly-selected included studies and refined accordingly. Data extracted included author, year, type of study, physiotherapist prescribed self-management strategy used, measure of patient adherence used and reported accuracy of this measure and results of methodological quality assessment using the quality assessment tool for quantitative studies developed by the Effective Public Health Practice Project (EPHPP).

Methodological quality assessment of non-intervention and intervention based studies

The EPHPP tool was used to assess the methodological quality of the non-intervention and intervention based studies included in this systematic review. This generic instrument was developed in 1998 for public health research regardless of study design (17, 18) and has been used in a number physiotherapy reviews (9, 19).

The EPHPP tool is a standardised tool which provides an overall methodological rating of strong, moderate or weak in eight sections: 1. Selection bias, 2. Study design, 3. Confounders, 4. Blinding, 5. Data collection methods, 6. Withdrawals and dropouts, 7. Intervention integrity 8. Analysis.

In accordance with recommendations of the authors of the EPHPP tool, overall study quality was classified based on the combination of the component ratings; strong (no weak ratings), moderate (less than one weak rating), weak (two or more weak ratings). Studies considered to have met accepted methodological criteria had a rating of strong or moderate. A reviewer's manual and dictionary were provided to assist the reviewers and maintain standardised results. Methodological quality for the included non-intervention and intervention based studies was conducted by one reviewer with a second reviewer who audited 10% of the included studies. Kappa was computed to determine inter-rater reliability of methodological quality assessment between the two reviewers. A Kappa of 0.72 indicated a substantial level of agreement.

Data analysis

Descriptive data and a narrative summary were used to report changes in the proportion of publications classified as a) non-data based, b) data-based, no new data, and c) data-based, new data: (i) qualitative studies, (ii) non-intervention studies, and (iii) intervention studies. The proportion of non-intervention and intervention based study designs which met accepted methodological criteria for design quality was described using percentages. A narrative summary was also used to describe the types of measures of patient adherence and the reported accuracy of those measures used in the non-intervention and intervention based studies due to study heterogeneity for patient population, type of self-management strategy, intervention and adherence measure used.

Results

The search provided a total of 144 unique records of which 80 were included for coding, leading to the identification of 28 non-intervention and 21 intervention based study designs, which then underwent methodological quality assessment. See Appendix 4.2 for more detailed results of the study selection process.

Publication characteristics

1. **Coding of papers:**

Eighty papers were included for coding. Of these, 11 were coded as non-data based reports, 8 were coded as data-based reviews, 12 were coded as data-based qualitative studies, 28 were coded as data-based non-intervention studies and 21 were coded as data-based intervention studies.

The number of non-data based report papers has remained steady over the last 20 years with 1-4 papers published over each of the 4 time periods (1995-1999, 2000-2004, 2005-2009, 2010-2014). The number of review papers published was the greatest for the time period 2010-2014 with 6 papers. Data-based papers for non-intervention studies rose markedly between the time periods 2000-2004 and 2005-2009 and then declined for the next time period, 2010-14; whereas intervention based studies have shown a steady increase from 1995-1999 to 2010-2014 (Figure 4.1). Appendix 4.3 provides a list of all included studies.

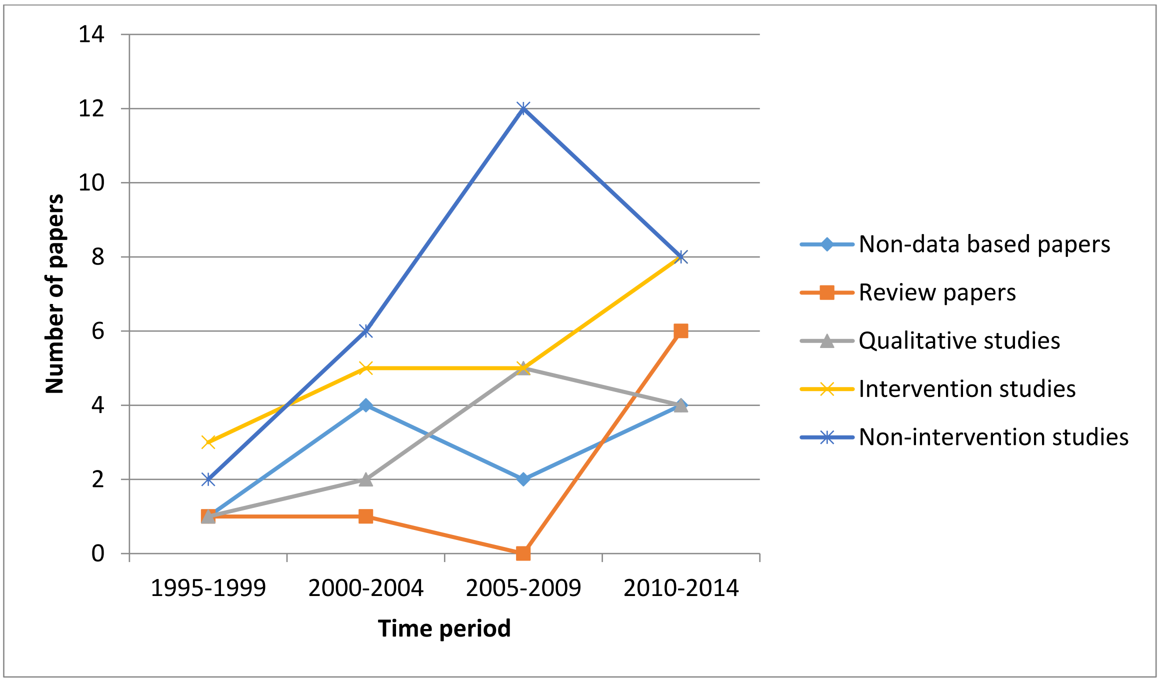

Figure 4.1: The number and type of studies published over the last 20 years over four time periods (1995-2014)

2. Methodological quality assessment

Results of the EPHPP assessment demonstrated that of the 49 non-intervention and intervention based studies, only 14 or 29% met the accepted methodological criteria for design quality. No studies were assessed as high quality. Thirty-five (71%) of the 50 included studies were assessed as weak quality. The main reason for a weak rating was related to data collection methods of patient adherence which affected the rating for the data collection methods. Lack of blinding in the RCTs was also a contributing factor to a weak rating as although a number of studies blinded the assessors, very few blinded the participants.

3. Types of measures used to assess patient adherence rates:

Forty-nine non-intervention and intervention based studies used some type of measure to assess patient adherence; of these, 22 of the included studies used a patient self-report diary / log, 22 studies used a self-administered survey or questionnaire, four used a patient face to face or telephone interview, five used an observational measure such as activity monitor or video cassette counter. Some studies used more than one measure of adherence and where this was the case, both measures were recorded.

Figure 4.2 summarises the measures used to assess patient adherence to physiotherapist prescribed self-management strategies in the data based intervention and non-intervention based studies, with patient self-report diaries/logs and survey/ questionnaires being the most commonly used measure of adherence, used in 85% of the included studies.

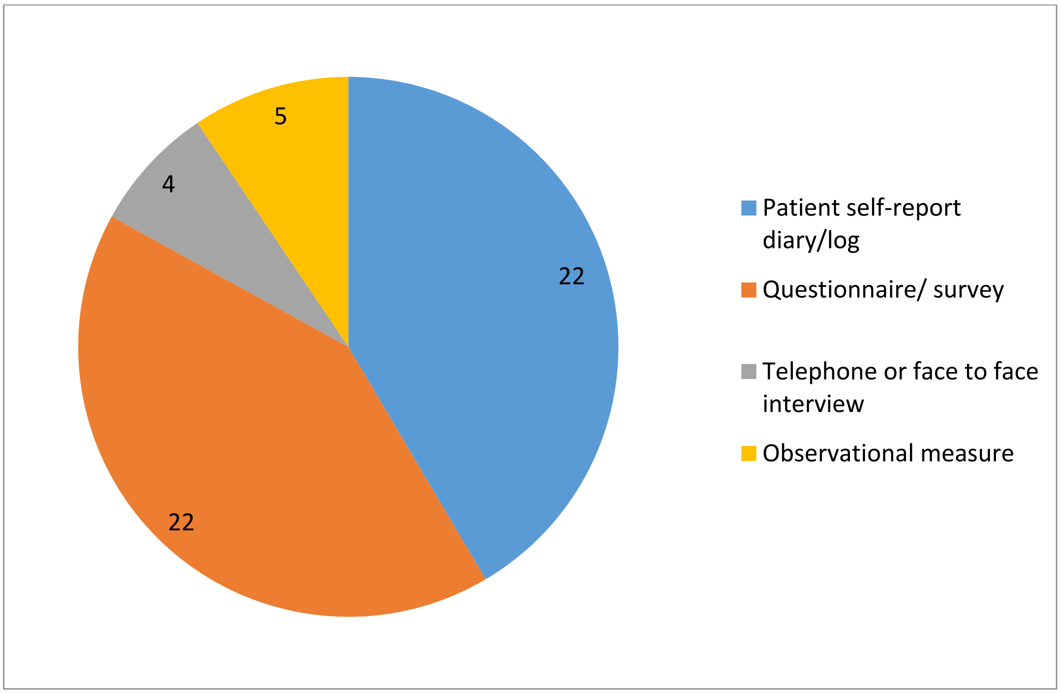

Figure 4.2: The types of adherence measure used in the non-intervention and intervention based studies (n=53)

a. Reported accuracy of the measures of patient adherence.

Of the 49 data based studies which measured patient adherence, 12 studies provided some evidence on the accuracy of the measure used with reporting of the degree of correlation across multiple measures. Table 4.1 provides a more detailed summary of results on the reported accuracy of the measures of patient adherence in these 12 studies. It can be seen that only five studies reported a statistically significant positive correlation between the multiple measures of patient adherence used in their studies to support the accuracy of their outcome measure.

Aside from these 12 studies, a number of other studies reported the use of adherence measures based on those developed by other research teams (20) or assessed correlations between adherence with other outcome measures such as intention to adhere (6). However, no adherence accuracy reporting was found for these measures in the included or referenced studies.

Table 4.1: Results on the reported accuracy of the measures of patient adherence used in the included non-intervention and intervention based studies.

Author and year	**Adherence measures used**	**Evidence to support accuracy of adherence measures**	**Results of accuracy of adherence measures**
Alewijnse et al., 2003a And Alewijnse et al., 2003b	7-day patient self-report diary; Patient self-report adherence questionnaire	Yes	These two studies based on the same measures reported the Spearman's rank correlation co-efficient between the self-report diary and an adherence questionnaire used in their studies on pelvic floor muscle exercise.
Brewer et al., 2004	Patient self-report; and Video counter	No	The Spearman's rank correlation co-efficient was used to compare the number of times a video was played (as recorded by a hidden video tape counter) with the patient self-report of adherence which found that the self-report was significantly greater.
Chen et al., 1999	Patient self-report of exercise adherence; and a) the patient recollection of the prescribed exercise program; and b) the physiotherapist's recorded exercise program prescription (patient chart)	No	The adherence rate for the patient self-report and patient recollection was 74% compared with 35% for patient self-report and physiotherapist recorded prescription. The correlation coefficient of these two adherence rates was 0.51. In general patients did not recall about 12% of the home exercises prescribed.

Evans and Hardy, 2002	Patient self-report exercise diary; and physiotherapist estimate of adherence	No	No statistical correlation between the measures of adherence. Results suggested that physiotherapist estimate of patient adherence was an inappropriate measure of patient adherence to exercise.
Goto et al., 2014	Activity monitor; and Physiotherapist prescription	No	Comparison data between measures not reported. Although the authors used an activity monitor, the monitor only collected data for physical activity; adherence to exercise was recorded using the number of times the patient inputted data into the monitor and it did not record any other objective data to compare this with.
Huang et al, 2014	iPod tracking system which directly recorded the number of times it was used for the prescribed exercises: and Physiotherapist prescription	Yes	The authors validated the sensor measurement of an iPod tracking system which recorded the number of exercises sessions completed by the patient and compared this to the physiotherapist prescription to provide a level of adherence.
Hunter et al., 2006	Patient self-report diary; and Activity monitor	No	The authors report that patients doing more than the prescribed amount of activity as adherent which leads to difficulty when interpreting the results for patient adherence.
Kolt and McEvoy, 2003	Home exercise compliance assessment (patient self-report); and Sports Injury Rehabilitation Scale (SIRAS) (physiotherapist	Yes	Authors report a significant correlation between a home exercise compliance assessment (using patient self-report) and SIRAS for patients with low back pain.

	rates the patient's adherence during rehabilitation sessions using a 5-point Likert-type scale)		
Schoo et al., 2005	Patient self-report log; and Physiotherapist report using correctness of exercise performance assessment	No	Comparison data between measures not reported. The authors collected data for correctness of exercise performance during assessment and self-report home exercise logs although no statistical correlation was reported between these two data sets.
Steele et al., 2008	Patient self-report measure; and an accelerometer	No	The authors suggest that patient self-report was subject to over-reporting in the intervention compared with accelerometer data although the study did have measurement issues with the accelerometer.
Taylor and May, 1996	Two compliance sheets as estimates of patient adherence to different facets of a home program for injured athletes: one completed by the physiotherapist; and, one completed by the patient	Yes, but only for rest prescription	On analysis the only significant correlations were physiotherapist and patient estimates of patient adherence to rest and not to the other facets of the program such as exercise.

Discussion

A comprehensive search of the literature revealed that 80 papers have been published on patient adherence to physiotherapist prescribed self-management strategies since 1995. An assessment of patient adherence during physiotherapy research is imperative because unless research includes an assessment of patient adherence then an accurate evaluation of treatment outcomes cannot be reported.

Although the majority of the 49 studies reporting new data had non-intervention study designs, it is encouraging to note that there was an increasing trend towards intervention studies and reviews published since 1995 given that the evidence hierarchy lists reviews and RCTs as the two highest levels of evidence (11). The increase in RCTs, in particular, suggests that progress is being made toward developing effective strategies to improve patient adherence (11). This finding is consistent with other studies which also found an improvement in the number of intervention studies being published in physiotherapy journals worldwide, even though non-intervention studies are still being published with the highest frequency (21, 22).

Qualitative research represented about 15% of the published studies included in this review. Although the methodological quality of this research was not assessed, qualitative studies contribute to physiotherapy research in four key areas; as standalone research; to inform future quantitative studies; to augment concurrent quantitative research; and to inform the use or development of outcome measures, and therefore their importance should not be overlooked (23).

The overall results of the quality assessment demonstrated that 71% of included studies were of weak quality. The quality of the studies was affected by the score for the data collection methods. This is consistent with a systematic review of measures of self-reported adherence to unsupervised home-exercise programs which found 58 studies reporting 61 different measures with only two measures scoring positively for content validity (24). A further systematic review concluded that measurement of adherence to self-management recommendations for chronic musculoskeletal conditions is currently performed on an ad hoc basis with a lack of homogeneity in measurement (2). The results of this review support the findings of both reviews (2, 24) that there is a gap in the literature for well-developed measures that capture adherence to self-management strategies including prescribed but unsupervised home-based exercises.

For intervention studies the quality rating was also affected by their scores for blinding. A study which reported on the quality of RCTs of physiotherapy interventions over time found that the prevalence of blinding of participants was 9% compared to only 2% of therapists but a more encouraging 33% of assessors (21). The authors do however report that the blinding of therapists and participants is not possible for most physiotherapy interventions involving engagement in exercise, education, rehabilitation and physical activity which is certainly supported by this review (21).

There are different sources of error that clinicians need to be aware of when interpreting studies using various measures of adherence. In this review, self-report diaries or questionnaires were the most commonly used measure of adherence, however, they are subject to problems of reporting bias, reporting errors or intentional manipulation by the patient most commonly in the form of over-estimation of adherence (25). Direct observation in the form of electronic recording devices, tally counters, and pedometers also have their own limitations, as the act of monitoring by external observers/devices may change adherence behaviour for the length of the monitoring process, but not long-term adherence attitudes and behaviours (25). In addition, electronic recording devices do have the potential to be unreliable due to wear and tear or not being used correctly leading to incomplete data and in many cases the patient also has to adhere to wearing them (24). In addition, objective measures may not always be possible or feasible in physiotherapy research. A multi-faceted approach to adherence assessment (a combination of measures across the spectrum of objective, prospective, clinician assessed through to patient self-report) may provide the most reliable measure of patient adherence (24).

The findings of this review suggest there is a large degree of heterogeneity in adherence measures applied in research studies, and there appears to be a gap in the research in measuring adherence in a rigorous and reproducible manner (2).

Strengths and limitations of this review.

The strength of this review is that it was inclusive of all physiotherapist prescribed self-management strategies, patient population and settings. This review was conducted in accordance with the PRISMA guidelines; however, it is possible that a number of factors may limit the findings. Unpublished studies and grey literature were not included which may have influenced the results. The authors defend this exclusion as studies which are unpublished or without peer review and are not easily accessible to physiotherapists offer questionable ability to inform practice. However, the possibility of publication bias cannot be excluded particularly as only studies published in English were included.

In addition, data were not extracted from the qualitative studies. Qualitative research aims to enrich understanding of human experience and the meaning of actions taken within social and cultural contexts (26). Contrary to the quantitative research which reported the specific measures of patient adherence, the qualitative studies reported the adherence experience. It was decided that this was outside of the aims of this review and would be better expressed in a separate paper.

Implications for practice.

In summary, physiotherapists should consider the issue of adherence when prescribing self-management strategies to their patients. This is particularly important prior to modifying treatment approaches under the assumption that the strategy is not effective when adherence to it may in fact be the issue. However, physiotherapists need to exercise a degree of caution when interpreting intervention outcomes of studies which do not provide a report on patient adherence or evidence to support the accuracy of the measure used.

Implications for research.

It should be a research priority to establish adherence measurement in physiotherapy research which has good accuracy. In addition, researchers need to consider methodological quality criteria when designing their research studies. Minimum standards for intervention studies should include random allocation, concealed allocation, blinding of assessors and use of intention to treat analysis (21).

Conclusion

There has been a trend towards intervention based studies and reviews over the last 20 years, however, the quality of this research still needs to improve based on the methodological assessment using the EPHPP tool. A range of different measures of patient adherence have been used in physiotherapy research, however accuracy of these measures is rarely reported. Accurate measurement of patient adherence is necessary for any research reporting on patient adherence and outcomes in relation to physiotherapist prescribed self-management strategies.

Key Points:

- There is an increasing trend towards publication of intervention studies and reviews focused on patient adherence to physiotherapist prescribed self-management strategies since 1995.
- Methodological quality criteria need to be considered when designing studies of patient adherence to physiotherapist prescribed self-management strategies to improve research quality and therefore, its ability to inform clinical practice.
- Patient adherence can be measured in many different ways, with patient self-report being the most common method used.
- There currently exists paucity in the reported accuracy of the measures used to assess patient adherence to physiotherapist prescribed self-management strategies.

Conflicts of interest

The authors declare that there are no conflicts of interest.

References:

1. Cooper K, Smith B, Hancock E. Patients' perceptions of self-management of chronic low back pain: evidence for enhancing patient education and support. Physiother. 2009;95:43-50.

2. Hall AM, Kamper SJ, Hernon M, Hughes K, Kelly G, Lonsdale C, et al. Measurement Tools for Adherence to Non-Pharmacologic Self-Management Treatment for Chronic Musculoskeletal Conditions: A Systematic Review. Arch Phys Med Rehabil. 2014;31;96(3):552-62.

3. World Health Organisation. Adherence to long-term therapies: evidence for action. WHO library. Switzerland2003.

4. Sluijs EM, Kok GJ, van der Zee J. Correlates of exercise compliance in physical therapy. Phys Ther. 1993;73(11):771-82.

5. Taylor AH, May S. Threat and coping appraisal as determinants of compliance with sports injury rehabilitation: An application of Protection Motivation Theory. J Sports Sci. 1996;14(6):471-82.

6. Bassett SF, Prapavessis H. A test of an adherence-enhancing adjunct to physiotherapy steeped in the protection motivation theory. Physiother Theory Pract. 2011;27(5):360-72.

7. Spetch LA, Kolt GS. Adherence to sport injury rehabilitation: implications for sports medicine providers and researchers. Phys Ther Sport. 2001;2(2):80-90.

8. Beinart NA, Goodchild CE, Weinman JA, Ayis S, Godfrey EL. Individual and intervention-related factors associated with adherence to home exercise in chronic low back pain: a systematic review. Spine J. 2013;13(12):1940-50.

9. Scurlock-Evans L, Upton P, Upton D. Evidence-based practice in physiotherapy: a systematic review of barriers, enablers and interventions. Physiother. 2014;100(3):208-19.

10. Herbert RD, Sherrington C, Maher C, Moseley AM. Evidence-based practice-imperfect but necessary. Physiother Theory Pract. 2001;17:201-11.

11. National Health & Medical Research Council. How to use the evidence: assessment and application of scientific evidence. In: National Health & Medical Research Council, editor. Canberra: Commonwealth of Australia Australian Government Publisher; 2000.

12. Sanson-Fisher R, Campbell E, Perkins J, Blunden S, Davies B. Indigenous health research:a critical review of outputs over time. The Medical journal of Australia. 2006;184:502-5.

13. Grimmer K, Bialocerkowski A, Kumar S, Milanese S. Implementing evidence in clinical practice: the 'therapies' dilemma. Physiother. 2005;90:198-4.

14. Joint Commitee for Guides in Metrology. International vocabulary of metrology- basic and general concepts and associated terms. 3rd ed. 2012.

15. Moher D, Liberati A, Tetzlaff J, Altman DG, Group P. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Med. 2009;6(7):e1000097.

16. Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gotzsche PC, Ioannidis JP, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. J Clin Epidemiol. 2009;62(10):e1-34.

17. Thomas BH, Ciliska D, Dobbins M, Micucci S. A process for systematically reviewing the literature: providing the research evidence for public health nursing interventions. Worldviews Evid Based Nurs. 2004;1(3):176-84.

18. Armijo-Olivo S, Stiles CR, Hagen NA, Biondo PD, Cummings GG. Assessment of study quality for systematic reviews: a comparison of the Cochrane Collaboration Risk of Bias Tool and the Effective Public Health Practice Project Quality Assessment Tool: methodological research. J Eval Clin Pract. 2012;18(1):12-8.

19. Sugavanam T, Mead G, Bulley C, Donaghy M, van Wijck F. The effects and experiences of goal setting in stroke rehabilitation - a systematic review. Disabil Rehabil. 2013;35(3):177-90.

20. White D, Stiller K, Haensel N. Adherence of adult cystic fibrosis patients with airway clearance and exercise regimens. J Cystic Fibrosis. 2007;6(3):163-70.

21. Moseley AM, Herbert RD, Maher CG, Sherrington C, Elkins MR. Reported quality of randomized controlled trials of physiotherapy interventions has improved over time. J Clin Epidem. 2011;64(6):594-601.

22. Paci M, Cigna C, Baccini M, Rinaldi LA. Types of article published in physiotherapy journals: a quantitative analysis. Physiother Res Int. 2009;14(4):203-12.

23. McPherson KM, Kayes NM. Qualitative research: its practical contribution to physiotherapy. Phys Ther Rev. 2012;17(6):382-9.

24. Bollen J, Dean S, Siegert R, Howe T, Goodwin V. A systematic review of measures of self-reported adherence to unsupervised home-based rehabilitation exercise programmes, and their psychometric properties. BMJ open. 2014;4.

25. Kettler LJ, Sawyer SM, Winefield HR, Greville HW. Determinants of adherence in adults with cystic fibrosis. Thorax. 2002;57(5):459-64.

26. Zitomer MR, Goodwin D. Gauging the quality of qualitative research in adapted physical activity. Adapt Phys Activ Q. 2014;31(3):193-218.

PAPER FIVE

Patient adherence to an exercise program for chronic low back pain measured by patient-report, physiotherapist perception and observational data

The findings of the critical review (paper four) concluded that adherence can be measured in many different ways with patient self-report being the most frequently used method. There are three main methods for measuring patient adherence which includes patient self-report (such as exercise logs or diaries, surveys and questionnaires), physiotherapist perceptions of patient adherence and the use of observational data (including patient demonstration). However, no published studies were located which compared these three measures of adherence, which means there is a paucity of data to indicate how these different methods for measuring adherence relate to each other in terms of results. This is an important gap to address particularly when selecting adherence measures for future research. Therefore, paper five was designed specifically to compare patient-reported levels of adherence with physiotherapists' perceptions of patient adherence; and to explore the proportion of patients who could recall and demonstrate accurately the exercises contained within their prescribed exercise program for chronic low back pain.

Due to strong evidence to support the effectiveness of home-based exercise in the treatment of chronic low back pain, exercise was chosen as the specific self-management strategy for this study.

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Patient adherence to an exercise program for chronic low back pain measured by patient-report, physiotherapist perception and observational data

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Patient adherence to an exercise program for chronic low back pain measured by patient-report, physiotherapist-perception and observational data

Abstract

Background Research supports the prescription of exercise programs for chronic low back pain (CLBP). However, program effectiveness is dependent upon patient adherence which is problematic to measure accurately.

Objectives To compare patient-reported adherence levels with physiotherapists' perceptions of patient adherence; and to explore the proportion of patients who could accurately recall and demonstrate the exercises contained within their prescribed exercise program for CLBP.

Design Cross-sectional observational study conducted within six Australian physiotherapy private practices.

Methods Participating patients (n=61) included those attending for a follow-up consultation with a physiotherapist (n=15) at a consenting practice (n=6) who had been prescribed an exercise program for CLBP. Patients were asked to self-report their level of adherence to the exercise program which was then compared to their physiotherapist's perception of adherence. Patients were also asked to recall *and* demonstrate the exercise program to an independent researcher, which was compared to the prescribed program.

Results In total, 24 patients (39%; 95% CI: 27-52%) self-reported as being completely adherent compared to 10 patients (16%; 95% CI: 8-28%) who were perceived by their physiotherapists as adherent. However, only nine patients (15%, 95% CI: 7-26%) were able to accurately recall and demonstrate their prescribed exercise program of which eight of these nine patients self-reported complete adherence to the exercise program; while four of the nine patients were perceived by the physiotherapist to be completely adherent.

Conclusion Adherence measures which are multi-faceted and include an observational component may assist in improving the measurement accuracy of patient adherence to home-based exercises.

Keywords: Patient compliance, exercise therapy, rehabilitation, back

Introduction

The benefits of therapeutic exercise can only be achieved when patients adhere to the prescribed program (1). Adherence can be defined as an active, voluntary, collaborative involvement of the patient in a mutually acceptable course of behaviour to produce a desired therapeutic result (2). It has been shown that patients who adhere to prescribed exercise achieve a greater increase in physical function compared with poor adherers (3).

No 'gold standard' currently exists to measure patient adherence to home-based exercise (4). A suggested strategy to accurately measure adherence is via a combination of measures across the spectrum of patient self-report, clinician assessed through to objective data (5).

Patient self-report is the most commonly reported measure of patient adherence within physiotherapy; which can include asking the patient whether they have completed their exercise program, the use of patient-administered exercise diaries and questionnaires (4). However, self-report measures are subject to reporting bias and/or errors or intentional manipulation by the patient, most frequently in the form of over-estimation of adherence (4, 6). Without a standardised self-report measure of exercise adherence, comparisons between studies is difficult (7). One study recently reported the development and psychometric evaluation of the Exercise Adherence Rating Scale (EARS) with encouraging results for internal consistency and test-retest reliability, which could be seen as an important step towards a standardised measure of patient-reported adherence (7). However, the EARS has the limitations of any patient-reported measure which includes social desirability and recall bias (7).

Another method physiotherapists may use is to make a judgement about the patient's level of adherence. This judgement may be based on their knowledge of the patient, questioning the patient regarding adherence directly or their perception of whether the patient's functional status is consistent with adherence. Physiotherapists interviewed during a qualitative study identified patient body language and other non-verbal cues as useful in identifying adherent patients and "with experience you get an idea of who is going to comply and who isn't" (p.383) (8). In addition, where patients may show a tendency towards over-estimating their level of adherence (4, 6) it has been suggested that physiotherapists may under-estimate their patients' adherence level (9). One study, which compared two measures of adherence, found that while 65% of patients self-reported as being adherent, physiotherapists perceived only 40% as adherent (9). A paucity of research exists utilising physiotherapist-perception as a measure of patient adherence to exercise.

Recommendations have been made to use patient adherence measures which include an observational component to increase measurement accuracy (4, 5). Observational measures used in physiotherapy research include the use of an iPod tracking system (10), accelerometer (11) and activity monitor (12). These measures have limited functionality for assessing adherence to home-based exercise programs because they assess activity or movement not the specific technique or performance of individual exercises. The Correctness of Exercise Performance (COEP) scale (13, 14) and the Sport Injury Rehabilitation Adherence Scale (SIRAS)(15) are both tools used to assess in-clinic adherence as a potential marker for home-exercise adherence. However, neither the COEP nor the SIRAS take into account specific exercise instructions in terms of dosage (number of sets or repetitions) which is also a component of adherence.

Few studies have compared patient adherence measures in physiotherapy; of 49 data-based studies that measured adherence, only 12 studies reported the degree of correlation between multiple measures (4). This included a comparison between patient self-report (via weekly exercise logs) and physiotherapist judgement of the patient's level of adherence during an exercise session using the SIRAS (16). Relatively high concordance between physiotherapist assessment of initial exercise adherence and patient self-report has been reported(9). Where there was discordance, the patients reported being more adherent than the level perceived by the physiotherapist (17).

Two studies which compared patient self-report measures with observational data for exercise and physical activity included a hidden video counter which counted the number of times an exercise video was played (18) and an accelerometer (11). Both studies reported data collected from self-report was greater than the observational measure suggestive of patient overestimation of adherence. No studies were located comparing physiotherapist-perception of patient adherence to an observational measure.

While exercise is prescribed for a multitude of conditions seen regularly in physiotherapy practice, the evidence for its effectiveness is particularly strong for patients with chronic low back pain (CLBP) (19-21); which is defined by a symptom duration of more than 12 weeks (22, 23). Therefore, the focus of this study was on patients receiving physiotherapy for CLBP. The objectives of this study were to:

1) Compare patient self-reported adherence levels with physiotherapists' perceptions of patient adherence; and

2) Explore the proportion of patients who could both recall and demonstrate accurately the exercises contained within their prescribed exercise program.

Methods

Design and Setting

Cross-sectional observational study was conducted within six physiotherapy private practices in two Australian states (South Australia and New South Wales). This study is reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines (24). Ethics approval for this research project was granted through the Human Research Ethics Committee, University of Newcastle (Australia); reference number H-2015-0064.

Recruitment of practices and physiotherapists

The Australian Physiotherapy Association 'find a physio' web link (available at: http://www.physiotherapy.asn.au/apawcm/controls/findaphysio.aspx) was used to locate physiotherapists practicing within 50km of two major Australian cities. Physiotherapists were eligible to participate if they worked clinically in private practice and treated adult patients with CLBP. Physiotherapists were sent an invitation email outlining the study aims and participation requirements as well as contact details for the research team. Physiotherapists who indicated their willingness to participate were visited by an experienced physiotherapist member of the research team. During this face-to-face meeting, additional physiotherapists who worked within the same practice were invited to participate. Written consent was obtained from both physiotherapists and practice owners prior to data collection.

Patient eligibility and recruitment

Patient participants comprised of a consecutive sample of patients attending for a follow-up physiotherapy consultation with an eligible physiotherapist at a consenting practice. Eligible patients were aged 18 years and older and were currently receiving physiotherapy for CLBP (this was defined as any patient who had pain originating from the lumbar spine for more than 12 weeks duration or, a recurrence of a previous lumbar spine complaint). Participating physiotherapists used their booking system to identify eligible patients at the start of each day. The practice receptionist introduced these patients to the research physiotherapist to discuss participation and obtain consent immediately prior to their scheduled physiotherapy consultation.

Data Collection

Data were collected between June and December 2015.

Patients: Immediately after providing informed consent and before attending their follow-up consultation, participating patients completed a face-to-face interview with a research physiotherapist. In this interview patients were asked questions related to the exercise program for CLBP prescribed to them by their physiotherapist at a previous consultation. The research physiotherapist was unaware of the details of the exercise program at the time of the interview.

Physiotherapists: Within 24 hours of each participating patient attending their follow-up consultation, physiotherapists were asked to complete a patient-specific survey. Physiotherapists could consult their patient records when completing this survey. Physiotherapists also completed a single self-reported demographic survey.

Data collected from patients and patient-specific data collected from physiotherapists were linked to enable comparison of data collected from these two sources.

Measures:

Physiotherapist demographics: Physiotherapist demographics included questions regarding gender, age, location of practice, mean number of hours worked per week, country in which they gained their physiotherapy qualification and possession of any post-graduate physiotherapy qualifications.

Patient demographics: Patient demographics related to gender, age and how their current physiotherapy treatment was being funded.

Therapy-related measures:

For each patient, physiotherapists reported: 1) the number of times that this patient had attended for a physiotherapy consultation for the same back injury prior to this consultation (open ended); 2) how many consultations *and* days ago that this patient was given this exercise program (open ended); 3) the total number of individual exercises contained within the exercise program (open ended).

For each exercise contained within the prescribed exercise program, physiotherapists were asked to report 1) the essential components of each exercise; 2) the number of sessions the patient was asked to complete the exercise per day/ week; and 3) the number of repetitions prescribed per session. Essential components of each exercise included the patient starting position (e.g. prone, hands placed under shoulders), main action (e.g. elbow and lumbar spine extension) and finishing position (e.g. chest raised from the ground, hands and pelvis remain in contact with the ground). Physiotherapists were asked to attach an exact copy of the exercise program if one was available.

Adherence-related measures:

<u>*Physiotherapist-perceived patient adherence:*</u> Physiotherapists were asked about their perceptions of the level of each patient's adherence to their prescribed exercise program for CLBP over the seven days prior to the patient's attendance at this follow up consultation (response options: all (100%); most (> 50%); some (<49%); none (0%).

<u>*Patient self-reported level of adherence:*</u> Patients who responded that they had been given an exercise program for CLBP by their physiotherapist at an earlier consultation were asked their level of adherence to this exercise program over the seven days prior to their attendance at this follow up consultation (response options: completely adherent (100%); most (> 50%); some (<49%); none (0%). This scale has been used in earlier research [29]. The adherence scale used was the same for both physiotherapist-perceived patient adherence and patient-reported adherence to allow for comparison of data.

<u>*Patient ability to recall and demonstrate exercise program*</u>: Patients were asked to report 1) the number of exercises contained within the prescribed program; 2) the name of each exercise contained within the program; 3) the number of sessions the patient was asked to complete their exercise program per day/ week; and 4) the number of

repetitions of each exercise prescribed per session. Patients were then asked if any of these exercises caused them pain or discomfort when completing at home. If the patient responded 'yes' then the patient was asked to describe the essential components of each exercise to the research physiotherapist; otherwise patients were asked to provide an active demonstration of each exercise.

Pilot testing of the patient interview and exercise demonstration data collection sheet was undertaken using five mock clinical role plays. During each role play a patient model (who was supplied with and given time to rehearse their response options to the interview questions and exercise program demonstration) was interviewed by the research physiotherapist and then asked to demonstrate one each of their exercises. Each role play was video recorded and the data collected by the research physiotherapist during the role play was compared to data collected by a second experienced physiotherapist using the video recordings (inter-rater reliability was substantial; Kappa = 0.80) (25).

Data Analysis

Data analysis was conducted using Stata 14 ®(USA).

Demographic data: Physiotherapist and patient demographics were described using mean, median, range and percentages. Physiotherapist participant characteristics were compared with Australian physiotherapist workforce characteristics using the one-sample Pearson chi square test.

Adherence-related data: Physiotherapist-perceptions of patient's level of adherence and patient-reported level of adherence were described using frequency and percentages with 95% confidence intervals (CIs). Raw agreement of physiotherapist perceived and patient self-reported adherence (i.e. the number of times that the physiotherapist perception of patient adherence agreed with the patient self-reported level of adherence) was calculated. For a standard 4 x 4 table, raw agreement is the sum of frequencies of the main diagonal of table divided by sample size (26). The authors chose to present raw agreement instead of the kappa statistic due to potential errors in interpretation of data derived from small sample sizes using kappa, whereas raw agreement is easily calculated and directly interpretable with its use supported in earlier research (27).

Therapy-related data: The physiotherapist-reported details of the exercise program prescribed to each patient was considered the "gold standard". These data were compared to patient-reported data on the number and type of exercises, frequency of exercise sessions and number of repetitions. Similarly, physiotherapist-reported data on the essential components of each prescribed exercise were compared to those demonstrated by the patient during the interview. Patients able to accurately recall the exercise program specifics (including number of exercises, exercise frequency and number of repetitions) *and* demonstrate the entire exercise program, were reported using frequencies, percentages and 95% CIs.

Results:

Participants:

Physiotherapists: Fifteen physiotherapists from six private practices (two in South Australia and four in New South Wales, Australia) consented to participate, Table 5.1. The characteristics of physiotherapists who participated in our study were similar to Australian physiotherapist workforce characteristics (27). This includes the mean age (34 years; range 25-66; p=0.64) and gender (47% male; p=0.15) of participating physiotherapists.

Table 5.1: Comparison of sociodemographic characteristics of physiotherapist participants to Australian workforce datasets.

Physiotherapist characteristic	**Study participants (n = 15)**	**Australian workforce data (28)**	***p*-value**
	Mean		
Hours worked per week	34 (range 20-40)	34	1.00
	n; %		
Physiotherapy qualification gained in Australia	13; 86%	85%	0.94
Post-graduate physiotherapy qualification	3; 20%	22%	0.76

Patients: Of 65 patients screened for eligibility, 64 were eligible and 61 consented to participate (consent rate 95%). All 61 participating patients responded that they had been provided with an exercise program for CLBP at an earlier consultation and therefore, completed the face-to-face interview. Data from these 61 patients are included in all analyses. Participating patients ranged in age from 20-98 years (mean 58 years; median 46 years) with 64% (n=39) being male.

Therapy service characteristics can be seen in Table 5.2.

Table 5.2: Therapy service characteristics and data source (n=61)

Therapy service characteristic	**Mean; median; range**	**Data source**
Number of physiotherapy consultations attended for current episode of CLBP	7; 4; 1-40	Physiotherapist survey
Number of consultations since receiving current exercise program for CLBP	4; 3; 1-25	Physiotherapist survey
Number of days since receiving current exercise program for CLBP	27; 14; 2-113	Physiotherapist survey
Number of individual exercises contained within current exercise program for CLBP	4; 3; 1-10	Physiotherapist survey
	n (%)	
Physiotherapy funding		Patient survey
• WorkCover	20; 32%	
• Private health insurance	26; 43%	
• Other	15; 28%	

Comparison of physiotherapist-perceived and patient self-reported levels of adherence to prescribed exercise program

Of the 61 patients included in this study, physiotherapists perceived that 10 patients (16%; 95% CI: 8-28%) were completely adherent ('all') to their exercise program. In comparison, 24 patients (39%; 95% CI: 27-52%) self-reported as being completely adherent ('all'), see Table 5.3. Raw agreement between physiotherapist-perceptions and patient self-report was 0.21.

Table 5.3: Comparison of physiotherapist-perceived and patient self-reported level of adherence to prescribed exercise program (n=61)

	Physiotherapist-perceived level of patient adherence				
Patient self-reported level of adherence	All	Most	Some	None	Total
All	**4**	8	11	1	24
Most	2	**7**	2	0	11
Some	3	13	**2**	2	20
None	1	2	3	**0**	6
Total	10	30	18	3	61

Proportion of patients who could accurately recall and demonstrate all of the exercise program.

Overall, nine patients (15%, 95% CI: 7-26%) were able to both recall all of the exercises contained within their program and demonstrate these accurately.

Of the 10 patients who were perceived by their physiotherapist as being adherent to 'all' of the exercise program (Table 3), only four (40%, 95% CI: 12-73%) patients were able to accurately recall all of the specifics of the exercise program (number, name, frequency and repetitions) and demonstrate all of the program exercises. The remaining five patients who were able to accurately recall and demonstrate their exercise program were perceived by their physiotherapist as being adherent to 'most' (n=2), 'some' (n=2) or 'none' (n=1) of their exercise program.

Of the 24 patients who self-reported as being adherent to 'all' of their exercise program (Table 3), eight (33%, 95% CI 15-55%) were able to accurately recall all of the specifics of the exercise program (number, name, frequency and repetitions) and demonstrate all of the program exercises. The remaining patient who was able to both recall and demonstrate their exercise program self-reported as adhering to 'most' of their exercise program.

Discussion

The proportion of patients who self-reported as being completely adherent in our study (39%) is consistent with the percentage reported in an earlier USA-based study (35%) related to exercise for participants with CLBP (29). However, in this earlier study, patients were considered adherent if they completed 80% of their home exercise program, therefore, the actual number of completely (100%) adherent patients could have been much lower. Low rates of self-reported exercise adherence have also been reported with different patient populations including acute low back pain (39%)(30), cystic fibrosis (41%)(31) and following shoulder surgery (25-36%) (32).

Specific data relating to physiotherapist-perception of exercise adherence for patients with CLBP is difficult to locate. A recent survey of 298 Australian private practice physiotherapists found that physiotherapists perceived that, on average, seven of the previous 10 patients to whom they had prescribed an exercise program had adhered (33). Another study identified that physiotherapists perceived only 40% of their patients as being adherent to an exercise-based falls prevention program (8). These rates are substantially higher that the physiotherapist-perceived rate (16%) in our study, which may be related to methodological and patient population differences. For example, in our sample the physiotherapist was rating an individual patient who was well known to them; while previous studies reported on physiotherapists' general perceptions of adherence rates. The definition of adherence varies between studies (i.e. binary 'yes/no' versus a four-point scale 'all; most; some; none'). Regardless of the study methods, it is discouraging to note that patient adherence is perceived by physiotherapists as being sub-optimal (33) which has implications for the clinical effectiveness of any exercise program.

There was poor agreement between patient self-report and physiotherapist- perceived levels (all, most, some, none) of patient adherence. Thirty-nine percent of patients self-reported as adhering to 'all' of their exercise program compared to 16% perceived by their physiotherapist. Concordance between patient-reported and physiotherapist-perceived adherence level only occurred in 21% of cases. This is much lower than the 75% agreement between physiotherapists and patients with knee osteoarthritis in an earlier study (9). This earlier study involved qualitative interviews with a small sample of patients (n=20) nested within a larger randomised controlled trial (9). The level of agreement was reported for initial patient adherence during the intervention phase of the study which may account for the higher level of concordance (9); particularly as concordance between physiotherapist perception and patient self-report did decrease to 20% at three months post-intervention (9).

When comparing patient self-report with the observational component, 39% of patients self-reported as being completely adherent to the exercise program compared to only 15% who were able to accurately recall and demonstrate their exercise program. Physiotherapists, on the other hand, perceived that 16% of patients were adherent which is much closer to the 15% who were considered adherent based on the observational data.

Examination of the data reveals that only eight (33%) patients who self-reported as being adherent and four (40%) patients who were perceived by their physiotherapist as being completely adherent were able to accurately recall and demonstrate their exercise program. Our findings suggest that concordance between patient adherence levels, measured using i) patient-report, or ii) physiotherapist perceptions, and the observational component were equally low. The authors are not aware of any past studies that have compared physiotherapist perceptions of adherence with observational data. Low levels of concordance between patient-report and an observational measure has also been reported in earlier research related to physical activity where data collected from patient self-report was greater than data collected via an observational measure (11, 18). Considering the complexity of measuring patient adherence to exercise, it is perhaps prudent to consider the development of adherence measures which are multi-dimensional.

Implications for measurement of adherence

The level of patient adherence to exercise prescriptions for CLBP varied from 15-39% depending on the method of assessment used. Although the observational measure was the most conservative of the measures, one patient in our study was able to accurately demonstrate and recall the specifics of their exercise program, but self-reported as being partially adherent (completing 'most' of their exercise program). Therefore, no single type of measure is able to capture all of the information needed to accurately assess patient adherence to home-based exercise programs. Physiotherapist perception and patient self-report may be able to capture views on adherence to the dose of the exercise program, but cannot accurately capture technique. Demonstration can assess technique but doesn't tell you if the patient has done the exercise the same number of times as prescribed. Therefore, our findings support earlier research that the measurement of patient adherence should be multi-faceted and include both self-report and an observational component (4, 6).

In addition, asking the patient to report what they are doing at home (in terms of exercise frequency and number of repetitions) as well as seeking a demonstration of each exercise can provide an ideal opportunity for the physiotherapist to correct or re-inforce the patient's exercise program and emphasise the importance of adherence related to treatment outcomes.

Limitations

A limitation of this study is the small sample size and wide confidence intervals which means that results should be interpreted with caution. The low number of patients able to correctly report the number of individual exercises contained within the prescribed exercise program may reflect a limitation of the structure of the patient interview used in our study, where patients were asked to report the number of exercises prescribed "at an earlier consultation" and have simply merged a series of programs together. Although the reasons for patients over- or under-reporting the number of exercises was not investigated, physiotherapists should be encouraged to communicate clearly with their patients each time that a change is made to their home program, so that patients are made aware which of the earlier prescribed exercises they can discontinue.

Conclusion

Due to the lack of a 'gold standard' for measuring patient adherence to home-based, unsupervised exercises, and the reported poor agreement between patient and physiotherapist self-reported measures, clinicians and researchers should consider using multi-faceted measures of adherence which incorporate an observational component similar to that described in this study. These measures have the potential to increase patient adherence measurement accuracy. The challenge now is to design and empirically test such a measure.

Highlights

- Patient adherence to exercise programs for CLBP is low irrespective of measure used
- Exercise non-adherence can negatively impact on patient outcomes
- Need to develop an accurate, robust, multifaceted measure of adherence

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Conflict of Interest

None declared.

References

1. Schneiders AG ZM, Singer KP. Exercise therapy compliance in acute low back pain patients. Manual Therapy. 1998;3(3):147-52.

2. Meichenbaum D, Turk, DC, editor. Treatment adherence: terminology, incidence and conceptualisation. In: Facilitating treatment adherence. New York: Plenium Press; 1987.

3. Bennell K. Neuromuscular training reduces the risk of leg injuries in female floorball players. J Physiother. 2008;54(4):282-.

4. Peek K, Sanson-Fisher R, Mackenzie L, Carey M. Patient adherence to physiotherapist prescribed self-management strategies: A critical review. Int J Ther Rehabil. 2015;22(11):535-43.

5. Bollen J, Dean S, Siegert R, Howe T, Goodwin V. A systematic review of measures of self-reported adherence to unsupervised home-based rehabilitation exercise programmes, and their psychometric properties. BMJ open. 2014;4.

6. Kettler LJ, Sawyer SM, Winefield HR, Greville HW. Determinants of adherence in adults with cystic fibrosis. Thorax. 2002;57(5):459-64.

7. Newman-Beinart NA, Norton S, Dowling D, Gavriloff D, Vari C, Weinman JA, et al. The development and initial psychometric evaluation of a measure assessing adherence to prescribed exercise: the Exercise Adherence Rating Scale (EARS), In Press. available at: http://dx.doi.org/10.1016/j.physio.2016.11.001. Physiother. 2016. .

8. Robinson L, Newton JL, Jones D, Dawson P. Self-management and adherence with exercise-based falls prevention programmes: a qualitative study to explore the views and experiences of older people and physiotherapists. Disabil Rehabil. 2014;36(5):379-86.

9. Campbell R, Evans M, Tucker M, Quilty B, Dieppe P, Donovan JL. Why don't patients do their exercises? Understanding non-compliance with physiotherapy in patients with osteoarthritis of the knee. J Epidemiol Comm Health. 2001;55(2):132-8.

10. Huang K, Sparto PJ, Kiesler S, Siewiorek DP, Smailagic A. iPod-based in-home system for monitoring gaze-stabilization exercise compliance of individuals with vestibular hypofunction. J Neuro Eng Rehabil. 2014;11(1):69.

11. Steele BG, Belza B, Cain KC, Coppersmith J, Lakshminarayan S, Howard J, et al. A Randomized Clinical Trial of an Activity and Exercise Adherence Intervention in Chronic Pulmonary Disease. Arch Phys Med Rehabil. 2008;89(3):404-12.

12. Hunter J, Singh SJ, Morgan MDL. Objective monitoring of adherence with home exercise training during pulmonary rehabilitation for chronic obstructive pulmonary disease. Physiother. 2006;92(1):50-4.

13. Friedrich M, Cermak T, Maderbacher P. The effect of brochure use versus therapist teaching on patients performing therapeutic exercise and on changes in impairment status. Phys Ther. 1996;76(10):1082-8.

14. Schoo AMM, Morris ME, Bui QM. The effects of mode of exercise instruction on compliance with a home exercise program in older adults with osteoarthritis. J Physiother. 2005;91(2):79-86.

15. Kolt GS, Brewer BW, Pizzari T, Schoo AM, Garrett N. The Sport Injury Rehabilitation Adherence Scale: a reliable scale for use in clinical physiotherapy. Physiother. 2007;93(1):17-22.

16. Kolt GS, McEvoy JF. Adherence to rehabilitation in patients with low back pain. Man Ther. 2003;8(2):110-6.

17. Baker MK, Kennedy DJ, Bohle PL, Campbell DS, Knapman L, Grady J, et al. Efficacy and feasibility of a novel tri-modal robust exercise prescription in a retirement community: a randomized, controlled trial. J Am Geriatr Soc 2007;55(1):1-10.

18. Brewer BW, Cornelius AE, Raalte JLV, Brickner JC, Sklar JH, Corsetti JR, et al. Rehabilitation adherence and anterior cruciate ligament reconstruction outcome. Psych, Health & Med. 2004;9(2):163-75.

19. Searle A, Spink M, Ho A, Chuter V. Exercise interventions for the treatment of chronic low back pain: a systematic review and meta-analysis of randomised controlled trials. Clin Rehabil. 2015;29(12):1155-67 13p.

20. Hayden JA, van Tulder MW, Malmivaara A, Koes BW. Exercise therapy for treatment of non-specific low back pain. Cochrane Database Syst Rev. 2005(3):CD000335.

21. Smidt N, de Vet HC, Bouter LM, Dekker J, Arendzen JH, de Bie RA, et al. Effectiveness of exercise therapy: a best-evidence summary of systematic reviews. Aust J Physiother. 2005;51(2):71-85.

22. Vos T, Barber RM, Bell B, Bertozzi-Villa A, Biryukov S, Bolliger I, et al. Global, regional, and national incidence, prevalence, and years lived with disability for

301 acute and chronic diseases and injuries in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet. 2015;386(9995):743-800.

23. Liddle SD, Baxter GD, Gracey JH. Exercise and chronic low back pain: what works? Pain. 2004;107(1-2):176-90.

24. Vandenbroucke JP, von Elm E, Altman DG, Gotzsche PC, Mulrow CD, Pocock SJ, et al. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE): explanation and elaboration. Epidemiol. 2007;18(6):805-35.

25. Sim J, Wright CC. The kappa statistic in reliability studies: use, interpretation, and sample size requirements. Phys Ther. 2005;85(3):257-68.

26. Uebersax. J. Raw agreement indices 2014 [25th October 2016]. Available from: http://www.john-uebersax.com/stat/raw.htm.

27. McHugh ML. Interrater reliability: the kappa statistic. Biochemia Medica. 2012;22(3):276-82.

28. Health Workforce Australia. Australia's Health Workforce Series – Physiotherapists in Focus. Adelaide, Australia: Health Workforce Australia; 2014.

29. Alexandre NM, Nordin M, Hiebert R, Campello M. Predictors of compliance with short-term treatment among patients with back pain. Rev Panam Salud Publica. 2002;12(2):86-94.

30. Schneiders A, Zusman, M, Singer, K. Exercise therapy compliance in acute low back pain patients. Man Ther. 1998;3(3):147-52.

31. White D, Stiller K, Haensel N. Adherence of adult cystic fibrosis patients with airway clearance and exercise regimens. J Cystic Fibrosis. 2007;6(3):163-70.

32. Roddey TS, Olson SL, Gartsman GM, Hanten WP, Cook KF. A randomized controlled trial comparing 2 instructional approaches to home exercise instruction following arthroscopic full-thickness rotator cuff repair surgery. J Ortho Sport Phys Ther. 2002;32(11):548-59.

33. Peek K, Carey M, Sanson-Fisher R, Mackenzie L. Physiotherapists' perceptions of patient adherence to prescribed self- management strategies: A cross-sectional survey of Australian physiotherapists. Disabil Rehabil. 2016 available at: http://dx.doi.org/10.1080/09638288.2016.1212281.

PAPER SIX

Interventions to aid patient adherence to physiotherapist prescribed self-management strategies: A systematic review

Physiotherapists who responded to the cross-sectional survey in paper one perceived that patient adherence could be positively influenced by individualising the strategy to the patient, through education and the use of supplementary written information. Results of the descriptive study (paper three) indicated that high levels of patient adherence to physiotherapist-prescribed self-management strategies are associated with the provision of supplementary printed information and confirming patient understanding by asking the patient to repeat back to the physiotherapist details of the self-management plan. However, as paper three utilised a descriptive study design, only correlational data was provided which cannot infer causation. Therefore, paper six was designed as a systematic review to investigate the evidence produced from intervention-based research in support of the effectiveness of interventions used by physiotherapists to aid patient adherence to all prescribed self-management strategies. Systematic reviews are considered the 'gold standard' in medical intervention evidence synthesis. Paper six used a clear and replicable method to systematically search, appraise and review the literature on adherence aiding interventions used in physiotherapy self-management.

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Interventions to aid patient adherence to physiotherapist prescribed self-management strategies: A systematic review

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Interventions to aid patient adherence to physiotherapist prescribed self-management strategies: A systematic review

Abstract

Background: Physiotherapist prescribed self-management strategies are an important adjunct to 'hands on' treatment. However, treatment outcomes are likely to be related to whether patients adhere to the prescribed strategy. Therefore, physiotherapists should be aware of adherence aiding interventions designed to maximise patient outcomes underpinned by quality research studies.

Objective: To conduct a systematic review of the interventions used to aid patient adherence to all physiotherapist prescribed self-management strategies.

Data sources: The search included the databases CINAHL, EMBASE, MEDLINE, PUBMED, PSYCINFO, SPORTSDiscus, the Cochrane Central Register of Controlled Trials, PEDro and Mednar for randomised controlled trials (RCTs) published in a peer reviewed journal from inception to November 2014.

Data extraction and synthesis: Data was extracted using a standardised form from 12 included RCTs for patient adherence rates to self-management strategies for interventions used to aid patient adherence and usual care. Two independent reviewers conducted methodological quality assessment.

Results: Twelve different interventions to aid patient adherence to exercise were recorded from 12 fair to high quality RCTs. Potential adherence aiding interventions include an activity monitor and feedback system, written exercise instructions, behavioural exercise program with booster sessions and goal setting.

Conclusion and implications of key findings: Despite a number of studies demonstrating interventions to positively influence patient adherence to exercise, there is insufficient data to endorse their use in clinical practice. No RCTs examining adherence aiding strategies to self-management strategies other than exercise were identified, indicating a significant gap in the literature.

Keywords: Patient adherence, self-management, physiotherapist, review, exercise,

PROSPERO reference no: CRD42015014516

Background:

Physiotherapy is a profession integral to health promotion, illness and injury prevention, acute care, rehabilitation and self-management and as such, it is an essential component of a holistic healthcare system (1, 2). Self-management can be defined as the management of the day-to-day impact of a condition, which is often a lifelong task (3). Effective self-management is often dependent on the collaboration between the patient and physiotherapist. It is this collaborative approach that helps the patient to acquire the skills and confidence to manage their condition; provides self-management strategies and allows for routine assessment of problems and accomplishments (3). Self-management strategies form an important part of physiotherapy treatment plans because patients will spend more time away from the physiotherapist than receiving clinic or hospital based care.

There are a range of self-management strategies that physiotherapists recommend to their patients. Advice ranked as the most commonly provided supplement to clinic-based treatment provided to patients with chronic low back pain by physiotherapists (4). Knee and elbow braces, taping and orthotics are also commonly prescribed by physiotherapists (5, 6). Despite this diversity of self-management strategies, past research on physiotherapist prescribed self-management strategies has tended to focus on exercise.

Adherence has been defined as "the extent to which a person's behaviour… corresponds with agreed recommendations from a healthcare provider" (p.13) (7). Poor treatment adherence is a problem across a number of healthcare disciplines including physiotherapy (8). Although adherence to physiotherapist-prescribed exercise programs has been shown to be an important predictor of treatment outcome (9, 10), 50-70% of patients are either non-adherent or only partially adherent to their home physiotherapy programmes (10, 11). Patient adherence assumes importance in physiotherapy because it may bring about potential savings in treatment costs, and avoidable morbidity (12).

Education, effective communication, patient-therapist rapport, social support and encouragement, goal setting, treatment efficacy and tailoring have all been shown to have an impact on patient adherence rates (13). A number of systematic reviews have assessed strategies for improving patient adherence with exercise for musculoskeletal conditions (8, 14, 15). However, it is important to ascertain whether adherence aiding interventions can positively impact on patient adherence to a range of self-management strategies (including but not limited to exercise) and for a range of patient conditions.

Objectives:

The objectives of this systematic review are to examine the effectiveness of interventions used to aid patient adherence to all physiotherapist prescribed self-management strategies.

Method:

This review followed a systematic review protocol (PROSPERO reference no: CRD42015014516). The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were used as a reference for the design and reporting of this review (16, 17).

Eligibility criteria

Papers were assessed for relevance according to the following criteria:

- **Types of participants;** included adult patient population who were prescribed a self-management strategy by a physiotherapist to perform independently, away from the physiotherapy clinic or other supervised environment. Studies using preventative strategies, paediatric or healthy participants were excluded.
- **Types of interventions;** included any intervention implemented within the RCT to aid patient adherence to a physiotherapist prescribed self-management strategy such as goal setting, supplemented education material and motivational program.
- **Types of control;** this included usual care; in other words a physiotherapist prescribed self-management strategy without an adherence aiding intervention.
- **Types of outcomes;** the main outcome of interest was a comparison of the reported rate of patient adherence to physiotherapist prescribed self-management strategies for adherence aiding interventions and usual care.
- **Types of studies;** only RCTs or Quasi- RCTs published in English which met pre-determined methodological criteria for design quality were included in this review.

Information sources and search criteria

A systematic search strategy was utilised for this systematic review. The initial search included the databases CINAHL, EMBASE, MEDLINE, PUBMED, PSYCINFO, SPORTSDiscus, the Cochrane Central Register of Controlled Trials and PEDro. The search for unpublished or grey literature was conducted using Mednar. Databases were searched for full texts from inception to November 2014. Initial key words used were 'physiotherapy' 'patient adherence' ‘self-management' ‘compliance’ with additional terms: “physical therapy’, ‘physical activity‘, ’exercise’, ‘tape’, ‘advice’, ‘brace’, ‘splint’ .

This was followed by an analysis of the text words contained within the title and abstract, and of the index terms used to describe the study.

A second search using all identified keywords and indexed terms was then commenced across all included databases. The third step included hand searching and screening of the included studies for any additional studies.

Study selection and data extraction

The first author scanned titles and abstracts based on the pre-specified inclusion criteria. A second reviewer independently assessed a random sample of 15% of the identified abstracts. Full texts were assessed independently by the first author and a second reviewer. Kappa was computed to determine inter-rater reliability of study selection. A Kappa of 0.78 indicated a substantial level of agreement. A third reviewer was available to consult if there were any discrepancies.

The first author undertook all the data extraction using a standardized data extraction form. The data extraction form extracted data on study (author, year), participants (population group), self-management strategy, adherence aiding intervention and control, results and author conclusions.

Methodological Quality Assessment

The quality assessment scale developed by the Physiotherapy Evidence Database (PEDro) was used to assess the methodological quality of the RCTs and quasi RCTs included in this systematic review. The PEDro scale uses the following criteria, a) eligibility criteria, b) random allocation, c) concealed allocation, d) baseline comparability, e) blinding of subjects, f) blinding of therapists, g) blinding of assessors, h) adequate follow-up, i) intention-to-treat analysis, j) between -group comparisons, k) point estimates and variability. The methodological quality of the studies was tabulated and given a rating of high (eight or more), moderate (six or more), fair (four or more) and low (three or less) using the overall PEDro score. Studies were required to receive a rating of fair or above (four or more out of ten) to be considered as having met accepted methodological criteria for design quality and therefore included in this review. Methodological quality for the included RCTs was conducted independently by two reviewers, and any disagreements were discussed and resolved without the need for a third reviewer.

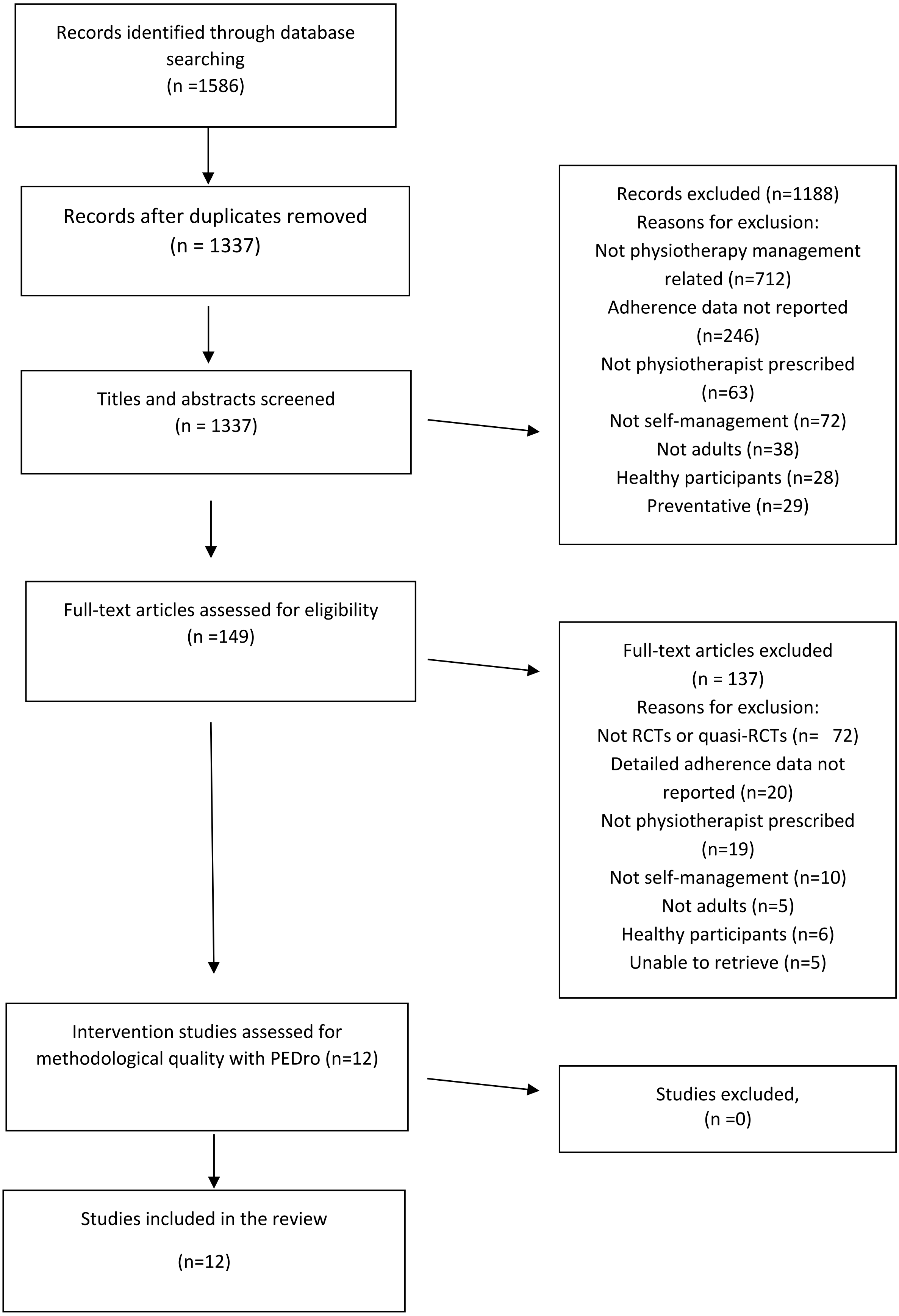
Data synthesis

Due to the heterogeneity of the interventions to aid adherence, patient population and type of self-management strategy, results are summarised narratively. The results for the interventions to aid patient adherence have been grouped using the Behaviour Change Technique Taxonomy (18).This taxonomy was developed using a delphi-type exercise with one of the aims being to provide systematic reviews with a reliable method for extracting and synthesising information associated with effectiveness (18).

Results:

In total 1586 citations were identified; 1437 were removed following review of title, abstract and removal of duplicates. The full texts of 149 papers were retrieved for further evaluation; 137 of these did not meet the inclusion criteria leaving a total of 12 studies which were included and assessed for methodological quality using the PEDro scale. A flow chart of the study retrieval and selection process is presented in Figure 6.1.

Figure 6.1: Flow chart of the literature search



Results of Methodological Quality Assessment:

Twelve studies were assessed using criteria outlined in the PEDro scale. The PEDro scale gives a score out of 10 (eligibility criteria is not used in determination of the final score). Kappa was computed to determine inter-rater reliability of methodological quality assessment between the two reviewers. Kappa of 0.71 indicated a substantial level of agreement (19). All 12 studies met the methodological quality criteria cut-point and therefore, were included. However, 50% of the included studies only scored fair (four or five out of 10), with 42% scoring moderate and 8% (or one study) receiving a high score.

All 12 studies met the criteria for randomisation. Only one study adequately concealed allocation. Groups were similar at baseline for nine of the included studies. Blinding of subjects, therapists and/ or assessors were also low scoring criteria in all of the included studies; with none of the included studies describing blinding of subjects. However, one study reported blinding of therapists and encouragingly six studies described blinding of assessors. Measures were obtained for at least one outcome in nine studies, although only five studies reported that all subjects included with outcome measures received the treatment or control. All 12 studies provided results of between-group statistics for at least one outcome and all but one study provided both point measures and measures of variability (Table 6.1).

Table 6.1: Results of methodological quality assessment using PEDro scale.

Author, year	**a)**	**b)**	**c)**	**d)**	**e)**	**f)**	**g)**	**h)**	**i)**	**j)**	**k)**	**Overall PEDro score**	**rating**
Alewijnse et al., 2003(20)	1	1	0	0	0	0	0	1	1	1	1	5	Fair
Bassett & Prapavessis , 2011(21)	1	1	0	1	0	0	0	1	0	1	1	5	Fair

Bassett & Petrie, 1999(22)	0	1	0	0	0	0	1	0	0	1	1	4	Fair
Evans & Hardy, 2002(23)	1	1	0	1	0	0	1	0	1	1	1	6	Moderate
Friedrich et al., 1998(24)	1	1	0	1	0	0	1	0	1	1	1	6	Moderate
Goto et al., 2014(25)	1	1	0	1	0	0	0	1	0	1	1	5	Fair
Lysack et al., 2005(26)	1	1	0	0	0	0	0	1	0	1	1	4	Fair
O'Brien et al., 2013(27)	1	1	0	1	0	1	1	1	0	1	1	7	Moderate
Pisters et al., 2010(9)	1	1	1	1	0	0	1	1	1	1	1	8	High
Schneiders et al., 1998(12)	1	1	0	1	0	0	1	1	0	1	1	6	Moderate
Schoo et al., 2005(28)	1	1	0	1	0	0	0	1	0	1	0	4	Fair

Steele et al., 2008(29)	1	1	0	1	0	0	0	1	1	1	1	6	Moderate

Key: a) eligibility criteria, b) random allocation, c) concealed allocation, d) baseline comparability, e) blinding of subjects, f) blinding of therapists, g) blinding of assessors, h) adequate follow-up, i) intention-to-treat analysis, j) between -group comparisons, k) point estimates and variability.

Types of adherence aiding strategies and adherence outcomes:

All 12 studies included exercise as the self-management strategy. The patient population used for the included studies ranged from patients with musculoskeletal conditions (both acute and chronic), urinary incontinence, haemophilia, post-orthopaedic surgery and chronic lung disease. There were 12 different adherence aiding interventions used in the 12 included studies. Three studies involved participants with hip and knee osteoarthritis (OA) although they used different adherence aiding interventions (Table 6.2). The results regarding the interventions to aid patient adherence are presented below using the 'Behaviour Change Technique Taxonomy' (18) and the *strength* of evidence following assessment of methodological quality (30).

Table 6.2: Results of data extraction from the included studies

Author, year	Participant population	Self-management strategy	Measure of adherence	Intervention/s	Control	Results	Conclusions
Alewijnse et al., 2003(20)	Urinary incontinence	Pelvic floor muscle exercise (PFME) therapy, with behavioural advice	Questionnaire and diary	PFME with 1 of 3 health education programs to promote long term adherence (reminder group; reminder and self-help guide group; reminder, self-help guide and counselling group)	PFME therapy only	The health education programs had no impact on treatment outcome or adherence	Results suggest that a standardised protocol checklist for physiotherapists covering all aspects of PFME may optimise outcome and adherence behaviour without the need for an additional health education program
Bassett & Prapavessi, 2011(21)	Ankle sprains	1.Exercise 2.Ice 3.Advice 4.Brace 5.elevation	Survey with Self-report 5 point Likert scale	A. Protection Motivation Theory (PMT) video information B. non-PMT information	C. No formal informatio n	There were no significant differences between the three groups for their adherence to the home-based physio	Results suggest a positive adherence-treatment outcomes relationship

Bassett & Petrie, 1999(22)	Upper and lower limb injuries	Exercise	Diary	A. Physiotherapist-patient collaborative goals B. Physio mandated goals	C. No formally set goals	Data showed there were no significant differences between the 3 groups on overall adherence	Treatment goals may not be a suitable motivational tool for all people
Evans & Hardy, 2002(23)	Sports related injuries	Exercise	Diary	A. Goal setting B. social support	C. No goals or social support	Means adherence for each group. A.78.83% B.51.84% C.49.09%	The group involving goal setting with a sports psychologist adhered significantly more to rehabilitation program
Friedrich et al., 1998(24)	CLBP	Exercise	Diary	Motivation group (MG); including five adherence enhancing interventions	No adherence enhancing interventio n (CG)	Mean adherence at 4 months: MG 76.7% CG 69.4%	There was no significant differences between MG and CG with regard to long term compliance
Goto et al., 2014(25)	Haemophilia	Exercise	Activity monitor	Self-monitoring group (SG) with feedback and activity monitor	Activity monitor with no display (CG)	Means adherence at 8 weeks: SG 79.0% CG 32.8%	A home exercise self-monitoring program has the potential for increased exercise adherence in haemophiliacs.

Lysack et al., 2005(26)	TKR, THR	Exercise	questionnaire	Customised video tape of exercises (CV)	No video tape of exercises (CG)	Number of adherent patients: Accuracy of exercises CV 5/18 (27%) CG 7/14(50%) Frequency of exercises CV 8/18 (44%) CG 5/22(22%)	There is no evidence that the videotape method offered any clear benefit over routine practices.
O'Brien et al., 2013(27)	Hip/ knee OA	Exercise	Self-report 5 point Likert scale	Action and coping plans (AP)	No action and coping plans (CG)	Stretching AP 3.7/5(74%) CG3.9/5(78%) Walking AP 3.6/5(72%) CG3.5/5(70%)	Exercise adherence was not significantly improved by the use of action and coping plans.
Pisters et al.,	Hip/ knee OA	Exercise	Self-report scale based on	Behavioural exercise program tailored to	Generic exercise	Adherent participants at week 13:	Behavioural graded activity with booster

2010(9)			a 5 point Likert scale	the patient with up to 7 booster sessions over the following year (BE)	program and no booster sessions (CG)	BE 75% CG 44% At week 65 BE 59% CG 34%	sessions results in better exercise adherence and a greater amount of physical activity than usual physiotherapy both in the short and long term.
Schneiders et al., 1998(12)	Acute LBP	Exercise	Exercise diary	Verbal and written exercise instructions (WG)	Verbal instructions only (CG)	Mean adherence WG 77.4% CG 38.1%	The use of written and illustrated exercise instructions as an educational strategy to improve compliance to exercise therapy for LBP is clearly shown to be effective in this study.
Schoo et al., 2005(28)	Hip/ knee OA	Exercise	Exercise log sheets and correctness of exercise performance scale	Verbal instructions plus B-Exercise brochure and audiotape of exercises	Verbal instructions plus A-Exercise brochure	Mean adherence: Between 1-4 weeks A 93% B 92% C 89%	Older people with OA who received face to face instructions and a brochure on how to perform and comply with an 8 week home exercise program did not show additional

				C-Exercise brochure and video tape of exercises		Between 5-8 weeks A 89.5% B 81.5% C 87%	benefits from other modes of instruction.
Steele et al., 2008(29)	Chronic lung disease	Exercise	Diary and accelerometer	12 week adherence intervention with weekly phone calls and home visits following pulmonary rehab program (HV)	Pulmonary rehab program only (CG)	Mean adherence Short term- week 20 HV 32 mins CG 16 mins Long term-Week 52 HV 33 mins CG 22 mins	The adherence intervention provided only limited short-term improvement in exercise capacity and self-reported maintenance of exercise after pulmonary rehabilitation. No long-term benefits were evident.

Shaping Knowledge: Two fair quality studies examined the impact of an education program on patient adherence using behavioural advice (20) and protection motivational theory (21) respectively. Both studies showed that there were no statistically significant differences between the intervention and control groups for patient adherence.

One moderate quality study (12) showed that provision of verbal instruction supplemented with written material improved adherence relative to verbal instruction alone. Two fair quality studies indicated that that adherence rates were not improved by the addition of a video tape or audiotape to usual care (verbal instruction with supplementary written material (26, 28)).

Goals and Planning: Two studies examined the effect of goal setting processes with conflicting results. One fair quality study by Bassett and Petrie (22) compared physiotherapist-patient collaborative and physiotherapist mandated goals with no formally set goals. Neither of the goal setting interventions resulted in improvements in adherence rates compared to usual care (22). In contrast, a moderate quality study by Evans and Hardy (23) concluded that those allocated to a goal setting group (supported by a sports psychologist) adhered significantly more to their rehabilitation program compared to those allocated to a social support group (supported by a sport psychologist but no goal setting) and to a usual care control group (no sport psychologist support). There were differences between the studies regarding patient population (age and type of injury) and the goal setting process involved which may have impacted on the results. Motivation to adhere and expedite their recovery may have been a factor in the study by Evans and Hardy (23) which involved an injured athletic population who were significantly younger than the study by Bassett and Petrie (22). In addition, this study used a sports psychologist (who also provided some counselling support) to set individually motivated goals based on the assessment by the physiotherapist which may account for the difference in results.

Feedback and Monitoring: One fair quality (25) study included an objective measure to provide self-monitoring and visual feedback. The results indicate that patient adherence can be positively influenced using an activity monitor to provide the patient with visual feedback regarding their level of physical activity as well as monitoring their exercise frequency (25).

Social Support: One high quality (9), two moderate quality (24, 27) and one fair quality (29) studies involved either counselling, action and coping plans, motivational support or weekly phone calls and home visits to aid patient adherence. The high quality study which used a behavioural exercise program tailored to the patient with up to seven booster sessions to aid adherence reported better exercise adherence and a greater amount of physical activity compared to the control group both in the short and long term (9). The use of weekly phone calls and home visits to aid exercise adherence in a fair quality study also demonstrated short term improvement (29). However, a moderate quality study concluded that exercise adherence was not significantly improved by the use of action and coping plans (27) . No improvement in long term adherence was demonstrated in a moderate quality study which used five motivational adherence enhancing interventions including counselling, reinforcement techniques, ‘treatment contracts’, visual reminders and exercise reporting (24).

Discussion:

Key findings and implications of key findings:

This review provides some guidance as to the effectiveness of interventions used to aid patient adherence to physiotherapist prescribed self-management strategies. However, of the 12 studies included in this review, all included exercise as the self-management strategy, highlighting an important gap in the research. The available evidence suggests that interventions such as using an activity monitor and feedback system, written exercise instructions, behavioural exercise program with booster sessions and goal setting may be effective in promoting adherence to exercise. However, due to the small number of studies examining any one type of intervention, there is insufficient data to endorse any of these interventions as part of routine clinical practice. Combining interventions and tailoring them to specific needs of individual patients rather than a group of patients may also improve adherence.

The variable quality of studies limited the conclusions which can be drawn from this review. Notably, only half of the included studies received a fair score (four or more out of ten). An earlier study of the Physiotherapy Evidence Database reported that the total score using the PEDro tool has been increasing by an average of 0.6 points for each decade between 1960 and 2009 although further improvement is still necessary (31). Their results were consistent with the findings of this review that reporting of blinding (particularly subjects and therapists) and concealed allocation was generally poor whereas random allocation and reporting of results of between-group statistical comparisons was much more prevalent (31). A further study which looked at PEDro scores across all sub-disciplines of physiotherapy also report low prevalence of blinding because physiotherapy interventions by nature are difficult to blind effectively (32). However, researchers should be encouraged to meet more readily achievable design standards for random allocation, concealed allocation, blinding of assessors, intention-to-treat analysis, between -group comparisons and point estimates and variability; giving studies a potential minimum PEDro score of six (31, 32).

A wide variation was seen in the rates of adherence. Mean adherence rates varied from 33% in the control group of one study (25) to 93% in another using a home exercise brochure (28). However, of the studies which reported mean percentage rates of adherence to home exercise programs, the average rate of adherence between studies was 67%. This range of adherence to exercise is similar to another review (57-88%) which also looked at rate of adherence to nutritional guidelines (22-97%), airway clearance techniques (33-91%) and medication (31-85%) (33). The challenge for adherence research is to establish what level of adherence is required to achieve a good therapeutic outcome for a variety of conditions (13).

Strengths and limitations:

The strength of this systematic review on adherence to physiotherapy is that it did not limit to a particular physiotherapy patient population or self-management strategy and therefore, provides a more comprehensive overview of the literature. This has in turn allowed for a comparison of adherence rates to a number of adherence aiding interventions for a number of different patient populations. This review also highlighted the paucity in literature on self-management strategies other than exercise which may be an important research gap to address.

The limitations of this review are that although it looked at adherence rates to adherence aiding interventions; it did not discuss the measures of adherence used and the impact that these can have on the results. There is currently no 'gold standard' for the measurement of patient adherence and therefore, the measurement of adherence remains problematic. A recent systematic review reported 61 measures of patient adherence to home based exercise programs with almost all lacking psychometric validation (34). This review also did not address the barriers to adherence and why some patients are more likely to adhere than others although this has been reported elsewhere (14).

It should be argued that just because one component of study design (such as blinding of subjects and/or therapists) cannot be successfully applied in many physiotherapy intervention studies, it does not mean that physiotherapy research is inferior (32, 35). Despite these limitations, the PEDro scale was specifically developed for physiotherapy research and thus its use here facilitates comparison with other physiotherapy reviews.

Clinical implications

Patient adherence has been positively linked to treatment outcomes. Therefore, physiotherapists should specifically question their patients about their level of adherence when prescribing self-management strategies and consider using interventions to maximise adherence and potentially improve treatment outcomes.

All studies included in this review used exercise in some form. However, physiotherapists prescribe a number of different patient self-management strategies. Advice ranked as the most common treatment provided to patients with low back pain by physiotherapists (4, 36). The type of advice may include staying active, to refrain from or limit exposure to certain activities, posture, seeking further help or support (36). Patient adherence to initial advice may reduce the severity and burden of injury and expedite recovery which can only be to the benefit of patients. However, unless high quality research with good methodological rigour is conducted to establish effective ways to promote adherence to self-management advice it is possible that physiotherapists are simply wasting their breath.

The use of a brace for symptomatic relief in knee OA and tennis elbow may also be of benefit and provide a cost effective treatment adjunct (5, 6). However, the cost of purchasing these devices is redundant if the patient does not wear them. A systematic review on adherence to therapeutic splint wear in acute hand injury found a mean adherence rate of 85% with evidence to suggest that immediacy of benefit, splint comfort and minimising interference with lifestyle and daily living activities can improve splint adherence (37).

However, while our review indicated insufficient evidence to recommend any interventions for improving adherence to exercise, it is encouraging to note that two out of the four interventions identified as showing promise in this review would be simple to implement. For example, provision of written information is something that could, pending further research to confirm its impact, be easily and cheaply integrated into routine practice.

Similarly, activity monitors, if confirmed by future research to be effective, are likely to be simple to use. Further, with increasing integration of technology into everyday lives (such as smart phone applications), this type of strategy is likely to be increasingly acceptable to patients. In contrast, the use of a behavioural exercise program with goal setting are likely to require more specialised skills to implement. If these interventions were confirmed to be effective on the basis of future research then physiotherapists may need additional training and/ or to work collaboratively with other disciplines to design such programs.

Research implications

Research with improved methodological rigour will enhance understanding of behavioural change interventions used in other professional domains such as occupational therapy and medicine, which may also aid adherence in a physiotherapy setting (38). Further high quality research is required regarding interventions to aid patient adherence in physiotherapy. An important research gap exists regarding patient adherence to self-management strategies including but not limited to exercise.

Conclusions:

This review provides some insight into the interventions used to aid patient adherence to physiotherapist prescribed self-management strategies. Despite studies which used an activity monitor and feedback system, written exercise instructions, behavioural exercise program with booster sessions and goal setting demonstrating positive influence on patient adherence to exercise, there is insufficient data to endorse their use in clinical practice. Further studies are needed to confirm the value of these interventions. Additionally, there is a need to examine interventions for improving adherence for a range of self-management strategies used in physiotherapy practice, not just exercise.

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References:

1. Higgs J, Refshauge K, Ellis E. Portrait of the physiotherapy profession. J Interprof Care. 2001;15(1):79-89.

2. Australian Institute of Health and Welfare. Australian Institute of Health and Welfare. Allied healthworkforce 2013. National health workforce series no5. Canberra: AIHW; 2013.

3. Cooper K, Smith B, Hancock E. Patients' perceptions of self-management of chronic low back pain: evidence for enhancing patient education and support. Physiother. 2009;95:43-50.

4. Liddle SD, Baxter GD, JH G. Physiotherapists' use of advice and exercise for the management of chronic low back pain: A national survey. Man Ther. 2009;14:189-96.

5. Struijs PA, Korthals-de Bos IB, van Tulder MW, van Dijk CN, Bouter LM, Assendelft WJ. Cost effectiveness of brace, physiotherapy, or both for treatment of tennis elbow. Br J Sports Med. 2006;40(7):637-43; discussion 43.

6. Page CJ, Hinman RS, Bennell KL. Physiotherapy management of knee osteoarthritis. Int J Rheum Dis. 2011;14(2):145-51.

7. World Health Organisation. Adherence to long-term therapies: evidence for action. WHO library. Switzerland2003.

8. McLean SM, Burton M, Bradley L, Littlewood C. Interventions for enhancing adherence with physiotherapy: a systematic review. Man Ther. 2010;15(6):514-21.

9. Pisters MF, Veenhof, C., de Bakker, D.H., Schellevis, F.G., Dekker, J. Behavioural graded activity results in better exercise adherence and more physical activity than usual care in people with osteoarthritis. J Physiother. 2010;56:41-7.

10. Beinart NA, Goodchild CE, Weinman JA, Ayis S, Godfrey EL. Individual and intervention-related factors associated with adherence to home exercise in chronic low back pain: a systematic review. Spine J. 2013;13(12):1940-50.

11. Bassett S. The assessment of patient adherence to physiotherapy rehabilitation. NZ J physiother. 2003;31(2):60-6.

12. Schneiders A, Zusman, M, Singer, K. Exercise therapy compliance in acute low back pain patients. Man Ther. 1998;3(3):147-52.

13. Spetch LA, Kolt GS. Adherence to sport injury rehabilitation: implications for sports medicine providers and researchers. Phys Ther Sport. 2001;2(2):80-90.

14. Jack K, McLean SM, Moffett JK, Gardiner E. Barriers to treatment adherence in physiotherapy outpatient clinics: a systematic review. Man Ther. 2010;15(3):220-8.

15. Jordan JL HM, Mason EEJ, Foster NE. Interventions to improve adherence to exercise for chronic musculoskeletal pain in adults (review). Cochrane Database Syst Rev, . 2010(1).

16. Moher D, Liberati A, Tetzlaff J, Altman DG, Group P. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Med. 2009;6(7):e1000097.

17. Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gotzsche PC, Ioannidis JP, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. J Clin Epidemiol. 2009;62(10):e1-34.

18. Michie S, Richardson M, Johnston M, Abraham C, Francis J, Hardeman W, et al. The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. Ann Behav Med. 2013;46(1):81-95.

19. Viera AJ, Garrett JM. Understanding interobserver agreement: the kappa statistic. Fam Med. 2005;37(5):360-3.

20. Alewijnse D, Metsemakers JFM, Mesters IEPE, van den Borne B. Effectiveness of pelvic floor muscle exercise therapy supplemented with a health education program to promote long-term adherence among women with urinary incontinence. Neurourol Urodyn. 2003;22(4):284-95.

21. Bassett SF, Prapavessis H. A test of an adherence-enhancing adjunct to physiotherapy steeped in the protection motivation theory. Physiother Theory Pract. 2011;27(5):360-72.

22. Bassett SF, Petrie KJ. The effect of treatment goals on patient compliance with physiotherapy exercise programmes. Physiother. 1999;85(3):130-7.

23. Evans L, Hardy L. Injury rehabilitation: a goal-setting intervention study. Res Q Exerc Sport. 2002;73(3):310-9.

24. Friedrich M, Gittler G, Halberstadt Y, Cermak T, Heiller I. Combined exercise and motivation program: effect on the compliance and level of disability of patients with chronic low back pain: a randomized controlled trial. Arch Phys Med Rehabil. 1998;79(5):475-87.

25. Goto M, Takedani H, Haga N, Kubota M, Ishiyama M, Ito S, et al. Self-monitoring has potential for home exercise programmes in patients with haemophilia. Haemophilia. 2014;20(2):e121-e7.

26. Lysack C, Dama M, Neufeld S, Andreassi E. A compliance and satisfaction with home exercise: a comparison of computer-assisted video instruction and routine rehabilitation practice. J Allied Health. 2005;34(2):76-82.

27. O'Brien D, Bassett S, P M. The effect of action and coping plans on exercise adherence in people with lower limb osteoarthritis: a feasibility study. NZ J physiother. 2013;41(2):49-57.

28. Schoo AMM, Morris ME, Bui QM. The effects of mode of exercise instruction on compliance with a home exercise program in older adults with osteoarthritis. J Physiother. 2005;91(2):79-86.

29. Steele BG, Belza B, Cain KC, Coppersmith J, Lakshminarayan S, Howard J, et al. A Randomized Clinical Trial of an Activity and Exercise Adherence Intervention in Chronic Pulmonary Disease. Arch Phys Med Rehabil. 2008;89(3):404-12.

30. National Health & Medical Research Council. How to use the evidence: assessment and application of scientific evidence. In: National Health & Medical Research Council, editor. Canberra: Commonwealth of Australia Australian Government Publisher; 2000.

31. Moseley AM, Herbert RD, Maher CG, Sherrington C, Elkins MR. Reported quality of randomized controlled trials of physiotherapy interventions has improved over time. J Clin Epidem. 2011;64(6):594-601.

32. Moseley AM, Elkins MR, Janer-Duncan L, Hush JM. The Quality of Reports of Randomized Controlled Trials Varies between Subdisciplines of Physiotherapy. Physiother Can. 2014;66(1):36-43.

33. O'Donohoe R, Fullen BM. Adherence of subjects with cystic fibrosis to their home program: a systematic review. Respir Care. 2014;59(11):1731-46.

34. Bollen J, Dean S, Siegert R, Howe T, Goodwin V. A systematic review of measures of self-reported adherence to unsupervised home-based rehabilitation exercise programmes, and their psychometric properties. BMJ open. 2014;4.

35. Bhogal SK, Teasell RW, Foley NC, Speechley MR. The PEDro scale provides a more comprehensive measure of methodological quality than the Jadad Scale in stroke rehabilitation literature. J Clin Epidemiol. 2005;58(7):668-73.

36. Fidvi N MS. Physiotherapy management of low back pain in India- a survey of self-reported practice. Physiother Res Int. 2010;15:150-9.

37. O'Brien L. Adherence to therapeutic splint wear in adults with acute upper limb injuries: a systematic review. J Hand Ther 2010;Mar 15(1):3-12.

38. Horne R, Weinman J, Barber N, Elliott R, Morgan M, Cribb A, et al. Concordance, adherence and compliance in medicine taking. London: NCCSDO. 2005;2005:40-6.

PAPER SEVEN

Aiding patient adherence to physiotherapist-prescribed self-management strategies: An evidence-based behavioural model in practice.

The systematic review (paper six) was important in highlighting that despite a number of interventions (including supplementing verbal information with printed information, activity monitors and goal setting) showing promise in their ability to positively influence patient adherence to exercise, there is insufficient data to endorse their use in clinical practice. Similarly paper three reported on correlational data to support the provision of printed information and confirming patient understanding as being associated with higher levels of patient-reported adherence to self-management.

Paper seven presents a behavioural model to guide physiotherapists in current best-practice steps for prescribing self-management strategies to their patients. This behavioural model was devised following a review of physiotherapy and the wider healthcare literature. The resulting six-step ‘cycle of adherence nudging- uCAN’ model included recommendations related to: selecting the most clinically relevant self-management strategy; asking patients about intentions to adhere and the identification of barriers to adherence; individualising the strategy to the patient; providing information on when and how to complete the strategy; building patient skills and confidence; and confirm patient understanding. A summary of the literature including levels of evidence, was presented in support of the use of each step in clinical practice.

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Aiding patient adherence to physiotherapist-prescribed self-management strategies: An evidence-based behavioural model in practice.

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Aiding patient adherence to physiotherapist-prescribed self-management strategies: An evidence-based behavioural model in practice.

Abstract

Self-management strategies are regularly prescribed by physiotherapists and can play an important role in the overall treatment plan for many patients. However, patient non-adherence to self-management is recognised as a significant barrier to the integrity of prescribed treatment plans. Physiotherapists are ideally placed to encourage patient self-management and facilitate adherence to these evidence-based strategies. The translation of best evidence into clinical practice is integral to the continued development of physiotherapy. We propose a six-step behavioural model based on current evidence on how to best aid, or 'nudge' patient adherence to physiotherapist-prescribed self-management strategies. We also suggest ways in which this model can be incorporated into routine physiotherapy practice.

Keywords: Self-management, patient adherence, physiotherapy, behavioural change, communication.

Introduction

Physiotherapists regularly prescribe a range of patient self-management strategies which can include exercise, advice, removable braces, self-taping and ice (1-5). Self-management strategies are an important treatment adjunct because patients will spend more time away from the physiotherapist than receiving 'hands on' care (1) and therefore, can assist patients in achieving maximal rehabilitation gains (6). It has been reported that physiotherapist self-management prescription is increasing due to a trend towards 'patient-centred' care, where patients are empowered to become active partners in their treatment (6). A systematic review reported that when patients adhere, self-management strategies such as home exercise programs are equally as effective as centre-based supervised rehabilitation which can bring about potential treatment cost-savings as well as increasing treatment flexibility for the patient (6).

Efficacious self-management strategies, however, will only result in improved outcome if the patient adheres to them. Patient adherence has been defined as the extent to which a patient's behaviour corresponds with the agreed treatment recommendations of a healthcare provider (7). A recent systematic review found that the mean rate of patient adherence to home physiotherapy programmes was 67% (1). This low rate of adherence is despite evidence from systematic reviews and randomised controlled trials (RCTs) indicating that physiotherapists can positively influence patient adherence to self-management strategies via the use of adherence aiding interventions; such as the provision of written information; goal setting; activity monitors; and behavioural graded activity (1, 8-10).

Physiotherapists have a professional responsibility to provide patient services based on current evidence (11), however, implementing evidence into clinical practice can be problematic (12). With reference to patient adherence, being up to date with the current literature is one aspect; but being able to make the translation of this knowledge into clinical practice is vital. Researchers should be encouraged to collaborate with clinicians to develop evidence summaries that aim to make the use of research evidence into practice more streamlined (13). Therefore, the objective of this discussion paper is to present a six-step behavioural model for physiotherapists to use when prescribing self-management strategies to their patients in order to aid adherence. We will present a summary of current literature supporting integration of this model in clinical practice as well as providing clinically relevant examples for each model step.

Establishing an evidence-based behavioural model to aid patient adherence to physiotherapist-prescribed self-management strategies

In physiotherapy, patient adherence can be viewed as being comprised of both an attitude and a behaviour (14). Adherence as an attitude consists of a willingness or intention to follow strategies prescribed by a health professional, whereas adherence behaviour relates to the actual carrying out of the strategy as intended (10). It has been suggested that if adherence to prescribed self-management strategies are to be increased, then adherence behaviour must be understood (15). Several general theoretical frameworks from health psychology literature may be useful in understanding adherence in physiotherapy; cognitive behavioural theory, motivational interviewing and social cognitive theory (15, 16). These cognitive-behavioural theories share common assumptions that people are able to use cognitive processes to affect behaviour which is individualised and self-regulating (15). These assumptions also emphasise the active role of the patient in adherence (15).

The six-step Cycle of Adherence Nudging (uCAN) behavioural model aims to aid or 'nudge' patients in improving adherence to self-management strategies. Nudging has been defined as a way of altering people's behaviour without limiting their options (17). The uCAN is presented as a series of simple steps that facilitate physiotherapists' access to adherence aiding interventions when prescribing self-management strategies to their patients in time pressured clinical situations (figure 7.1). Each step has been devised from recent research, summarised below using the following levels of evidence proposed by Sackett et al. (18): level 1a – Systematic review of RCTs; level 1b- RCTs; level 2a- Systematic review of cohort studies; and level 2b- Individual cohort studies.

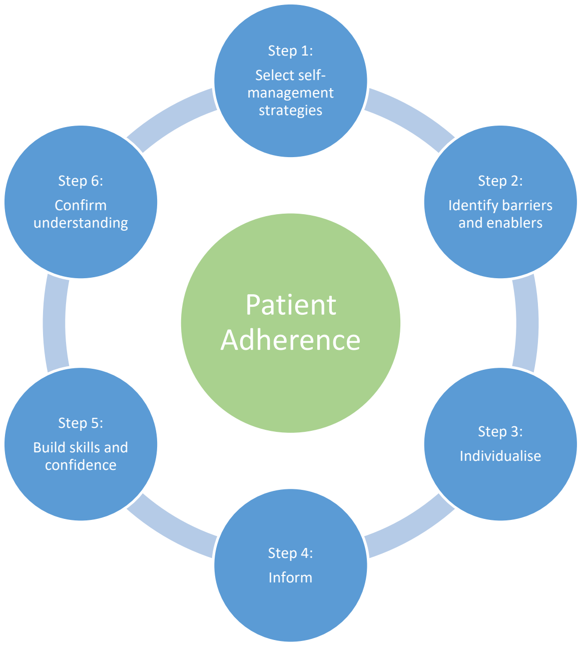

Figure 7.1 Cycle of Adherence Nudging (uCAN) behavioural model to aid patient adherence to physiotherapist prescribed self-management strategies.

Best practice communication skills are essential to successful implementation of the model:

When integrating the proposed model into clinical practice it is important to consider best practice communication skills. Communication that enhances the physiotherapist-patient relationship is vital for achieving the desired treatment outcome (19). Best practice communication should be purposeful, goal orientated and based on research from empirical studies, practitioner experience and theoretical paradigms (11, 19, 20). Two established models of healthcare communication are the practitioner-centred model and the patient-centred model (19). The practitioner-centred model has a strong scientific basis leading the physiotherapist to focus on diagnosis and providing treatment aimed at the practitioner-identified problem (19). Whereas the patient-centred model emphasises the need to gather information and tailor treatment according to the patient's needs and perspective (19). Current physiotherapy research and guidelines promote patient-centred communication as best practice (19). However, observational studies indicate that a patient-centred communication style is not always used in physiotherapy consultations (19). Awareness of communication in practice is particularly relevant for physiotherapist-prescribed self-management strategies because there is a reliance on active patient involvement. Active listening to the patient's beliefs about their condition, treatment approaches, and previous experiences with physiotherapy using open, empathetic communication techniques will guide the physiotherapist towards a more patient-centred treatment approach. Techniques such as motivational interviewing can be also used for assessing a patient's readiness for change (21).

In addition, physiotherapists should be aware of the consequences of poor communication; with patient dissatisfaction, inaccurate diagnosis, poor adherence, suboptimal outcome and an increased risk of litigation being potential outcomes (21-23). A patient-centred approach to communication is adopted throughout the presentation of the six-steps of the uCAN behavioural model. Steps 1 and 2 provide guidance on patient-centred communication strategies that may aid adherence to physiotherapist prescribed self-management strategies. Steps 3-6 provide guidance on addressing common barriers related to knowledge, skills, confidence and remembering to perform the self-management strategy.

The six-steps of the uCAN behavioural model:

Step 1: Self-management strategy selection: Provide rationale for the self-management strategy.

There are a range of self-management strategies that physiotherapists can recommend to their patients. However, it is important that physiotherapists recommend only the most clinically relevant self-management strategy based on current evidence regarding the benefit for similar patients with a similar condition. The physiotherapist should then use a patient-centred approach to discuss with their patient whether self-management strategies could be integrated into their treatment program. For example, research supports the use of footwear advice, weight loss management and exercises for patients with hip and knee osteoarthritis (24). The physiotherapist should discuss these self-management strategies with the patient and then negotiate which strategy or strategies the patient would like to try first; allowing for the fact that the patient may reject all options and that this is their choice. To assist patients with making an informed decision, the physiotherapist should provide information about the risks and benefits of each strategy, including the option of no treatment. If the patient proposes an option of their own, the physiotherapist should discuss the relative benefits of this option based on empirical research and support them in their decision (24).

Provide a rationale: When providing the rationale for the self-management strategy, cognitive behavioural theory proposes that a person's actions are motivated by perceived rewards of acting in a certain way or perceived negative consequences associated with failure to complete a particular action (16). Physiotherapy patients may be motivated to adhere to a prescribed self-management strategy if they perceive it will improve their functioning; or reduce pain and discomfort; and if they have had some input into self-management strategy selection. Hence, it is imperative that patients understand and agree with the rationale behind the prescription of a self-management strategy. For example, patients should be informed about what outcome it is likely to achieve; and the mechanism by which this will work. In accordance with this, studies have shown that patients carry out prescribed strategies less effectively when they view their health problem as less severe (23). This suggests that when recommending a self-management strategy, it is important to explain what the self-management strategy is, and what it is designed to do. This should be done while adopting a patient-centred approach to communication, using language that is directly applicable to the patient's issue and appropriate for their level of health literacy. As an example, 'this exercise will improve pelvic floor muscle strength, which means that when you pick up your toddler, you will notice less or no leakage'.

Step 2: Ask about intention to adhere; and identify barriers and enablers to completing the self-management strategy.

Assess intentions to adhere: It is important to explicitly question the patient about their intention to adhere early in the prescription process, before providing the patient with too much further information. Level 1b evidence suggests a correlation between the intentions to adhere and adherence behaviours (5). Therefore, when prescribing a self-management strategy, physiotherapists should ask their patient whether they think they will be able to carry out the self-management strategy at home. Patients may be uncomfortable saying that they aren't likely to adhere. However, physiotherapists can promote patient honesty by using a non-judgmental manner and explaining that non-adherence is common and understandable. It could be that this particular self-management strategy may need to be reconsidered or additional education regarding the self-management strategy may be required. For example, a patient may have been prescribed exercises by a physiotherapist in the past and may be unwilling to try them again either due to pain associated with exercise or the belief that they won't help. The physiotherapist may be able to change these negative associations through education.

Cognitive behavioural theory suggests that there are a range of factors that can affect behaviour, including adherence-related behaviours. These include individual knowledge, attitudes, beliefs, as well as physical and environmental factors (16). Once the physiotherapist has established the patient's intention to adhere it is important to question them about potential barriers. Empathy and understanding of the barriers to self-management adherence will evoke more discussion; acknowledging that the choice to change is the patient's will increase the likelihood of honesty (16). Physiotherapists should encourage the patient to play an active role in identifying solutions to address barriers. It may assist the patient if the physiotherapist asks questions about the patient's experience of adhering to self-management strategies in the past.

It is important to establish individual patient barriers to adherence as there are several examples from physiotherapy research that illustrate the negative impact barriers can have on adherence. Level 1a evidence on adherence to exercise for older patients found that reduced mental wellbeing appeared to present a greater barrier to exercise adherence than physical wellbeing (25). Level 2a evidence has shown that patient beliefs about treatment approaches are strongly associated with adherence and that non-adherent individuals were likely to have lower levels of prior activity, lower exercise self-efficacy and low levels of social support (26).

Step 3: Individualise the self-management strategy: simplify the self-management strategy and tailor it to the patient's circumstances.

Social cognitive theory suggests that a patient's belief in their ability to carry out the self-management strategy must be nurtured by building on success; therefore, the prescribed self-management strategy must be achievable (16). Evidence suggests that simple regimes are more likely to be adhered to than complex ones (23, 27). Level 1b evidence indicates that patients who were prescribed 2 home exercises performed better on in-clinic reassessment than those given 8 home exercises (27). Therefore, where possible physiotherapists should prescribe simple self-management regimes, and explore how these can be tailored to the patient's lifestyle using a patient-centered approach.

Tailoring of the regime refers to considering how the patient can integrate the self-management strategy into their daily routine. This may include coupling the self-management strategies to regular habits which are determined in consultation with the patient (e.g. having breakfast, driving to work), or considering how triggers or reminders can be used to maximise adherence. Reminders have been used effectively in a number of contexts. For example, Level 2c research on hand hygiene found that an electronic motion sensor–triggered audible reminder immediately and significantly improved and sustained greater adherence of hospital visitors and clinical staff to hand hygiene guidelines (28). Qualitative physiotherapy studies reporting on the use of laminated exercise sheets which can be displayed in patients' homes to act as visual reminders to exercise (29) and the use of triggers to assist women in remembering pelvic floor muscle exercises (30) have been shown to increase adherence.

Step 4: Inform: Provide instructions on when and how to complete the self-management strategy.

Knowledge is considered a prerequisite to successful performance of a self-management strategy. Specific knowledge of when (i.e. once a day; or under what circumstances) and how (i.e. how many repetitions; how long; which technique) a prescribed behaviour should be performed is critical to adherence (31). Level 1a evidence regarding patients with chronic neck pain identified the most effective components of a physiotherapist-prescribed exercise program related to the provision of specific information regarding the frequency, intensity, time and type (FITT) for each exercise (32).

Another consideration when providing instructions, is that delivery of an effective self-management strategy relies on establishing an evidence-based strategy and ensuring an adequate dosage (15). There is a risk that a self-management strategy will be ineffective if the prescribed intensity or frequency is too low. Therefore, physiotherapists need to review the evidence related to the recommended dosage of the self-management strategy as well as developing an understanding of their patient's adherence rate in order to ensure that this dosage is prescribed and being achieved (15).

Skills in transferring information can increase the probability that the patient will recall the information, adhere to the self-management strategy instructions and be satisfied with the care provided (33). Medical literature shows factors such as anxiety, feeling unwell, and poor health literacy may lead to poor understanding and retention of information conveyed within a consultation(23). Patient non-adherence with a self-management strategy may be unintentional simply due to a misunderstanding of the physiotherapist's instructions. Patients simply cannot carry out the directives that they don't recall (23). Young healthy volunteers have been shown to recall less than 25% of the information conveyed during simulated medical consultations (34). This level of recall may be even lower for those physiotherapy patients who are under increased stress due to pain and other anxieties. Level 1a and 1b evidence supports that patient adherence can be aided by the use of written information to aid recall of the specific instructions (1, 35).

Step 5: Building skills and confidence: Physiotherapist modelling, patient practice and feedback

Psychological theories suggest that a behaviour is more likely to be actioned if an individual has the requisite knowledge and skills and has seen the behaviour modelled (36, 37). Modelling, such as demonstrating the correct exercise technique, is particularly effective when undertaken by respected individuals such as physiotherapists (36). Social cognitive theory promotes effective self-management to keep people healthy throughout their lives (16). Behaviours, including self-management strategies can be learned through watching others perform the behaviour correctly, having the opportunity to practice the behaviour and receive corrective feedback if needed.

Self-efficacy is the perceived confidence in one's ability to accomplish a specific task and has been shown to affect exercise adoption and maintenance (25). Self-efficacy can be increased via modelling and also through encouragement (verbal persuasion). Physiotherapy research also supports the important role of self-efficacy and modelling in adherence. For example, Level 2c evidence supports that during the course of physiotherapy, moderate to strong reciprocal relationships have been shown to exist between self-efficacy and adherence to rehabilitation (38). Level 2c research investigating adherence of older women with strength training and aerobic exercise showed that a patient is more likely to recall instructions when they have an active role in the strategy through practise than being passive recipients (39). Qualitative research has demonstrated that adequate instruction and exercise practise with the physiotherapist was essential for patients to gain confidence, learn how to perform the exercises efficiently and for adherence to the program (40).

Therefore, it is recommended that physiotherapists nurture patient self-efficacy and motivation to adhere by modelling behaviour such as the physiotherapist demonstrating a particular exercise prior to encouraging active patient practice accompanied by corrective and supportive feedback.

Step 6: Confirm understanding: Allow time for patient questions

When prescribing a self-management strategy, physiotherapists should employ best practice patient-centred communication skills (19). There are a range of communication strategies that can be used to maximise understanding and recall such as presenting the most important information first; emphasising the importance of key information; using lay language and avoiding medical jargon; and asking the patient to summarise what has been agreed during the consultation (23, 33). Asking the patient to summarise information regarding the self-management strategy can serve two functions. First, it allows for an opportunity for any misunderstandings to be identified and for the provision of additional information to confirm understanding. For patients to effectively receive and understand information that they are given, they need the opportunity to ask questions and have them answered in order to clarify the information that they have received (23). Second, it may increase the likelihood of adherence. Patients want to participate in the process of caring for their own health and therefore, when patients verbally agree to do something, they may be more likely to adhere (23).

It has been shown that patient treatment outcomes can be improved when healthcare providers assess their patient's ability to recall instructions or advice; however, this step in communication is often neglected (41). Level 1b evidence on exercise delivery method discussed that the effectiveness of recall can be affected by memory problems in older patients (35). Therefore, seeking confirmation supplemented with written instruction or using the patient's smart phone to record the instructions can increase adherence to exercise programs (35).

Physiotherapists should seek confirmation that the patient fully understands what is being asked of them to do at home which then provides an opportunity to modify or supplement their instructions to promote patient success.

A summary of the uCAN steps are presented in Table 7.1.

Table 7.1 Summary of the steps involved in the uCAN behavioural model

Adherence nudging steps	Summary
Step 1: SMS selection: Provide rationale for the SMS	• Select the most appropriate SMS based on research evidence and patient's presentation
Step 2: Ask about intention to adhere and identify barriers and enablers to completing the SMS	• Assess patient's intention to adhere • Correct or re-inforce patient perceptions regarding the SMS • Question patients about specific barriers to adherence • Reassure patients that it is okay to have difficulty completing SMS • Assist patients in finding ways to integrate SMS into their routine
Step 3: Individualise the SMS: Simplify the SMS and tailor it to the patient's circumstances.	• Individualise the SMS to the patient's specific needs. • Simplify the SMS to assist with adherence • Tailor the SMS to fit into a patient's routine
Step 4: Inform: Provide instructions on when and how to complete the SMS.	• Provide specific dosage instructions related to research regarding patient outcomes • Provide written instructions or other supplementary material to aid recall
Step 5: Building skills and confidence: Physiotherapist modelling, patient practice and feedback	• Physiotherapist to model SMS (if possible) • Provide time for patient to practice the SMS • Physiotherapist to provide encouraging and corrective feedback
Step 6: Confirm understanding: Allow time for patient questions	• Ask the patient to repeat the SMS • Confirm understanding • Correct any misinformation • Answer any questions • Provide supplementary information or adherence aiding interventions as required

Cyclical nature of the uCAN model

Self-management is an ongoing task. Therefore, it is recommended that physiotherapists assess adherence to self-management strategies at subsequent consultations. If the patient indicates that they have experienced difficulties with adherence, then the physiotherapist can explore any barriers or reasons for this by returning to the relevant step in the model. It may be that the self-management strategy itself needs to reconsidered leading to a return to step-one or that the patient misunderstood the specific instructions in step-four. Therefore, the uCAN model is designed to be used as a cyclical model with steps repeated as many times as needed to encourage patient self-management adherence and therefore, have a positive impact on treatment outcome.

Discussion:

The uCAN behavioural model is suggested as a way of incorporating best practice adherence research into clinical care. It has been reported that there currently exists a 'knowledge to practice' gap in physiotherapy whereby clinicians have the knowledge and skills to search out current research into effective strategies for aiding patient adherence to their prescribed self-management strategies, but that they are not consistently implementing it into practice (13). The six-steps of the uCAN model draw on theoretical constructs that have been empirically shown to be associated with positive behavioural change (16). We believe that this is the first behavioural model to apply these theories to aid patient adherence to physiotherapist-prescribed self-management strategies.

Physiotherapists' have been described as promoters, preventers and rehabilitators (16). Patient health outcomes can be positively influenced by physiotherapist prescribed self-management strategies, and, therefore, incorporating methods to aid patient adherence to self-management strategies is an important component of a physiotherapist's role. In addition to individual patient benefits, there are also health system related benefits to prescribing and maximising patient adherence to self-management strategies (6). These may include a reduction in the number of in-clinic treatments thereby decreasing costs for the both the patient and healthcare system as well as freeing up waiting lists. Physiotherapists can be assured that investing time designing, prescribing and actively monitoring self-management strategies is both evidence-based and economically efficient (6).

Implications for practice and research

There is growing recognition of the importance of knowledge translation in physiotherapy to ensure that research findings are rapidly integrated into clinical practice. Frameworks or practice models are important resources to promote the uptake of evidence into physiotherapy practice settings (42). The steps proposed within the uCAN model draw on evidence-based strategies that have been shown to promote adherence in other healthcare contexts. The model as a whole, however, has not been tested in the physiotherapy setting. Therefore, before translation into practice, the model should be tested for effectiveness in aiding patient adherence to physiotherapist prescribed self-management strategies using a rigorous research design methodology. The next stage for us as researchers is to design a study which has considered all aspects of methodological quality as detailed in assessment tools such as PEDro (43) or the Cochrane risk of bias assessment (44). Physiotherapy researchers have increasingly focused on evidence produced from RCTs (12, 45). RCTs provide an efficacious design method to evaluate the effectiveness of an intervention. They are grounded in a medical paradigm in which individuals are randomly assigned to receive an intervention or control condition which assists in eliminating selection bias (46). Therefore, a randomized controlled design is likely to provide the most robust evidence for the effectiveness of this behavioural model in improving patient adherence to self-management strategies and thus improve patient outcome. In the meantime, physiotherapists should use this model as a summary for reviewing current research and reflecting on their own clinical practice when prescribing self-management strategies to their patients.

Conclusion

The uCAN behavioural model draws on current research suggesting that patient adherence to physiotherapist-prescribed self-management strategies can be aided or nudged by considering six important steps during the prescribing process. These include: selecting the appropriate self-management strategy based on best-evidence and patient preference; identifying barriers and enablers to adherence; individualizing the self-management strategy to the patient; providing tailored patient information; building patient skills and confidence; and confirming patient understanding. Patient adherence has been shown to be directly related to patient outcome; therefore, it is important that physiotherapists translate high-quality adherence aiding research into routine clinical practice. Further research testing the effectiveness of this behavioural model is recommended.

Conflict of interest

No potential conflict of interest was reported by the authors.

References:

1. Peek K, Sanson-Fisher R, Mackenzie L, Carey M. Interventions to aid patient adherence to physiotherapist prescribed self-management strategies: A systematic review. Physiother. 2016;102(2):127-35.

2. Page CJ, Hinman RS, Bennell KL. Physiotherapy management of knee osteoarthritis. Int J Rheum Dis. 2011;14(2):145-51.

3. Liddle SD, Baxter GD, JH G. Physiotherapists' use of advice and exercise for the management of chronic low back pain: A national survey. Man Ther. 2009;14:189-96.

4. Struijs PA, Korthals-de Bos IB, van Tulder MW, van Dijk CN, Bouter LM, Assendelft WJ. Cost effectiveness of brace, physiotherapy, or both for treatment of tennis elbow. Br J Sports Med. 2006;40(7):637-43; discussion 43.

5. Bassett SF, Prapavessis H. A test of an adherence-enhancing adjunct to physiotherapy steeped in the protection motivation theory. Physiother Theory Pract. 2011;27(5):360-72.

6. Novak I. Effective home programme intervention for adults: a systematic review. Clin Rehabil. 2011;25(12):1066-85 20p.

7. World Health Organisation. Adherence to long-term therapies: evidence for action. WHO library. Switzerland2003.

8. Goto M, Takedani H, Haga N, Kubota M, Ishiyama M, Ito S, et al. Self-monitoring has potential for home exercise programmes in patients with haemophilia. Haemophilia. 2014;20(2):e121-e7.

9. Pisters MF, Veenhof, C., de Bakker, D.H., Schellevis, F.G., Dekker, J. Behavioural graded activity results in better exercise adherence and more physical activity than usual care in people with osteoarthritis. J Physiother. 2010;56:41-7.

10. Schneiders A, Zusman, M, Singer, K. Exercise therapy compliance in acute low back pain patients. Man Ther. 1998;3(3):147-52.

11. Chan S, Clough A. A critical evaluation of evidence-based practice of physiotherapy in musculoskeletal medicine. Int Musculoskelet Med. 2010;32(4):163-6 4p.

12. Grimmer K, Bialocerkowski A, Kumar S, Milanese S. Implementing evidence in clinical practice: the 'therapies' dilemma. Physiother. 2005;90:198-4.

13. Manns PJ, Norton AV, Darrah J. Knowledge Translation and Implementation Special Series. Cross-Sectional Study to Examine Evidence-Based Practice Skills and Behaviors of

Physical Therapy Graduates: Is There a Knowledge-to-Practice Gap? Phys Ther. 2015;95(4):568-78 11p.

14. Hendrick P, Mani R, Bishop A, Milosavljevic S, Schneiders AG. Therapist knowledge, adherence and use of low back pain guidelines to inform clinical decisions--a national survey of manipulative and sports physiotherapists in New Zealand. Man Ther. 2013;18(2):136-42.

15. Sirur R, Richardson J, Wishart L, Hanna S. The role of theory in increasing adherence to prescribed practice. Physiother Can. 2009;61(2):68-77.

16. McGrane N, Cusack T, O'Donoghue G, Stokes E. Motivational strategies for physiotherapists. Phys Ther Rev. 2014;19(2):136-42.

17. Thaler D, Sunstein C. Nudge: Improving decisions about health, wealth and happiness. New Haven: CT: Yale University Press; 2008.

18. Sackett DL, Straus SE, Richardson WS R, osenberg W, RB. H. Evidence-based Medicine – How to practice and teach EBM (2nd edn). Oxford: Churchill Livingstone,; 2000.

19. Hiller A, Guillemin M, Delany C. Exploring healthcare communication models in private physiotherapy practice. Patient Educ Couns. 2015;98(10):1222-8.

20. Isaac CA, Franceschi A. EBM: evidence to practice and practice to evidence. J Eval Clin Pract. 2008;14(5):656-9.

21. Barron CJ, Moffett JA, Potter M. Patient expectations of physiotherapy: definitions, concepts, and theories. PHYSIOTHER THEORY PRACT. 2007;23(1):37-46.

22. Davis HF, L. (eds). Counselling and communication in healthcare. Chichester, UK: John Wiley & Sons Ltd; 1991.

23. DiMatteo MR, Haskard-Zolnierek KB, Martin LR. Improving patient adherence: a three-factor model to guide practice. Health Psych Rev. 2012;6(1):74-91.

24. Poulis I. Approaches to conflicts between treatment recommendations and patients' decisions in physiotherapy: a case study. Phys Ther Rev. 2012;17(3):184-9 6p.

25. Picorelli AM, Pereira LS, Pereira DS, Felicio D, Sherrington C. Adherence to exercise programs for older people is influenced by program characteristics and personal factors: a systematic review. J Physiother. 2014;60(3):151-6.

26. Jack K, McLean SM, Moffett JK, Gardiner E. Barriers to treatment adherence in physiotherapy outpatient clinics: a systematic review. Man Ther. 2010;15(3):220-8.

27. Henry KD, Rosemond C, Eckert LB. Effect of number of home exercises on compliance and performance in adults over 65 years of age. Phys Ther. 1999;79(3):270-7.

28. Fakhry M, Hanna GB, Anderson O, Holmes A, Nathwani D. Effectiveness of an audible reminder on hand hygiene adherence. Am J Infect Control. 2012;40(4):320-3.

29. Robinson L, Newton JL, Jones D, Dawson P. Self-management and adherence with exercise-based falls prevention programmes: a qualitative study to explore the views and experiences of older people and physiotherapists. Disabil Rehabil. 2014;36(5):379-86.

30. Hyland G, Hay-Smith J, Treharne G. Women's experiences of doing long-term pelvic floor muscle exercises for the treatment of pelvic organ prolapse symptoms. Int Urogynecol J. 2014;25(2):265-71.

31. Shiffman RN, Dixon J, Brandt C, Essaihi A, Hsiao A, Michel G, et al. The GuideLine Implementability Appraisal (GLIA): development of an instrument to identify obstacles to guideline implementation. BMC Med Inform Decis Mak. 2005;5:23.

32. O'Riordan C, Clifford A, Van De Ven P, Nelson J. Chronic Neck Pain and Exercise Interventions: Frequency, Intensity, Time, and Type Principle. Arch Phys Med Rehabil. 2014;95(4):770-83.

33. Sanson-Fisher R, Campbell EM, Redman S, DJ. H. Patient-provider interactions and patient outcomes. Diabetes Educ. 1989;15:134-8.

34. Sandberg EH, Sharma R, Sandberg WS. Deficits in retention for verbally presented medical information. Anesthesiol. 2012;117(4):772-9.

35. Schoo AMM, Morris ME, Bui QM. The effects of mode of exercise instruction on compliance with a home exercise program in older adults with osteoarthritis. J Physiother. 2005;91(2):79-86.

36. Grady A, Bryant J, Carey M, Paul C, Sanson-Fisher R. Enablers of the implementation of tissue plasminogen activator in acute stroke care: a cross-sectional survey. PLoS One. 2014;9(12):e114778.

37. Harman K, MacRae M, Vallis M. The Development and Testing of a Checklist to Study Behaviour Change Techniques used in a Treatment Programme for Canadian Armed Forces Members with Chronic Non-specific Low Back Pain. Physiother Canada. 2014;66(3):313-21 9p.

38. Wesch N, Hall C, Prapavessis H, Maddison R, Bassett S, Foley L, et al. Self-efficacy, imagery use, and adherence during injury rehabilitation. Scand J Med Sci Sports. 2012;22(5):695-703.

39. Picorelli AM, Pereira DS, Felicio DC, Dos Anjos DM, Pereira DA, Dias RC, et al. Adherence of older women with strength training and aerobic exercise. Clin Interv Aging. 2014;9:323-31.

40. Escolar-Reina P, Medina-Mirapeix F, Gascon-Canovas JJ, Montilla-Herrador J, Jimeno-Serrano FJ, de Oliveira Sousa SL, et al. How do care-provider and home exercise program characteristics affect patient adherence in chronic neck and back pain: a qualitative study. BMC Health Serv Res. 2010;10:60.

41. Kravitz RL, Hays RD, Sherbourne CD, DiMatteo MR, Rogers WH, Ordway L, et al. Recall of recommendations and adherence to advice among patients with chronic medical conditions. Arch Intern Med. 1993;153(16):1869-78.

42. Hudon A, Gervais MJ, Hunt M. The contribution of conceptual frameworks to knowledge translation interventions in physical therapy. Phys Ther. 2015;95(4):630-9.

43. Kamper SJ, Moseley AM, Herbert RD, Maher CG, Elkins MR, Sherrington C. 15 years of tracking physiotherapy evidence on PEDro, where are we now? Br J Sports Med. 2015.

44. Higgins JP, Altman DG, Gotzsche PC, Juni P, Moher D, Oxman AD, et al. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. BMJ. 2011;343:d5928.

45. Moseley AM, Herbert RD, Maher CG, Sherrington C, Elkins MR. Reported quality of randomized controlled trials of physiotherapy interventions has improved over time. J Clin Epidem. 2011;64(6):594-601.

46. Sanson-Fisher RW, D'Este CA, Carey ML, Noble N, Paul CL. Evaluation of systems-oriented public health interventions: alternative research designs. Annu Rev Public Health. 2014;35:9-27 19p.

DISCUSSION

Thesis overview

The main objective of this body of work was to address gaps in the literature related to patient adherence to physiotherapist-prescribed self-management strategies.

More specifically, this thesis addressed gaps in the broader research related to the:

1) Prescription of self-management strategies by physiotherapists in Australian private practice (paper one),
2) Perceptions of Australian private physiotherapist practitioners regarding patient adherence to prescribed self-management strategies encountered in their practice (paper two).
3) Level of patient-reported adherence to self-management strategies prescribed in Australian private practice, and the characteristics associated with patient-reported high levels of adherence reported at strategy level (paper three).
4) Literature on patient adherence published over the last 20 years and the types of adherence measures used to assess patient adherence and the reported accuracy of those measures (paper four).
5) Comparison of three different measures of patient adherence to prescribed home-based exercises by physiotherapists in private practice, (paper five).
6) The effectiveness of interventions to aid patient adherence to all physiotherapist-prescribed self-management strategies (paper six).
7) Presentation of a behavioural model based on current evidence on how best to aid patient adherence to physiotherapist-prescribed self-management strategies (paper seven).

Examination of the physiotherapy literature indicated that most adherence research has concentrated on prescription of home-based exercise rather than other self-management strategies. Therefore, this body of work focused on a broader range of physiotherapist-prescribed self-management strategies, including, but not limited to, exercise, advice, the use of ice or heat, lumbar rolls, removable braces, and self-taping. This thesis comprises seven papers; of which five are published and two are under editorial review in peer-reviewed international journals. Four of the papers are data-based (papers one, two, three and five), two are reviews of the literature (papers four and six) and one is a commentary presenting a behavioural model (paper seven). A summary of the design of the studies reported within the papers is included below:

Papers one and three reported a cross-sectional observational study of 113 physiotherapist-patient consultations involving 14 physiotherapists from four private physiotherapy practices across two Australian states. **Paper three** also presented the results derived from follow-up telephone interviews with each patient participant in the cross-sectional observational study.

Paper two reported on a cross-sectional web-based survey of 298 practising physiotherapists across all Australian states and territories.

Paper five reported on a cross-sectional observational study conducted within six Australian physiotherapy private practices involving 15 physiotherapists and 61 patient participants. This paper presented the results of patient-specific questionnaires completed by each treating physiotherapist. It also reported data obtained via patient self-report and research physiotherapist coding of face-to-face interviews and exercise demonstration with each patient participant.

Paper four was a critical review of the quantity and quality of adherence literature related to patient adherence in physiotherapy over the last 20 years.

Paper six was a systematic review of the literature summarising 12 included randomised controlled trials of interventions used to aid patient adherence to physiotherapist-prescribed self-management strategies.

Paper seven presented a six-step behavioural model to guide physiotherapists during the self-management prescription process. Each step of this model was based on up-to-date evidence on how best to aid or 'nudge' patient adherence to each prescribed strategy. Ways in which this model can be incorporated into routine physiotherapy practice are also suggested.

A detailed account of the main findings of the papers included in this thesis is provided below, followed by an analysis of the strengths and limitations, clinical implications and recommendations for future research of this body of work.

Summary of main findings

Physiotherapist-prescribed self-management strategies are an integral component of physiotherapy

Physiotherapists can play an important role in prescribing, encouraging and monitoring patient self-management. The contact time that physiotherapists have with their patients enables them to identify issues impacting on their patients' health and physical functioning [1] and develop strategies to overcome these issues. Patient self-management is considered by the World Confederation for Physical Therapy as an integral component of physiotherapy treatment [2]. A modified Delphi study conducted in the UK in 2012 identified that exploring the role, content and effectiveness of self-management strategies in physiotherapy were research priorities [3]. However, there is little data on the extent to which self-management strategies are prescribed in Australian physiotherapy private practice.

Results of a survey of 298 physiotherapists, reported in paper two, indicate that 89% of practising physiotherapists perceived the following self-management strategies to be important for improving patient outcomes: exercise, advice (postural advice, increasing physical activity/ general fitness), self-taping, removable braces, self-massage and weight management strategies [4]. In line with this, the observational study of 113 private practice physiotherapist-patient consultations (reported in paper one), found that 96% of patients were prescribed one or more self-management strategies from a range of nine different types of strategies (exercise, advice, ice, heat, lumbar roll, removable braces, self-taping, self-massage, self-mobilisation) [5].

Papers one and two make a significant contribution to addressing identified gaps in the literature on the role and use of self-management strategies in physiotherapy [4, 5]. These papers also enhance knowledge about physiotherapists' engagement with patient self-management, and motivations behind this (i.e. widely held perceptions that self-management is important for improving patient outcomes [4]). As reported in paper one, physiotherapists were observed to spend, on average, almost one quarter of the consultation time related to self-management prescription [5]. Some physiotherapists devoted up to half of the consultation time on patient self-management [5]. This is a notable amount of time given the competing priorities during physiotherapist-patient consultations such as devoting time to patient assessment and treatment. The amount of self-management prescription time could be seen as a metric of the importance placed upon patient self-management by physiotherapists.

<u>Adherence to physiotherapist prescribed self-management strategies needs to be improved</u>

The effectiveness of self-management strategies is dependent upon the level of patient adherence [6-8]. Several studies in this body of work explored levels of patient adherence to self-management strategies using different methods, including patient-report, physiotherapist perspective and observational data. In paper two, physiotherapists were asked to consider the last 10 patients to whom they had prescribed either exercise; self-taping; removable braces; and advice, and then report how many of these 10 patients they perceived had adhered to at least 80% of each prescribed strategy [4]. The mean perceived percentage of adherent patients reported by physiotherapists was: 70% for exercise, 64% for self-taping, 75% for removable braces and 58% for advice [4]. These levels of adherence are similar to the mean level (67%) across all of the studies included in the systematic review of interventions to aid patient adherence to physiotherapist-prescribed self-management strategies (paper six) [9]. However, lower levels of adherence were identified in the observational studies reported in papers three and five, where self-reported adherence was 56% among patients with musculoskeletal injuries; and 14-39% (depending on the type of measure used) among patients with chronic low back pain. Adherence levels in earlier research has also shown substantial variation; 30% of adults with cystic fibrosis adhered to daily self-managed chest physiotherapy [10]; 49% of participants completed a home-based exercise program for low back pain [11] and 62% of participants adhered to home exercises for meniscal tears and osteoarthritis [12]. Taken together these results indicate that levels of patient adherence to physiotherapist-prescribed self-management strategies are sub-optimal. Improving levels of patient adherence may potentially have a positive impact on patient treatment outcomes and therefore, exploring ways to maximise patient adherence should be a research priority.

<u>Different methods of measuring adherence provide different estimates of adherence</u>

One of the aims of the critical review (paper four) was to examine the types of measures used to assess patient adherence in the physiotherapy literature as well as the reported accuracy of these measures. A key finding of this review (paper four) was the lack of a ‘gold standard’ measure of patient adherence to physiotherapist-prescribed self-management strategies [13]. Therefore, in this thesis a range of different methods were employed to assess adherence.

Patient adherence can be assessed from both the physiotherapist and patient perspective. Paper five reported on a comparison of patient self-reported levels of adherence with physiotherapists' perceptions of patient adherence to a prescribed exercise program for low back pain. The results demonstrated that there was poor agreement between these two measures (raw agreement 0.21). It has previously been reported that physiotherapists may demonstrate a tendency to underestimate patient levels of adherence [14]. Whereas it has been reported that patients have a tendency to over-estimate their level of adherence, either intentionally or otherwise [15]. Without knowing the 'true' level of patient adherence it is impossible to know which of these two measures are more accurate.

It has been suggested that the use of observational measures of adherence may improve adherence measurement accuracy [13, 16]. Observational methods have also been used to assess adherence to a range of self-management strategies, particularly in relation to medication adherence. One paper related to self-management in cystic fibrosis reported disparities between patient self-report and an observational measure of medication adherence; with self-reported adherence being much higher than data derived from electronic monitoring [17]. However, studies which compare patient self-report to home-based exercise programs with an observational measure have been difficult to locate during literature searching. One study did compare the number of patient-reported completions of a home exercise routine using a video-recorded program with the number of times the video-recorded program was actually played (using a hidden counter within the video cassette)[18]. The results indicated that the number of times patients self-reported playing the video to complete the exercise program was significantly greater than the number of times the video had actually been played [18]. The results of paper five support these findings with the percentage of patients self-reporting as completely adherent (39%) being greater than the percentage of patients who were considered potentially completely adherent using the observational measure (15%). However, it should be acknowledged that the observational data from paper five did not measure the same aspect of adherence as the self-report data. In paper five, patients self-reported whether they had completed the exercise program as prescribed by their physiotherapist using a four-point Likert scale ('all', 'most', 'some', 'none'). Whereas the observational measure assessed whether the patient was able to recall and provide an accurate demonstration of each of the exercises contained within the prescribed program. It is proposed that key components of an adherence measure to an exercise program should include a report on the number of times and/or frequency each exercise has been completed (whether this is via self-report or using technology such as a smart phone app which is able to log exercise completion rates) as well as some form of exercise demonstration. The second component is vital as a patient may be completing an exercise but following the wrong technique which may compromise the effectiveness of the exercise.

<u>Measures of adherence should capture all of the elements of adherence</u>

Patient adherence to a self-management plan is multidimensional and measures of adherence should reflect this. More specifically adherence measures need to capture whether patients have completed the right strategy, for the prescribed amount of time on the prescribed amount of days. For an exercise program, for example, adherence measures should capture the number and type of exercises, exercise frequency and number of sets/repetitions. For a removable brace this might relate to wearing the brace in the correct position for the prescribed amount of time.

Despite this, the critical review (paper four) reported that patient self-report was the most commonly used measure of adherence in research studies, and that most studies only assess one element of adherence such as the number of times the patient completed the exercise within a given time period [13]. Many studies have used Likert scales to assess whether patients have completed their self-management strategy as prescribed by their physiotherapist. For example, two earlier studies used the same self-report adherence measure which required patients to rate their level of adherence to exercise from 1= not at all, to 5= as advised [19, 20]. Physiotherapists may also use a similar scale to rate their perceived level of patient adherence (as used in paper five). [21]. Self-reported or other-reported measures using Likert scales or a ‘tick box’ in an adherence diary for every day that the patient has completed the strategy, may not capture all of the elements of adherence, such as those related to use of correct technique, strategy instructions or ‘dose’.

Observational measures of adherence have the advantage of enabling assessment of accuracy of self-management technique to determine whether the patient can perform the strategy correctly. However, similar to self-report Likert scales, observational measures often don't capture all aspects of adherence. For example, the Correctness of Exercise Performance (COEP) scale uses a three grade scale to judge whether individual exercises are performed correctly based on the assumption that only patients who complete the exercises correctly can be judged as adherent [22, 23]. However, the limitation of the COEP scale is that it does not take into account adherence to exercise instructions regarding frequency and number of repetitions which is important in establishing that the correct dosage of the exercise program is being completed by patients. The Sport Injury Rehabilitation Adherence Scale (SIRAS) [24] measures patient effort/intensity during exercise performance, their ability to follow instructions and how receptive they are to changes being made to the rehabilitation program [24]. Although the SIRAS is able to capture different elements of adherence when compared to the COEP scale, like the COEP scale it does not measure adherence to specific exercise instructions or 'dose' such as the number of times the exercise has been completed at home compared with the physiotherapist's prescription.

In paper five, many different elements of adherence were considered. Self-report data were used to assess adherence related to whether the patient was completing the correct number of exercises at the correct dose; while observational data were used to assess correct technique. The findings of paper five suggest that a number of patients self-reported completing exercises at home but that they were either completing the wrong type of exercise, undertaking the wrong 'dose' or following an incorrect technique. Therefore, adherence measures which rely on a single method (such as self-report of completion only) may not capture all of these elements of adherence and may not provide an accurate picture of what the patient is actually doing at home.

The challenge for adherence researchers is to develop a measure for use in physiotherapy which uses a multi-faceted approach (i.e. a combination of patient self-report and observational components) to accurately capture all of these complex elements of patient adherence to self-management strategies.

<u>Physiotherapists perceive that there are a number of important methods to aid patient adherence to physiotherapist-prescribed self-management strategies</u>

The cross-sectional survey of 298 practising physiotherapists, reported in paper two, examined their perceptions regarding the importance of methods employed to aid patient adherence and the barriers to using these methods [4]. It was important to survey physiotherapists' attitudes to methods to aid patient adherence because earlier research has indicated that when healthcare professionals perceive something as beneficial and easy to implement into practice, they are more likely to do so [25]. Encouragingly, 99% of surveyed physiotherapists perceived that improving patient adherence was relevant to their clinical practice; and 98% believed that they could positively influence their patients' level of adherence [4]. Physiotherapists perceived that the most important methods to aid patient adherence to prescribed self-management strategies were individualising the strategy to the patient (including tailoring to patient lifestyle and reducing the complexity of the strategy); providing patient education (including providing a clear rationale for the strategy and the provision of supportive material) and practicing the strategy within the consultation (including physiotherapist demonstration, patient practice and checking that the patient understands the instructions) [4]. Physiotherapists surveyed in paper two also reported that there were minimal barriers to implementing these methods into routine practise [4]. For example, physiotherapists reported that they had sufficient time (83%) and knowledge/skills (84%) to assess patient adherence during routine consultations [4]. These results are perhaps indicative of physiotherapists' willingness to integrate these methods to aid patient adherence into routine patient care.

Prescription characteristics may influence patient adherence

The systematic review (paper six), reported that there is insufficient evidence to recommend any of the adherence aiding interventions examined. Despite this, adherence aiding interventions which appeared promising and warrant further investigation include: an activity monitor and feedback system, written exercise instructions, behavioural exercise programme with booster sessions and goal setting.

In paper three, a multiple mixed effects logistic regression model was conducted to explore which, if any, of the adherence aiding methods identified in the literature were associated with higher levels of patient self-reported adherence. Results indicated that when the physiotherapist provided the patient with printed information as well as confirming patient understanding by asking the patient to repeat the details of the self-management program, patients were more likely to report higher levels of adherence. Asking the patient to summarise what has been agreed to during the consultation has been highlighted as forming part of best-practice communication skills [26-28]. This can serve two functions: one, it provides the physiotherapist with an opportunity to correct any misunderstandings and two, it may increase the likelihood of adherence [26]. While causality cannot be inferred due to the study design, these findings are consistent with that of the systematic review regarding the potential value of written exercise instructions. Therefore, taken together these studies indicate that strategies such as provision of written information and seeking confirmation that the patient has understood the self-management strategy prescribed may assist in promoting adherence. [25].

<u>Evidence based strategies from the broader healthcare literature on adherence may be applied to physiotherapy practice.</u>

Given the paucity of evidence for enhancing adherence in the physiotherapy literature identified in paper six, paper seven explored how evidence based strategies from other areas of healthcare may be applied to the physiotherapy context. Six steps or strategies were proposed that could be used by physiotherapists when prescribing self-management strategies to patients [26]. These steps, described in the uCAN model, included: 1) selecting the most clinically relevant self-management strategy based on current evidence regarding the benefit for similar patients with a similar condition as well as providing the patient with a rationale for each strategy; 2) asking the patient about intentions to adhere and identifying barriers and enablers to adherence; 3) individualising the strategy to each patient's circumstances; 4) Providing instructions on when and how to complete each strategy (including verbal as well as in printed formats); 5) building patient skills and confidence via demonstration, practise and feedback, and; 6) confirming patient understanding [26].

However, the uCAN behavioural model has not been tested and there is limited physiotherapy-specific evidence to endorse the use of these methods in clinical practice. A well-designed randomised controlled trial (RCT) investigating the effectiveness of methods to aid patient adherence as set out in the uCAN model (paper seven) as well as those associated with high levels of adherence in paper three, is recommended.

Strengths and limitations of thesis

Paper Two (national survey of practising physiotherapists survey)

The results of paper two may not be generalisable to all Australian physiotherapists

The Australian Physiotherapy Association (APA) 'find a physio' web link was used to locate publically listed practising physiotherapists. Data from 2014 indicates that of the 24,800 physiotherapists who had unlimited (general) registration to practise physiotherapy in Australia [29], over 17,000 (69%) were members of the APA [30]. While most practicing physiotherapists are APA members, not every member of the APA is listed on the 'find a physio' web link which was used to identify the sample for the study reported in paper two. Unfortunately there is no data available on the percentage of APA members represented on the 'find a physio' web-link, or the characteristics of those who are not listed. Given that APA members are more likely to work in private practice compared with all registered physiotherapists (63% compared to 37%), the potential of sampling bias cannot be eliminated [30, 31]. In an attempt to reduce selection bias, all eligible physiotherapists with a listed email address were emailed an invitation to participate in the survey with an enclosed web link to complete the survey [4].

The response rate to the survey in paper two was low at 44% which increases the risk of non-response bias [4]. It was not possible to collect data regarding non-responders due to the study recruitment method. Therefore, a comparison was made between survey responders and Australian workforce datasets from a range of sources to examine representativeness including age, gender, number of hours worked per week, number who graduated in Australia, number in possession of a post-graduate qualification and location of practice [4]. All of these characteristics demonstrated non-significant differences between each study sample and national datasets [4].

Papers One, Three and Five (observational papers)

Limitations related to participant recruitment may affect the generalisability of the results

Data reported in papers one and three were derived from four private practices and paper five from six practices. All practices were located in metropolitan areas, within a 50km radius of two large cities. Therefore, it is unlikely that results are representative of all private physiotherapy practices across Australia, particularly those in rural areas.

The overall numbers of physiotherapists involved in the studies were small, 14 physiotherapists from four practices participated in paper one; while paper five involved a total of 15 physiotherapists from six practices. No major differences were identified between physiotherapist participant characteristics for papers one, two, three and five when compared with Australian physiotherapy workforce datasets, although only a limited number of characteristics were compared.

It should also be noted that in an attempt to recruit a homogenous sample of patients for paper five, recruitment was limited to patients receiving physiotherapy for chronic low back pain. Therefore, the generalisability of the results to other patient populations is limited. However, paper five is believed to be the first to compare patient self-report, physiotherapist-perceptions and an observational measure of adherence. This paper therefore potentially makes a valuable contribution to the literature despite these limitations.

To reduce selection bias, a consecutive sample of physiotherapy patient participants who met each study's inclusion criteria were recruited for the observational studies. The consent rate for these observational studies was very high with between 95-99% of patients invited to participate consenting to take part. Therefore, although participants in these studies may not be representative of all patients seen in physiotherapy private practice across Australia, they could be considered representative of patients from those practices.

<u>Precision and generalisability of results can be affected by sample size in paper five</u>

The sample size was a strength of papers one and three which used the same dataset. In total, 113 physiotherapist-patient consultations were observed involving 14 physiotherapists from four practices. This sample size is greater than the 12 physiotherapists observed during initial patient consultations to review their use of behavioural change techniques [32] or the 52 physiotherapist-patient interactions observed to explore communication models used in physiotherapy private practice [33].

However, the small sample of paper five is a limitation. In total 61 patients were asked to self-report their level of adherence to a prescribed exercise program for chronic low back pain. The same patients were then asked to recall the exercise program specifics and demonstrate each exercise to an independent researcher. The small sample size of patients meant that all of the quantitative findings of paper five were reported with wide 95% confidence intervals thus leading to a cautious interpretation of results.

Observational study participants received limited study information in an attempt to minimise changes of behaviour

The studies reported in papers one, three and five involved direct observation of physiotherapist-patient consultations, or patients demonstrating exercises prescribed for chronic low back pain. Therefore, it is possible that participants altered their behaviour due to the presence of the research physiotherapist. The Hawthorne effect refers to when research participants change their behaviour as a consequence of being studied [34]. An attempt was made to minimise this bias by providing minimal details about each study's aims during recruitment, without deceiving participants. Refer to appendix 10.6 for an example of a participant information statement provided to patients for the study reported in papers one and three. Therefore, although it is possible that physiotherapist and patient participant behaviour was impacted by the presence of the researcher, this was potentially minimised by the participants not being completely aware of the research question in advance, which is a strength of the design of these studies [35].

A number of strategies were used to increase the accuracy of the observational assessments

Paper one reported data regarding the prescription habits and consultation time devoted to self-management in Australian private practice [5]. Previous studies of prescription of self-management strategies have relied upon self-reported practice by physiotherapists [4, 36, 37]. The accuracy of self-reported practice data is questionable because it can be subject to recall bias and social desirability. Therefore a strength of paper one is the collection of observational data on the number, type and methods used to prescribe self-management strategies. A number of strategies were used to enhance the accuracy and reliability of these observations. As mentioned previously, an attempt was made to minimise bias due to the Hawthorne effect by providing minimal details about each study's aims during recruitment.

Strategies were also employed to enhance the accuracy and reliability of the observation checklist including the use of a coding guideline and pilot testing. The observation checklist in papers one and three was pilot tested prior to data collection using mock video clinical vignettes. This provided an opportunity to practise using the observational checklist and to refine the definitions in the coding guideline. A high interrater reliability was achieved (Kappa 0.92) indicating the reliability of the checklist. The same researcher (PhD candidate), who is an experienced physiotherapist collected all of the data during clinical observations and patient telephone interviews in an attempt to maintain consistency in data reporting [38]. The data collection tool for the observational adherence measure in paper five also underwent pilot testing for the same reasons.

<u>Accuracy of assessment of patient adherence in observational studies</u>

In the studies reported in papers three and five, patients were asked to self-report their level of adherence to each self-management strategy prescribed by their physiotherapist. Therefore, as with any self-report measure, accuracy may have been affected by recall bias and social desirability bias. The self-report measure used in paper three classified levels of adherence to each strategy using a four-point Likert scale (‘all’, ‘most’, ‘some’, ‘none’). While results using this scale are simple to report, they do not provide the more detailed information which can result from using adherence diaries or logs. An additional limitation is that the self-reported measure used in paper three (and in general) only report on participants’ perceptions regarding the extent to which they completed each strategy, not whether they have performed the strategy correctly.

While it is well accepted that there are limitations of self-reported adherence data, there is a paucity of information about the extent to which patient self-reported adherence relates to adherence data collected via other methods. A strength of paper five was that in addition to patient self-report, two other methods to assess patient adherence were used (physiotherapist perceptions and observational data). Physiotherapists in paper five were asked whether they felt that their patient had adhered to ‘all’, ‘most’, ‘some’ or ‘none’ of the prescribed exercise program in the last seven days. Results of paper five suggest that the levels of patient adherence as measured by patient-report compared with physiotherapist-perceptions lead to quite different results (39% compared with 16%). However, neither measure provided data on the extent to which patients were able to accurately perform the prescribed exercises. As this is arguably a pre-requisite for adherence, patients were also asked to report exercise program instructions and then demonstrate one of each exercise contained within the prescribed program to an independent researcher. Without a ‘gold standard’ measure of adherence to physiotherapist-prescribed self-management strategies one of the strengths of paper five was the use of multiple measures of adherence which have provided further insight in the complexity of accurately measuring all of the elements of patient adherence.

Predictors of adherence analysed at 'strategy' level can provide new insight when developing adherence aiding interventions

Very few studies have reported patient adherence at the 'self-management strategy' level with previous research reporting self-management adherence at the 'patient' level [12, 39, 40]. The unit of analysis is important as research indicates that patients are often prescribed more than one self-management strategy during their course of physiotherapy [4, 41], thus patients may report different levels of adherence to different strategies. Examining adherence at strategy level may provide important insight into how physiotherapists can develop adherence-aiding skills which focus on the modifiable characteristics of the strategy rather than the patient. For example, the results of paper three suggest that there are a number of prescription characteristics which physiotherapists can modify when prescribing self-management strategies to encourage high levels of adherence including the type of strategy prescribed and the use of supplementary printed information. It is believed that paper three is the first to look at predictors of adherence to a broad range of self-management strategies (not just exercise) prescribed during private practice to patients with musculoskeletal conditions. Therefore, paper three can provide a reference point for future adherence aiding research.

Papers Four and Six (Reviews of the literature)

Unpublished studies, grey literature and studies published in languages other than English were not included in the reviews

The reviews of papers four and six did not include unpublished studies and grey literature in the search strategy which may have influenced the findings. The rationale for this was that studies which have not undergone peer review as part of the publication process and those not easily accessible by clinical physiotherapists offer questionable ability to inform practice [9, 13]. Furthermore, studies which were published in languages other than English were excluded, unless an English translation was also provided within the same journal which was the case with one study [11]. This was due to insufficient resources to translate publications into English. Nonetheless, the possibility of publication bias cannot be excluded as a limitation.

Paper Seven (Commentary proposing a behavioural model)

The uCAN behavioural model requires testing prior to endorsement for clinical practice

Paper seven presented the uCAN behavioural model for aiding patient adherence. Although each step of the model was devised from recent physiotherapy literature and research from other disciplines of healthcare, a key limitation is that the model as a whole has yet to be tested for effectiveness in improving adherence to prescribed self-management strategies. Without this empirical evidence, it cannot be recommended for adoption into clinical practice [26].

Papers One to Six

Reporting guidelines were used in the design and reporting of each paper

Studies one, two, three and five were undertaken and reported in line with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [42]. The STROBE Statement consists of a checklist of 22 items, which relate to the title, abstract, introduction, methods, results and discussion sections of observational studies. The guideline supports authors on how to improve the reporting of observational studies; as well as facilitating critical appraisal by reviewers, journal editors and readers [42]. The critical and systematic reviews (studies four and six) also used rigorous methods to report, review and critically appraise the literature. The Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) Statement consists of a 27-item checklist and a four-phase flow diagram with the aim being to help authors improve the reporting of systematic reviews and meta-analyses [43]. The use of reporting guidelines such as STROBE and PRISMA is encouraged to help researchers improve the completeness and transparency of their research reports and limit the number of poorly reported studies [44]. Therefore, it is hoped that the quality of the studies included in this thesis is enhanced through the use of these guidelines.

Clinical Implications

The results of this body of work give rise to two main implications for physiotherapy clinical practice.

1. <u>Physiotherapists should assess all of the elements of patient adherence in subsequent consultations</u>

Adherence should also be assessed clinically using a multifaceted measure which captures all of the elements of adherence (including type of strategy, frequency of completion and accuracy of technique). Simply asking the patient if they have been completing the prescribed self-management strategy at home using a Likert scale may not provide an accurate assessment of adherence. This is because; one, the patient response might be subject to over-estimation [13, 15, 18] and; two, the patient might be doing the strategy but not using the correct technique or following the prescribed dose. The results of paper five suggest, certainly with respect to patient completion of exercise programs, that patients should be asked to self-report to the physiotherapist not only how many exercises they are completing at home but also program frequency and number of sets/repetitions in order to capture the different elements of adherence. The self-report measure should also be accompanied by an exercise demonstration to assess whether the patient is also following the correct technique (an additional element of adherence). In paper five, 57% of patients self-reporting that they had completed 'all' or 'most' of their exercise program in the last seven days but only 15% of patients could accurately recall and demonstrate their prescribed exercise program to an independent researcher. Therefore, because correct technique is likely to be essential for patients to achieve a clinical benefit, the need for physiotherapists to incorporate patient demonstration of prescribed exercises into routine consultations as a means of checking technique adherence is increasingly important. Patient demonstration may also be applicable for strategies such self-taping, self-massage and donning and doffing a removable brace, where technique of the strategy is also important. Strategy demonstration may also provide the ideal opportunity for physiotherapists to provide reinforcement of the self-management plan [26] or further enable strategy completion at home by incorporating methods to aid patient adherence.

2. Physiotherapists should consider the use of methods to aid patient adherence

A number of methods that physiotherapists use when prescribing self-management strategies to their patients are supported by earlier studies within the physiotherapy and/or healthcare literature. However, these methods still need to be further tested for effectiveness for a wider range of self-management strategies and for different patient populations. These methods might include:

a. Patient education

Patient education such as providing a rationale for the self-management plan may aid patient adherence [26]. A patient-centred approach suggests that patients should be presented with evidence-based self-management options with a brief rationale behind the selection of each strategy. This allows the patient to make an informed decision as to whether they can or will incorporate the strategy into their home treatment program. In the survey reported in paper two, physiotherapists reported that the provision of a clear rationale for each strategy was important for aiding patient adherence. This is supported by a Cochrane review that simple educational strategies may enhance exercise adherence for patients with chronic musculoskeletal pain [45]. However, contrary to this, providing strategy rationale was not found to be associated with higher levels of adherence in paper three. The reason for this may be related to the frequency that physiotherapists were observed to use this method or the different patient populations or simply that strategy rationale needs to be provided in conjunction with other information or strategies to aid adherence.

Additionally, when physiotherapists assess adherence at subsequent consultations, this may provide the ideal opportunity for patients to express any barriers to completing the strategy at home or voice any misgivings about the effectiveness of the strategy [26]. This may lead to additional educational resources being provided by the physiotherapist or reinforcement of the rationale for strategy completion [45].

b. Reducing the complexity of self-management programs and strategies

Research suggests that simple self-management regimes are more likely to be adhered to than more complex ones [28, 46]. Patients in paper five were prescribed a mean number of four exercises per program. However, 20% of physiotherapists gave their patients more than seven exercises (with the maximum being 10 exercises) despite research suggesting that patients are more likely to adhere when prescribed only two exercises [46]. In paper five, patient recall and levels of adherence were poor. Therefore, reducing the number or the complexity of prescribed exercises may result in improved patient recall and adherence, however, further exploration of this is needed. Although paper three did not find any association between the number of strategies prescribed and high levels of adherence, this may reflect that strategies which were not recalled were not included in the analysis. It is possible that prescribing multiple strategies may result in poorer recall and hence adherence [5]. Patients cannot adhere to strategies that they don't recall. In addition, when multiple strategies are prescribed, it can be difficult to ascertain which strategy has been the most beneficial for that patient [5]. Therefore, physiotherapists may wish to consider both the complexity and number of strategies when prescribing self-management plan [5].

c. Other adherence aiding interventions

A correlation between patient-reported intentions to adhere and adherence behaviours was reported in an earlier study [47]. Therefore, physiotherapists should specifically question their patients about their intentions to adhere when prescribing self-management strategies [26]. This discussion may then prompt the physiotherapist to consider the use of interventions to aid patient adherence which may in turn potentially lead to an improvement in treatment outcomes.

While the systematic review (paper six) indicated insufficient evidence to recommend any specific intervention for improving adherence to exercise, four interventions were promising [9]. Using a scientist-practitioner model, physiotherapists could further explore and test the impact of these on adherence among their patients. It is encouraging to note that two out of the four interventions identified as showing promise in this review would be simple to implement [9]. For example, provision of written information is something that could be easily and cheaply integrated into routine practice. The use of printed information was also found to be associated with high levels of adherence in paper three. Similarly, activity monitors could be simple to use at home, particularly given the recent rise in popularity of activity wrist bands aimed at increasing physical activity. Furthermore, with increasing integration of technology into everyday lives (such as smart phone applications), activity monitors are likely to be increasingly acceptable to patients. Interventions such as printed information or activity monitors which may aid adherence, may also aid patient recall or act as a reminder to complete the strategy, thereby increasing their clinical utility.

If proved effective, further translational research studies are required regarding the implementation of these adherence aiding interventions into routine clinical practice.

Recommendations for future research

<u>Further exploration of the role of recall in non-adherence is needed</u>

Patient non-adherence can be classified as intentional (when patients actively decide not to follow the prescribed strategy) or unintentional due to issues with recall [48]. Intentional non-adherence is the subject of much debate in the literature [48, 49]. Unintentional patient non-adherence may relate to patients simply forgetting aspects of the strategy's instructions such as the number of times to complete an exercise per week; or patients may not recall being prescribed the strategy at all. Previous studies in other areas of healthcare show that a large percentage of chronically ill patients failed to recall elements of potentially important medical advice [50]. Recall can be adversely affected by memory problems in older adults, or due to increased stress related to pain or being in an unfamiliar environment [28, 51]. In addition, one study reported that the more verbal information provided, the lower the recall [52]. In an earlier study, a total of 1751 patients with diabetes mellitus, hypertension, and heart disease were identified among 20,223 patients visiting family physicians, general internists, cardiologists, and endocrinologists [50]. The main outcome measure of this study was patient ability to recall 15 disease-specific recommendations provided during their medical consultations [50]. Results indicated that among patients in these three disease groups, the proportion of patients able to recall recommendations to take prescribed medications exceeded the fraction recalling recommendations to follow a restricted diet, exercise regularly, and perform various self-care activities [50]. The authors of this study concluded that patient treatment outcomes can be improved when healthcare professionals assess their patient's ability to recall instructions or advice; but this step is often neglected during patient consultations [50].

There is a need to explore the impact of patient recall on patient adherence to prescribed self-management strategies in physiotherapy. Observational data collected during the 113 physiotherapist-patient consultations in paper three indicated that 232 self-management strategies were prescribed by physiotherapists, however, results of the telephone interview showed that patients only recalled 170 (73%) of these strategies during a telephone interview 10-14 days later. This means that 62 strategies (27%) were not recalled by patient participants and therefore, could not have been adhered to, given that recall is a necessary component of adherence [50]. However, there is a paucity of research related to this unintentional non-adherence to physiotherapy. A study which explores patient recall would be a great addition to the physiotherapy literature.

Interestingly, patients who were prescribed exercise were more likely to recall being given this strategy; 97% of exercise prescriptions were recalled compared with 52% for advice and 58% for other strategies. Therefore research into patient recall may be able to delineate the reasons for this, and explore which methods physiotherapists should implement to aid recall and potentially improve levels of adherence. A number of the methods shown to be associated with higher levels of adherence may also aid patient recall, although this has not been investigated in relation to self-management prescription in physiotherapy practice. Therefore, specific areas for future research may include developing and testing the impact of methods to enhance recall of prescribed self-management strategies such as provision of supplementary printed information. Further research regarding patient recall and its impact on adherence in physiotherapy is recommended.

<u>There is a need to develop of an accurate measure of adherence to self-management strategies</u>

Issues related to the complexity of accurately measuring patient adherence is a recurring theme in healthcare literature [13, 16]. In physiotherapy, there is a need to establish an adherence measure which has good measurement accuracy [13]. Paper five is believed to be the first study to compare patient-report with physiotherapist-perceptions and an observational measure. This is an important step towards the development of a robust multi-faceted measure of adherence to physiotherapist-prescribed self-management strategies which is able to capture all of the elements of adherence (related to 'dose' and strategy performance). This should include exploring the use of Smartphone Apps for monitoring and recording exercise adherence. Although no studies were located for inclusion in the use of these Apps in the reviews of papers four and six, this is an emerging area which warrants further investigation. The results of paper five provide useful background information to be considered when designing such a measure [16]. Bollen et al (2014) reported that there is an urgent need to develop valid and reliable adherence measures that can be used for rehabilitation research purposes [16]. When testing the effectiveness of self-management strategies for specific conditions in physiotherapy, there is a need for robust measures of adherence to interventions. Without this, it is unclear whether a non-significant intervention effect reflects an ineffective self-management strategy or poor adherence among the intervention group. The importance of developing an accurate measure of adherence to self-management for research and clinical assessment purposes cannot be overstated. Therefore, the next logical step in physiotherapy research would be to develop and test the accuracy of a multi-faceted measure of adherence which captures all of the elements of adherence.

<u>The development of a well-designed RCT to test the effectiveness of the uCAN behavioural model</u>

The steps of the uCAN behavioural model (paper seven) are based on evidence from physiotherapy and other healthcare settings. However, the model as a whole was not tested as part of this thesis. Therefore, further research is needed to test the uCAN model for effectiveness in aiding patient adherence to physiotherapist prescribed self-management strategies [26]. Suggested aims for this study could include the following:

Primary aim: To test the effectiveness of the uCAN model in improving adherence to physiotherapist-prescribed exercises among non-specific chronic low back pain patients at 6, 12 and 24 week follow up.

Secondary aim: To test the effectiveness of the uCAN model in improving back-specific function, general health, pain and work limitations.

Randomised controlled trials (RCTs) are considered the gold-standard research design for evaluating the effectiveness of a healthcare interventions [53], including physiotherapy interventions [54]. A RCT methodology is grounded in a medical paradigm in which individuals are randomly assigned to receive an intervention or control condition which assists in eliminating selection bias [55]. Therefore, a RCT is likely to provide the most robust test of the effectiveness of the uCAN behavioural model in improving patient adherence to self-management strategies and potentially improve patient outcomes.

For interventions which seek to change healthcare provider practice, randomisation at patient level does introduce the possibility of experimental contamination [56]. For example, it is possible that both intervention and control participants could be treated by the same physiotherapist. Therefore, it is possible that the physiotherapist may inadvertently deliver components of the intervention to the patient allocated to the usual care group. This could lead to confounding results. An alternative study design that could be applied in this setting to minimise the risk of experimental contamination could be a cluster RCT, where randomisation of physiotherapists or physiotherapy practices replaces traditional randomisation of patients [56]. Cluster RCTs are most effective when large numbers of clusters are recruited to balance potentially confounding characteristics in the intervention and control arms of the study [57]. Therefore, cluster-RCTs can be more costly and time consuming to conduct due to the need to recruit an increased number of physiotherapy practices. Cluster RCTs may be considered the 'gold standard' design for many interventions such as educational interventions targeted at the health professional rather than the individual patient [58]. Therefore, a cluster RCT may be the most appropriate study design to test the effectiveness of the uCAN model.

A further consideration is the type of sampling strategy used in order to increase the homogeneity of the patient population [59]. For example, it might be useful to consider testing the uCAN model in relation to the prescription of exercise only, given that this is the most commonly prescribed strategy (paper one), which is grounded in a firm evidence base for a number of patient populations including chronic low back pain and knee osteoarthritis [60, 61].

Intervention fidelity will also need to be assessed in order to allow for accurate interpretations of treatment effects [62]. One review identified four core components of intervention fidelity: 1) intervention design and protocols; 2) intervention training; 3) monitoring of intervention delivery; and, 4) monitoring of intervention receipt, which should be considered when designing intervention-based research [62].

A final consideration would be to determine how patient adherence in this study will be measured. Paper five has supported the use of a multi-faceted measure of patient adherence which captures all of the elements of adherence. Therefore, a measure which incorporates patient-report and observational data which assesses both strategy dose and technique might provide a way forward in the absence of a 'gold standard' measure.

The benefits of conducting such a research study would be that if the steps included in the uCAN behavioural model are found to be effective in improving patient adherence, this model could contribute to the development of best-practice prescribing guidelines in physiotherapy.

Conclusions

This body of work represents an innovative and methodologically rigorous effort to describe physiotherapy patient adherence to a range of self-management strategies, and to provide insight regarding the use of adherence-aiding strategies. Poor patient adherence to treatment plans is not only an issue in physiotherapy [49] but within healthcare as a whole [63]. This thesis used a range of research methodologies to investigate patient adherence to physiotherapist-prescribed self-management strategies.

Physiotherapist-prescribed self-management strategies are an integral component of physiotherapy treatment in Australian private practice [5]. Physiotherapists in paper one were observed to regularly prescribe self-management strategies to their patients and allocate approximately 25% of their consultation time to self-management prescription [5].

However, levels of patient adherence to self-management could be improved. The physiotherapists surveyed in paper two perceived that levels of adherence to self-management strategies are currently sub-optimal [4], which is supported by the observational data reported in papers three and five.

Encouragingly, physiotherapists in paper two indicated a willingness to apply methods to aid patient adherence to self-management strategies. Results from paper three indicate that higher levels of patient adherence was associated with the use of printed information and asking patients to repeat the self-management plan, however given the cross sectional study design causality cannot be determined. This finding was supported by the paper six systematic review indicating that the following interventions could be effective in aiding patient adherence: supplementary patient information, behavioural exercise program and activity monitors [9].

Papers four and five demonstrated the paucity of research related to well-developed and reliable measures of patient adherence [13], and the need for more high quality trials examining the effectiveness of a range of adherence aiding interventions (paper six) [9]. However, paper four highlighted the need to not only increase the quantity of adherence research in physiotherapy but to also improve the methodological quality [9, 13].

Finally, paper seven presented the uCAN behavioural model, which was based on six steps (each supported by evidence of varying levels from healthcare literature) to aid patient adherence to physiotherapist-prescribed self-management strategies [26].

In conclusion, this thesis highlights the need for physiotherapists to carefully consider the complex issues surrounding patient adherence and how best to aid this when prescribing self-management strategies to their patients.

References

1. Richardson, J., et al., *Self-management interventions for chronic disease: a systematic scoping review.* Clin Rehabil, 2014. **28**(11): p. 1067-77.

2. World Confederation for Physical Therapy. *World Confederation for Physical therapy. Policy statement. Description of physical therapy*. 2011 [cited 2015 7th May]; Available from: http://www.wcpt.org/sites/wcpt.org/files/files/PS_Description_PT_Sept2011_FORMATTED_edit2013.pdf.

3. Rankin, G., et al., *Chartered Society of Physiotherapy's identification of national research priorities for physiotherapy using a modified Delphi technique.* Physiother, 2012. **98**(3): p. 260-72.

4. Peek, K., et al., *Physiotherapists' perceptions of patient adherence to prescribed self-management strategies: A cross-sectional survey of Australian physiotherapists.* Disabil Rehabil, 2016 **available at: http://dx.doi.org/10.1080/09638288.2016.1212281**.

5. Peek K, et al., *An observational study of Australian private practice physiotherapy consultations to explore the prescription of self-management strategies.* Musculoskelet Care, 2017. Available at :https://doi.org/10.1002/msc.1181.

6. Spetch, L.A. and G.S. Kolt, *Adherence to sport injury rehabilitation: implications for sports medicine providers and researchers.* Phys Ther Sport, 2001. **2**(2): p. 80-90.

7. O'Brien, L., *Adherence to therapeutic splint wear in adults with acute upper limb injuries: a systematic review.* J Hand Ther 2010. **Mar 15**(1): p. 3-12.

8. Middleton, A., *Chronic Low Back Pain: Patient Compliance With Physiotherapy Advice and Exercise, Perceived Barriers and Motivation.* Phys Ther Rev, 2004. **9**(3): p. 153-160.

9. Peek, K., et al., *Interventions to aid patient adherence to physiotherapist prescribed self-management strategies: A systematic review.* Physiother, 2016. **102**(2): p. 127-135.

10. Myers, L.B. and S.A. Horn, *Adherence to chest physiotherapy in adults with cystic fibrosis.* J Health Psychol, 2006. **11**(6): p. 915-926.

11. Alexandre, N.M., et al., *Predictors of compliance with short-term treatment among patients with back pain.* Rev Panam Salud Publica, 2002. **12**(2): p. 86-94.

12. Tuakli-Wosornu, Y.A., et al., *Predictors of Exercise Adherence in Patients With Meniscal Tear and Osteoarthritis.* Arch Phys Med Rehabil, 2016. **97**(11): p. 1945-1952.

13. Peek, K., et al., *Patient adherence to physiotherapist prescribed self-management strategies: A critical review.* Int J Ther Rehabil, 2015. **22**(11): p. 535-543.

14. Campbell, R., et al., *Why don't patients do their exercises? Understanding non-compliance with physiotherapy in patients with osteoarthritis of the knee.* J Epidemiol Comm Health, 2001. **55**(2): p. 132-138.

15. Kettler, L.J., et al., *Determinants of adherence in adults with cystic fibrosis.* Thorax, 2002. **57**(5): p. 459-64.

16. Bollen, J., et al., *A systematic review of measures of self-reported adherence to unsupervised home-based rehabilitation exercise programmes, and their psychometric properties.* BMJ open, 2014. **4**.

17. O'Donohoe, R. and B.M. Fullen, *Adherence of subjects with cystic fibrosis to their home program: a systematic review.* Respir Care, 2014. **59**(11): p. 1731-46.

18. Brewer, B.W., et al., *Rehabilitation adherence and anterior cruciate ligament reconstruction outcome.* Psych, Health & Med, 2004. **9**(2): p. 163-175.

19. Bassett, S.F. and H. Prapavessis, *Home-based physical therapy intervention with adherence-enhancing strategies versus clinic-based management for patients with ankle sprains.* Phys Ther, 2007. **87**(9): p. 1132-43.

20. O'Brien D, Bassett S, and M. P, *The effect of action and coping plans on exercise adherence in people with lower limb osteoarthritis: a feasibility study.* NZ J physiother, 2013. **41**(2): p. 49-57.

21. Prince, S.A., et al., *A comparison of direct versus self-report measures for assessing physical activity in adults: a systematic review.* Int J Behav Nutr Phys Act, 2008. **5**(1): p. 56.

22. Friedrich, M., T. Cermak, and P. Maderbacher, *The effect of brochure use versus therapist teaching on patients performing therapeutic exercise and on changes in impairment status.* Phys Ther, 1996. **76**(10): p. 1082-8.

23. Schoo, A.M.M., M.E. Morris, and Q.M. Bui, *The effects of mode of exercise instruction on compliance with a home exercise program in older adults with osteoarthritis.* J Physiother, 2005. **91**(2): p. 79-86.

24. Kolt, G.S., et al., *The Sport Injury Rehabilitation Adherence Scale: a reliable scale for use in clinical physiotherapy.* Physiother, 2007. **93**(1): p. 17-22.

25. Grol, R. and J. Grimshaw, *From best evidence to best practice: effective implementation of change in patients' care.* The lancet, 2003. **362**(9391): p. 1225-1230.

26. Peek, K., et al., *Aiding patient adherence to physiotherapist-prescribed self-management strategies: An evidence-based behavioural model in practice.* Phys Ther Rev, 2016. Available at: https://doi.org/10.1080/10833196.2016.1226537.

27. Sanson-Fisher, R., et al., *Patient-provider interactions and patient outcomes.* Diabetes Educ, 1989. **15**: p. 134-138.

28. DiMatteo, M.R., K.B. Haskard-Zolnierek, and L.R. Martin, *Improving patient adherence: a three-factor model to guide practice.* Health Psych Rev, 2012. **6**(1): p. 74-91.

29. Physiotherapy Board of Australia, *March Newletter*. 2016.

30. Dripps, M. *Utilising private sector capacity in clinical training- challenges and opportunities.* 2014 [cited 2015 5th May]; Available from: http://www.slideshare.net/informaoz/marcus-dripps-australian-physiotherapy.

31. Physiotherapy Board of Australia. *Physiotherapy registrant data: December 2014* 2014 [cited 2015 7th May]; Available from: http://www.physiotherapyboard.gov.au/About/Statistics.aspx.

32. Emilson, C., et al., *Physical therapists' assessments, analyses and use of behavior change techniques in initial consultations on musculoskeletal pain: direct observations in primary healthcare.* BMC Musculoskelet Disord, 2016. **17**: p. 1-14.

33. Hiller, A., M. Guillemin, and C. Delany, *Exploring healthcare communication models in private physiotherapy practice.* Patient Educ Couns, 2015. **98**(10): p. 1222-8.

34. McCambridge, J., J. Witton, and D.R. Elbourne, *Systematic review of the Hawthorne effect: New concepts are needed to study research participation effects.* J Clin Epidemiol, 2014. **67**(3): p. 267-277.

35. Johnson, T.P. and F.J. Van de Vijver, *Social desirability in cross-cultural research.* Cross-cultural survey methods, 2003. **325**: p. 195-204.

36. Fidvi N, M.S., *Physiotherapy management of low back pain in India- a survey of self-reported practice.* Physiother Res Int, 2010. **15**: p. 150-159.

37. Liddle SD, Baxter GD, and G. JH, *Physiotherapists' use of advice and exercise for the management of chronic low back pain: A national survey.* Man Ther, 2009. **14**: p. 189-196.

38. Collins, D., *Pretesting survey instruments: an overview of cognitive methods.* Qual Life Res, 2003. **12**(3): p. 229-238.

39. Alewijnse, D., et al., *Predictors of long-term adherence to pelvic floor muscle exercise therapy among women with urinary incontinence.* Health Educ Res, 2003. **18**(5): p. 511-524.

40. McCullough, A.R., et al., *Predictors of adherence to treatment in bronchiectasis.* Respir Med, 2015. **109**(7): p. 838-45.

41. Crowe, M., et al., *Self-management and chronic low back pain: a qualitative study.* J Adv Nurs, 2010. **66**(7): p. 1478-86.

42. Vandenbroucke, J.P., et al., *Strengthening the Reporting of Observational Studies in Epidemiology (STROBE): explanation and elaboration.* Epidemiol, 2007. **18**(6): p. 805-35.

43. Moher, D., et al., *Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement.* PLoS Med, 2009. **6**(7): p. e1000097.

44. Moher, D., et al., *Guidance for developers of health research reporting guidelines.* PLoS Med, 2010. **7**(2): p. e1000217.

45. Kroon, F.P., van der Burg, L. R., Buchbinder, R., Osborne, R. H.,Johnston, R. V. and Pitt, V., *Self-management education programmes for osteoarthritis.* Cochrane Database Syst Rev, 2014(1)

46. Henry, K.D. and C. Rosemond, *Effect of Number of Home Exercises on Compliance and Performance in Adults Over 65 Years of Age.* Phys Ther, 1999. **79**(3): p. 270.

47. Bassett, S.F. and H. Prapavessis, *A test of an adherence-enhancing adjunct to physiotherapy steeped in the protection motivation theory.* Physiother Theory Pract, 2011. **27**(5): p. 360-372.

48. Bassett, S., *Bridging the intention-behaviour gap with behaviour change strategies for physiotherapy rehabilitation non-adherence.* NZ J Physiother, 2015. **43**: p. 105-111 7p.

49. Bassett, S., *The assessment of patient adherence to physiotherapy rehabilitation.* NZ J physiother, 2003. **31**(2): p. 60-66.

50. Kravitz, R.L., et al., *Recall of recommendations and adherence to advice among patients with chronic medical conditions.* Arch Intern Med, 1993. **153**(16): p. 1869-78.

51. Linn, A.J., et al., *May you never forget what is worth remembering: the relation between recall of medical information and medication adherence in patients with inflammatory bowel disease.* J Crohn's Colitis, 2013. **7**(11): p. e543-e550.

52. Latorre-Postigo, J.M., et al., *Older adults' memory for medical information, effect of number and mode of presentation: An experimental study.* Patient Educ Couns, 2017. **100**(1): p. 160-166.

53. Sullivan, G.M., *Getting Off the "Gold Standard": Randomized Controlled Trials and Education Research.* J Grad Med Educ, 2011. **3**(3): p. 285-289.

54. Maher, C.G., et al., *A description of the trials, reviews, and practice guidelines indexed in the PEDro database.* Phys Ther, 2008. **88**(9): p. 1068-77.

55. Sanson-Fisher, R.W., et al., *Evaluation of systems-oriented public health interventions: alternative research designs.* Annu Rev Public Health, 2014. **35**: p. 9-27 19p.

56. Torgerson, D.J., *Contamination in trials: is cluster randomisation the answer?* BMJ 2001. **322**(7282): p. 355-357.

57. Reich, N.G. and A. Milstone, *Improving efficiency in cluster-randomized study design and implementation.* Open Access J Clin Trials, 2013. **6**: p. 11-15.

58. Campbell, M.K., et al., *Analysis of cluster randomized trials in primary care: a practical approach.* Fam Pract, 2000. **17**(2): p. 192-196.

59. Palinkas, L.A., et al., *Purposeful sampling for qualitative data collection and analysis in mixed method implementation research.* Adm Policy Mental Health, 2015. **42**(5): p. 533-544.

60. Saragiotto, B.T., et al., *Motor Control Exercise for Non-specific Low Back Pain: A Cochrane Review.* Spine (Phila Pa 1976), 2016.

61. Bennell, K. and F. Dobson, *Review: Exercise interventions improve pain and function in people with knee osteoarthritis compared with no exercise.* Evid Based Nurs, 2014. **17**(4): p. 109.

62. Gearing, R.E., et al., *Major ingredients of fidelity: A review and scientific guide to improving quality of intervention research implementation.* Clin Psych Rev, 2011. **31**(1): p. 79-88.

63. McLean, S.M., et al., *Interventions for enhancing adherence with physiotherapy: a systematic review.* Man Ther, 2010. **15**(6): p. 514-21.

Patient adherence to physiotherapist-prescribed self-management strategies

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APPENDICES

CONTENTS

Appendix 1: Paper One

John Wiley & Sons have kindly granted permission to copy and communicate this work:

Peek, K., Carey, M., Mackenzie, L. & Sanson-Fisher, R. "An observational study of Australian private practice physiotherapy consultations to explore the prescription of self-management strategies." Musculoskeletal Care. (2017) https://doi.org/10.1002/msc.1181

Appendix 1.1: Published Paper

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WILEY

RESEARCH ARTICLE

An observational study of Australian private practice physiotherapy consultations to explore the prescription of self-management strategies

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Abstract

Objective The aim of the study was to explore the types of self-management strategies prescribed; the number of strategies and the overall length of time allocated to self-management prescription, by consultation type and by injury location, in physiotherapy consultations.

Methods A cross-sectional, observational study of 113 physiotherapist-patient consultations was undertaken. Regression analyses were used to determine whether consultation type and injury location were associated with the number of strategies prescribed and the length/fraction of time spent on self-management.

Results A total of 108 patients (96%) were prescribed at least one self-management strategy – commonly exercise and advice. The mean length of time spent on self-management was 5.80 min. Common injury locations were the neck (n = 40) and lower back (n = 39). No statistically significant associations were observed between consultation type or injury location for either outcome (number of strategies and the length/fraction of time allocated to self-management prescription).

Conclusion Physiotherapists regularly spend time prescribing self-management strategies such as exercise, advice, and the use of heat or ice to patients receiving treatment linked to a range of injury locations. This suggests that self-management is considered to be an important adjunct to in-clinic physiotherapy. The practice implications of this are that clinicians should reflect on how self-management strategies can be used to maximize patient outcomes, and whether the allocation of consultation time to self-management is likely to optimize patient adherence to each strategy.

KEYWORDS

adherence, consultation time, physiotherapy, self-management

1 | INTRODUCTION

The main goal of physiotherapy is to restore (or maintain) optimal physical functioning; therefore, physiotherapists routinely treat patients with a wide range of injuries (Fransen, 2004). In many countries, physiotherapy is delivered both in public and private healthcare settings. In Canada, 42% of physiotherapists work in private practice (Perreault, Clermont, Rossignol, Poitras, & Morin, 2014) and approximately 25% of UK physiotherapists work outside of the National Health Service (Beddow, 2010). In Australia, private physiotherapy practices are in operation in over 5,000 locations nationally, with approximately 53.5% of registered physiotherapists working in the private sector (Engel, Brown, Swain, & Lystad, 2014). It has been estimated that these physiotherapists deliver an average of 796 consultations per physiotherapist annually (Engel et al., 2014). The median number of physiotherapy consultations per patient has been reported as 15; with the longest period between consultations being 5.4 days (Grimmer-Somers, Milanese, Kumar, Brennan, & Mifsud, 2012). This consultation frequency places physiotherapists in an ideal position to initiate and follow up with patients about their role in injury self-management.

Self-management refers to any strategy that is specifically intended for the patient to complete independently to manage their condition (Hall et al., 2014; Long & Holman, 2003). Self-management strategies maybe considered as an important adjunct to in-clinic care as patients will spend more time away from the therapists than receiving 'hands-on' treatment (Peek, Carey, Sanson-Fisher, & Mackenzie, 2016; Peek, Sanson-Fisher, Mackenzie, & Carey, 2016a). There is high-quality evidence that home-based self-management strategies can be as effective as physiotherapist-provided therapy (Novak, 2011). Key clinical findings from a systematic review reported that equal gains can be made from either a home programme or expert-provided therapy for improving function and strength following anterior cruciate ligament reconstruction; improving symptom management for patients with knee osteoarthritis; improving exercise adherence for obese patients; and improving exercise tolerance in patients with rheumatoid arthritis (Novak, 2011). In addition, there is evidence that home programmes may lead to improved treatment outcomes for patients following arthroscopic knee surgery and those with patellofemoral pain syndrome (Novak, 2011).

In spite of evidence suggesting the effectiveness of self-management strategies for a range of injuries (Novak, 2011; Page, Hinman, & Bennell, 2011), to the authors' knowledge, there is limited research about self-management prescription in physiotherapy. A national survey of Irish physiotherapists, practising in both the public and private health sectors, reported that advice and exercise were the most frequently provided treatments for chronic low back pain (Liddle, Baxter, & Gracey, 2009). The frequent use of advice and exercise is also supported by a survey of Indian physiotherapists (Fidvi & May, 2010). However, neither of these studies differentiated between treatment strategies which were provided by physiotherapists during clinic time and those intended as self-management (Fidvi & May, 2010; Liddle et al., 2009). In addition, the results of these studies were limited as they relied on physiotherapist self-report (Fidvi & May, 2010; Liddle et al., 2009) rather than more objective methods, such as observation. Understanding which types of self-management strategies are prescribed can provide an indication of the extent to which physiotherapists are incorporating self-management within their overall treatment plan.

Physiotherapists and other rehabilitation professionals play an important role in health promotion, injury prevention and rehabilitation (McGrane, Cusack, O'Donoghue, & Stokes, 2014). However, there are currently no published studies regarding the amount of consultation time that physiotherapists in outpatient settings spend on prescribing patient self-management strategies, and the number and types of strategies prescribed during this time. The amount of consultation time that physiotherapists devote to self-management could provide an indicator as to the relative importance placed upon self-management. These data could also provide a benchmark regarding the time that private practitioners spend on self-management prescription, enabling clinicians and researchers to develop strategies as to how best this time could be utilized to encourage patient participation and adherence.

In order to broaden knowledge about physiotherapist–patient communication in Australian private practice, the objectives of the present observational study were to explore, in physiotherapy consultations:

1. The types of self-management strategies prescribed;
2. The number of self-management strategies prescribed (overall, by consultation type and by injury location); and
3. The length of time allocated to self-management strategy prescription (overall, by consultation type and by injury location).

2 | METHODS

2.1 | Study design

A cross-sectional, observational study of physiotherapist–patient consultations was utilized to provide a more robust data collection methodology than relying on physiotherapists' self-reported behaviour. It was undertaken and reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines (Vandenbroucke et al., 2007). Ethics approval for this research project was granted through the University of Newcastle (Australia) Human Research Ethics Committee.

2.2 | Setting and participants

Physiotherapists working in private practice within 50 km of two large cities in Australia were located via the Australian Physiotherapy Association 'Find a Physio' web link (available at: http://www.physiotherapy.asn.au/apawcm/controls/findaphysio.aspx). Physiotherapists were sent an invitation email to participate in the study, with an attached 'Participant Information Statement'. Eligibility criteria included physiotherapists who worked in private practice and saw a general case mix of patients. Study participation required written consent both from private physiotherapy practice owners as well as individual physiotherapists.

Patient participants comprised a consecutive sample of patients attending for either an initial or follow-up consultation (regardless of injury location or condition) with an eligible physiotherapist at a consenting practice. Patient inclusion criteria included: aged 18 years and older, with sufficient understanding of English, as well as being physically and mentally able to give informed consent.

Eligible patients were identified by the practice receptionist at the time of their attendance for their physiotherapy consultation. Patients were then approached by the researcher (a physiotherapist with 18 years of clinical experience, including 7 years in private practice) to discuss participation in the study. They were given written information about the study prior to giving informed consent.

2.3 | Data collection

Data were collected between May and October 2015. Physiotherapists were asked to complete a demographic survey which included characteristics such as gender, location of practice, country in which they obtained their physiotherapy qualification and postgraduate qualifications.

The research physiotherapist observed up to 10 physiotherapist–patient consultations for each participating physiotherapist. The number of observed consultations was limited to 10 patients per physiotherapist to reduce the burden of study participation for each physiotherapist. A coding checklist and guideline for the observation component was developed specifically for this study by a team of experienced researchers, for use during the physiotherapist–patient consultations. During the observed consultations, the research physiotherapist recorded the number and type of self-management strategies prescribed in each consultation; the total consultation time (calculated to the nearest whole minute from the recorded start and finish time of each consultation); and the amount of time spent prescribing self-management strategies as per the coding checklist (recorded to the nearest whole minute using a digital watch) (see Appendix 1). Self-management strategies were defined as "any strategy that the physiotherapist prescribed to the patient specifically for them to complete independently, away from the clinic". This is consistent with the definition used in previous studies (Hall et al., 2014; Lorig & Holman, 2003; Peek, Sanson-Fisher, Mackenzie, & Carey, 2015; Peek, Carey, et al., 2016, Peek, Sanson-Fisher, et al., 2016a). Examples included independent exercises; recommendations to use a heat pack; and giving the patient a brace to wear. Advice was recorded only when it related to a specific activity or action which the physiotherapist requested the patient to complete, such as advice: "I want you to get up and walk around after sitting for 60 minutes while at work". If the advice was non-specific or conversational, this was not recorded, such as "maybe a sit–stand desk would help; we can discuss this next time". Two mock clinical vignettes were used to pilot-test the observation checklist by the study's research physiotherapist and a second experienced physiotherapist. Inter-rater reliability was substantial (kappa =0.92) (Cohen, 1992). In an attempt to minimize reactivity (i.e. change in patient and/or physiotherapist behaviour due to being observed), the coding checklist was not accessible to patients or physiotherapists prior to study completion. Therefore, although patients and physiotherapists were made aware, prior to giving consent, that their consultation was to be observed, neither were informed of which specific aspects of the consultation was of interest to the researcher.

The following data were obtained from the treating physiotherapist for each consenting patient: age, gender, injury location, whether the consultation was an initial or follow-up session and the number of previous physiotherapy consultations.

2.4 | Data analysis

Data analysis was conducted using the statistical software package, Stata® 14 (College Station, Texas, USA). Descriptive statistics (proportions means and/or medians) were calculated for participant characteristics, the number and types of self-management strategies prescribed, and the duration and types of consultation times. For each consultation, the total consultation time and total time spent on self-management strategies were documented. These data were then used to calculate the mean percentage of the total consultation time spent on self-management strategies as well as the mean time spent per strategy. The median is reported as well as the mean, where data distributions were skewed (de Nijs & Klausen, 2013).

Multivariable regression analyses were performed to assess associations between factors. Poisson regression was used to explore associations between the number of prescribed self-management strategies (dependent variable) and the independent variables: type of consultation (initial or follow-up) and injury location (due to the small numbers of some injury locations, injury locations were combined into three categories: lower limb, spine and upper limb); total consultation time was accounted for as an offset in the model. Overdispersion of the data was assessed by inspecting the residual deviance divided by the number of degrees of freedom. When exploring associations between the time spent prescribing self-management strategies as a fraction of the total consultation time (dependent variable) and the type of consultation (initial or follow-up) and injury location (independent variables), a Gamma regression analysis (with a log link) was used. Parameter estimates from this model when exponentiated reflect a multiplicative difference in the outcome. Statistical significance was set at $p = 0.05$ for all analyses.

3 | RESULTS

3.1 | Participants

A total of 14 physiotherapists, from four private physiotherapy practices in two large cities in Australia, were recruited, of whom eight (57%) were female. Twelve (86%) had obtained their physiotherapy qualification in Australia and two (14%) had a postgraduate physiotherapy qualification. The mean number of hours worked per week was 34.

The total number of patients screened for eligibility was 119, of whom 114 were eligible (insufficient knowledge of English to be able to give consent: $n = 1$; younger than 18 years: $n = 4$). Of these, 113 consented to participate, giving a consent rate of 99% (a mean of eight patients per physiotherapist). Patient participant characteristics are summarized in Table 1. All 113 patients attended for physiotherapy treatment of a musculoskeletal condition. With regard to the location

TABLE 1 Sociodemographic and injury characteristics of patient participants ($n = 113$)

Patient characteristic	Mean; median; range
Age	52; 50; 25–95 (years)
Number of previous physiotherapy consultations	10; 5; 0–130
	Frequency (%)
Gender:	
• Female	77 (68%)
• Male	36 (32%)
Attendance for initial consultation	19 (17%)
Location of injury:	
Lower limb	
• Ankle	3 (3%)
• Knee	14 (12%)
• Hip	4 (4%)
Spine	
• Lower back	39 (34%)
• Upper back	3 (3%)
• Neck	40 (35%)
Upper limb	
• Shoulder	8 (7%)
• Elbow	2 (2%)

of patient injury, 73% of patients (n = 82) attended for physiotherapy of the spine (Table 1).

Figure 1 shows the number of patients prescribed with each type of self-management strategy. After exercise (n = 105), giving advice was the most common strategy (n = 91). The type of advice given to patients was categorized using the following subheadings: advice to rest or refrain from a particular activity (n = 30); postural advice (n = 30); ergonomic advice (n = 5); advice to increase physical activity at home (n = 17); advice about the pelvic floor (n = 3); advice to complete exercises/walking in water (n = 4); and advice about the use of mobility aids (n = 2). The least frequently observed strategies were self-taping and self-mobilization (n = 2; 2% each) (Figure 1). Exercise was the only self-management strategy prescribed in isolation; all other strategies were prescribed to patients in combinations of two or more. The largest range of self-management strategies were prescribed to patients attending with a neck or lower back complaint, with 79 patients receiving prescriptions from a total of seven different strategies, including exercise, advice, heat, self-massage, self-mobilization, lumbar roll and self-taping. In addition, physiotherapists were observed to provide supplementary printed information to 59 of the 108 patients (55%) who were prescribed with a self-management strategy, most frequently related to exercise (n = 38).

Overall, 108 patients were prescribed at least one self-management strategy (96%). A total of 232 self-management strategies were prescribed to these patients (mean = 2.15 strategies per patient, standard deviation [SD] = 1.05). Of the 108 patients who received a self-management strategy, 32 patients received only one self-management strategy (all in the form of exercise); 50 patients received two self-management strategies (most commonly in the form of exercise and advice [n = 40]); 16 patients received three strategies (commonly observed combinations included exercise, advice, heat and lumbar roll); and 10 patients received four strategies (from a combination of exercise, advice, heat, ice and brace). Five patients were not observed to receive a self-management strategy.

The average number of self-management strategies prescribed in initial consultations was 2.74 (SD = 1.19), and in follow-up consultations was 1.86 (SD = 0.80). However, there was no statistically significant association between consultation type (initial versus follow-up) and the number of self-management strategies prescribed when controlling for injury location, time spent prescribing

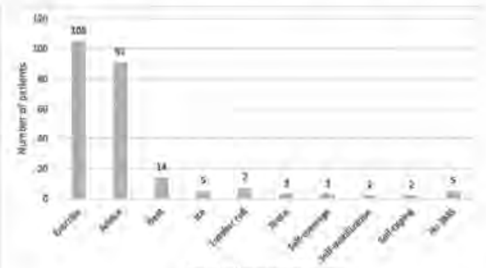

FIGURE 1 Number of patients prescribed with each type of self-management strategy. SMS, self management strategy

self-management strategies and overall consultation time (incidence rate ratio [IRR] = 0.86; p = 0.29).

When broken down by injury location, the five patients who were not prescribed a self-management strategy had all attended for physiotherapy of their lower back (Table 2). All three patients who attended for physiotherapy of their upper back received only one self-management strategy (exercise). The largest number of prescribed self-management strategies were to patients attending for treatment of the knee, lower back and neck (n = 4).

When injury locations were grouped into three body regions (lower limb, spine and upper limb), the average number of self-management strategies prescribed to individuals being treated for lower limb injuries was 2.29 (SD = 1.14), for injuries to the spine was 2.01 (SD = 1.09), and for injuries to the upper limbs was 2.62 (SD = 0.52). In spite of these observations, there was no statistically significant association between the number of self management strategies and injury location (lower limb [reference category], spine [IRR = 0.85; p = 0.14], upper limb [IRR = 1.22; p = 0.08]) when controlling for consultation type (initial versus follow-up) and overall consultation time.

The overall length of consultation time varied from 60 min for an initial consultation down to 17 min for a follow-up consultation, with consultations lasting an average of 26 (SD = 9.22) min. Table 2 shows that, overall, an average of 5.80 min per consultation was spent on self-management strategies (22% of total consultation time). The mean consultation time spent per strategy was 2.71 min. When patients were prescribed exercises only (n = 32), physiotherapists spent a mean time of 4.23 min prescribing these to their patients. However, when physiotherapists prescribed exercise in combination with one or more self-management strategy, the total mean time physiotherapists spent on self-management strategies was 6.53 min (including the time spent to prescribe the exercises).

The observed consultation time that physiotherapists spent prescribing self-management strategies varied greatly between patients. One physiotherapist was observed to spend 30 min (or 50% of the total consultation time) of an initial consultation prescribing self-management strategies. The shortest time spent prescribing a self-management strategy in an initial consultation was 1 min (3% of total consultation time). During follow-up consultations, the longest time spent on self-management strategies was 15 min (50% of consultation time), with the shortest being 0 min (0% of consultation time). However, on average physiotherapists spent approximately 9.31 (SD = 7.91) min on self-management strategies during an initial consultation (25% of the total consultation time) and 5.10 (SD = 3.89) min during a follow-up consultation (21% of total consultation time). Results from the Gamma regression model indicated that there was no statistically significant association between consultation type (initial versus follow-up) and the fraction of time spent on self-management strategies, when controlling for injury location (a 14% increase in the fraction of time spent on the prescription of self-management plans for physiotherapists; p = 0.43).

Table 2 shows the mean amount of consultation time spent on self-management strategies overall and per strategy, for each injury location. When considering self-management prescription time allocations by injury location, the longest time spent per strategy was

TABLE 2 Time spent on self-management strategies; number of prescribed self-management strategies; and time spent per self-management strategy (by injury location and overall)

Location of injury	Time (minutes) spent on self-management strategies Mean (range)	Number of self-management strategies provided Mean (range)	Time (minutes) spent per self-management strategy Mean
Ankle	4.3 (4–5)	1.7 (1–2)	2.5
Knee	5.9 (2–10)	2.7 (1–4)	2.2
Hip	6.5 (1–15)	1.5 (1–3)	4.3
Lower back	6.1 (0–30)	1.9 (0–4)	3.2
Upper back	1.0 (1)	1.0 (1)	1.0
Neck	5.9 (1–15)	2.1 (1–4)	2.8
Shoulder	4.8 (1–13)	2.4 (2–3)	2.0
Elbow	4.0 (4)	3.0 (3)	1.3
Overall	*5.8 (0–30)*	*2.0 (0–4)*	*2.7*

with patients presenting with hip injuries, where physiotherapists spent over 4 min per strategy; these patients also received a small number of strategies (three patients received exercise only, and one received exercise and advice). Patients presenting with injuries of their upper back received only 1 min of prescription time, for exercise.

When injury locations were grouped into three body regions, the amount of consultation time spent on self-management strategies for lower limb injuries was 6.23 (SD = 3.20) min; for injuries to the spine was 5.81 (SD = 5.54) min, and for injuries to the upper limbs was 4.71 (SD = 3.39) min. In spite of these observations, there was no statistically significant association between injury location (lower limb [reference category], spine [$p = 0.25$], upper limb [$p = 0.20$]) and the amount of consultation time spent on self-management strategies, when controlling for consultation type (initial versus follow-up).

4 | DISCUSSION

Clinical practice requires a complex interplay between experience and training, research, guidelines and judgement, and should be informed not only by randomized controlled trials, but also by pragmatically designed studies that better reflect real-life clinical practice (Price, Brusselle, Roche, Freeman, & Chisholm, 2015). Our data were derived from clinical observations, and were therefore more likely to reflect real-world physiotherapist–patient consultations compared with self-reported surveys, which can be subject to reporting bias (Kettler, Sawyer, Winefield, & Greville, 2002; Peek et al., 2015).

An overwhelming majority of patients (96%) received a self-management strategy, with physiotherapists observed to prescribe from a range of 9 different strategies to their patients. This prescribed range has been supported to varying degrees in the literature, with exercise and heat commonly being prescribed to patients with lower back pain (Crowe, Whitehead, Jo Gagan, Baxter, & Panckhurst, 2010), as well as advice (Liddle et al., 2009), splints (Sandford, Barlow, & Lewis, 2008), heel lifts (Goss & Moore, 2004), ice (Bassett & Prapavessis, 2011) and braces (Page et al., 2011). Given the range and frequency of self-management prescription by physiotherapists in past research (Peek et al., 2016, 2016a) and the current study, it could be argued that physiotherapists consider self-management strategies to be an important part of the overall patient treatment plan.

Exercise was prescribed in 93% of consultations, indicating that it has a central role in physiotherapy practice. All patients in our study, regardless of injury location, were given home exercise, with the exception of eight patients with lower back or knee injuries. Thirty-two patients (28%) were prescribed exercise only. This observation was not unexpected, given that research relating to the efficacy of home exercise is abundant (Clijsen, Fuchs, & Taeymans, 2014; Hayden, van Tulder, Malmivaara, & Koes, 2005; NICE, 2014; Smidt et al., 2005; Taylor, Dodd, Shields, & Bruder, 2007; Tunwattanapong, Kongkasuwan, & Kuptniratsaikul, 2016).

Advice was the second most observed strategy, followed by the use of heat. Advice has been self-reported by physiotherapists as the most commonly prescribed supplement to clinic-based care for patients with back pain (Liddle et al., 2009). The observed frequency of heat versus ice prescriptions may have been more related to the chronicity of the injury, although time since injury was not recorded. The least commonly prescribed self management strategies were self-mobilization, self-taping and self-massage.

It is encouraging that physiotherapists are integrating the prescription of self-management strategies into routine practice, particularly given the presence of supportive research regarding the efficacy of a number of strategies (Novak, 2011). However, more high-quality research is needed to support the effectiveness of a number of strategies – in particular, physiotherapeutic advice, which can vary in content between clinicians. Therefore, although self-management strategies could be considered as an important treatment adjunct, clinicians should refer to injury location-specific best practice evidence when prescribing self-management strategies to their patients.

In our study, patients received a mean of two self-management strategies per observed consultation, most commonly in the form of exercise and advice. This number of strategies is supported by a qualitative study on patients with chronic low back pain (Crowe et al., 2010). However, 26 patients received three or more self-management strategies, most commonly in the form of exercise, advice and heat. Patients attending for physiotherapy of their neck and lower back received the greatest range of self-management strategies. The effectiveness of a range of management approaches for these injury locations has been reported (Otoo, Hendrick, & Ribeiro, 2015; Searle, Spink, Ho, & Chuter, 2015; van der Velde et al., 2015).

Patients were observed to receive more self management strategies during an initial consultation (n = 2.74) compared with a follow-up consultation (n = 1.86). The clinical rationale for this might be to provide patients with a larger number of self-management strategies at the outset of treatment, to facilitate their recovery. However, when multiple treatment approaches are used concurrently, it can be difficult to determine which one(s) have been effective. The provision of multiple strategies may also have implications for patient adherence, particularly when a patient may already be overwhelmed with other information related to their injury and prognosis. There is evidence that providing more complex information in health care consultations results in poorer patient recall (DiMatteo, Haskard-Zolnierek, & Martin, 2012; Henry & Rosemond, 1999). This suggests that providing multiple self-management strategies may have an adverse impact on recall and, hence, on adherence to the prescribed strategies.

Physiotherapists spent a mean of 5.80 min on self-management strategies (inclusive of initial and follow-up consultations), representing a mean of 22% of consultation time. However, the adequacy of this time might vary depending on whether the physiotherapist has prescribed the strategy before, the complexity of the strategy and whether the patient understands what they are being asked to do. A systematic review of interventions to aid patient adherence to physiotherapist-prescribed self-management strategies reported a mean rate of adherence of 67% (Peek et al., 2016, 2016a). It would be interesting to explore whether patient adherence is affected by the number of prescribed strategies and the overall time spent by physiotherapists in prescribing self-management strategies during a physiotherapist-patient consultation. In our study, patients attending for treatment of knee injuries were prescribed approximately three self-management strategies each (above the overall study mean), with physiotherapists spending about 2 min per strategy (below the overall study mean). This suggests that clinicians should be careful that the number of self-management strategies prescribed does not adversely affect the overall prescription time, as this may potentially diminish the quality of this prescription, and potentially affect treatment plan adherence and outcomes.

It has been reported that the more individual exercises contained within an exercise programme, the less likely it is that patients will adhere to them (Henry & Rosemond, 1999). Therefore, the same might be true of the number of individual self-management strategies prescribed. Although the relationship between the time spent on prescribing self-management strategies, and patient adherence and outcomes has not been explored in physiotherapy, there is research into information provision from other areas of healthcare practice, suggesting that "less may be more". Consultation time in general practice has been reported as averaging between 18 and 23 min (Patwardhan, Davis, Murphy, & Ryan, 2013), which is not dissimilar to that in physiotherapy. Research suggests that general practitioners with longer consultation times prescribe less and offer more advice on lifestyle and other health-promoting activities, and that a longer consultation time is associated with a range of better patient outcomes (Freeman et al., 2002). Therefore, it may be more appropriate for physiotherapists and other healthcare professionals to prescribe fewer self management strategies and spend more time on promoting adherence to a single strategy, to encourage the optimization of patient outcomes.

Although the present observational study was novel, in researching physiotherapist use of prescribed self-management strategies in private practice settings, there were some limitations. Generalizability may have been limited by recruiting patients only from four private physiotherapy practices in two Australian cities. A consecutive sample of patients was utilized, to reduce selection bias, but some bias would still have been present owing to convenience sampling. As with any observational research, it is possible that physiotherapists and patients altered their behaviour because of the presence of the researcher. However, the researcher attempted to minimize this bias by providing minimal details about the study's aims, to physiotherapists and patients alike, during recruitment.

Given the frequency with which self-management strategies are prescribed, more research is required to support their efficacy. The allocation of consultation time to self-management prescription and its impact on patient adherence and outcomes also require further investigation.

5 | CONCLUSION

Australian physiotherapists in private practice were observed to prescribe self-management strategies to their patients regularly, most frequently in the form of exercise and advice. The largest range of strategies was prescribed for patients presenting with neck and lower back injuries (the most commonly treated patient injury areas). These results suggest that self-management strategies such as exercise, advice and the use of heat/ice are considered an important treatment adjunct to in-clinic care. However, clinicians should reflect on which self-management strategy is the most appropriate for each patient, based on individual need, and allocate consultation time appropriately to maximize patient adherence and treatment outcomes.

Physiotherapists and other healthcare professionals, in their pursuit of evidence-based practice, should critically evaluate their clinical decisions regarding patient self-management strategies. Clinicians need to ensure that they are selecting the most appropriate strategy for each patient, based on empirical research findings, and be encouraged to consider a number of factors when determining how many strategies to prescribe. This may include whether prescription of multiple strategies will result in poorer adherence, and hence compromise patient outcomes. Clinicians also need to reflect on the most appropriate use of patient consultation time when prescribing self-management strategies, given that there are other competing priorities such as assessment and 'hands-on' treatment. Physiotherapists and other healthcare professionals should be encouraged to invest time in prescribing self-management as an extension to in-clinic treatment, thereby potentially improving patient outcomes.

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REFERENCES

Bassett, S. F., & Prapavessis, H. (2011). A test of an adherence-enhancing adjunct to physiotherapy steeped in the protection motivation theory. *Physiotherapy Theory and Practice*, *27*(5), 360–372. doi: 10.3109/09593985.2010.507238

Beddow, A. (2010). *Physiotherapy workforce review*. UK: Retrieved from https://www.google.com.au/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0ahUKEwjZuf2O4_bMAhWHJaYKHTxqDu0QFggiMAE&url=http%3A%2F%2Fwww.csp.org.uk%2Fsystem%2Ffiles%2Fsecure%2Fcfwi_physiotherapy_workforce_review_2010_0.pdf&usg=AFQjCNGawmdOsIBziD1FvuXn7OLeU1MO1Q&cad=rjaCentre for workforce intelligence.

Clijsen, R., Fuchs, J., & Taeymans, J. (2014). Effectiveness of exercise therapy in treatment of patients with patellofemoral pain syndrome: Systematic review and meta-analysis. *Physical Therapy*, *94*(12), 1697–1708. doi: 10.2522/ptj.20130310

Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*(1), 155–159.

Crowe, M., Whitehead, L., Jo Gagan, M., Baxter, D., & Panckhurst, A. (2010). Self-management and chronic low back pain: A qualitative study. *Journal of Advanced Nursing*, *66*(7), 1478–1486. doi: 10.1111/j.1365-2648.2010.05316.x

de Nijs, R., & Klausen, T. L. (2013). On the expected difference between mean and median. *Electronic Journal of Applied Statistical Analysis*, *6*(1), 110–117. doi: 10.1285/i20705948v6n1p110

DiMatteo, M. R., Haskard-Zolnierek, K. B., & Martin, L. R. (2012). Improving patient adherence: A three-factor model to guide practice. *Health Psychology Review*, *6*(1), 74–91. doi: 10.1080/17437199.2010.537592

Engel, R. M., Brown, B. T., Swain, M. S. & Lystad, R. P. (2014). The provision of chiropractic, physiotherapy and osteopathic services within the Australian private health-care system: A report of recent trends. *Chiropractic & Manual Therapies*, 22(1), 3. doi: 10.1186/2045-709X-22-3

Fidvi, N., & May, S. (2010). Physiotherapy management of low back pain in India- a survey of self-reported practice. *Physiotherapy Research International*, 15(3), 150–159. doi:10.1002/pri.458

Fransen, M. (2004). When is physiotherapy appropriate? *Best Practice & Research. Clinical Rheumatology*, *18*(4), 477–489. doi:10.1016/j.berh.2004.03.006

Freeman, G. K., Horder, J. P., Howie, J. G. R., Hungin, A. P., Hill, A. P., Shah, N. C., & Wilson, A. (2002). Evolving general practice consultation in Britain: Issues of length and context. *BMJ*, *324*(7342), 880–882. doi: 10.1136/bmj.324.7342.880

Goss, D. L., & Moore, J. H. (2004). Compliance wearing a heel lift during 8 weeks of military training in cadets with limb length inequality. *Journal of Orthopaedic and Sports Physical Therapy*, *34*(3), 126–131. doi:10.2519/jospt.2004.1284

Grimmer-Somers, K. Milanese, S., Kumar, S., Brennan, C., & Mifsud, I. (2012). Number and frequency of physiotherapy services for motor vehicle-induced whiplash: Interrogating motor accident insurance data 2006 & 2009. *Journal of Rehabilitation Medicine*, *44*(9), 774–780. doi: 10.2340/16501977-1018

Hall, A. M., Kamper, S. J., Hernon, M., Hughes, K., Kelly, G., Lonsdale, C., & Ostelo, R. (2014). Measurement tools for adherence to non-pharmacologic self-management treatment for chronic musculoskeletal conditions: A systematic review. *Archives of Physical Medicine and Rehabilitation*, *96*(3), 552–562. doi: 10.1016/j.apmr.2014.07.405

Hayden, J. A., van Tulder, M. W., Malmivaara, A., & Koes, B. W. (2005). Exercise therapy for treatment of non-specific low back pain. *Cochrane Database of Systematic Reviews*, *3*, CD000335. doi: 10.1002/14651858.CD000335.pub2

Henry, K. D., & Rosemond, C. (1999). Effect of number of home exercises on compliance and performance in adults over 65 years of age. *Physical Therapy*, *79*(3), 270–277. doi:10.1093/ptj/79.3.270

Kettler, L., Sawyer, S., Winefield, H., & Greville, H. (2002). Determinants of adherence in adults with cystic fibrosis. *Thorax*, *57*(5), 459–464. doi:10.1136/thorax.57.5.459

Liddle, S. D., Baxter, G. D., & Gracey, J. H. (2009). Physiotherapists' use of advice and exercise for the management of chronic low back pain: A national survey. *Manual Therapy*, *14*(2), 189–196. doi:10.1016/j.math.2008.01.012

Lorig, K. R., & Holman, H. (2003). Self-management education: History, definition, outcomes, and mechanisms. *Annals of Behavioral Medicine*, *26*(1), 1–7. doi:10.1207/s15324796abm2601_01

McGrane, N., Cusack, T., O'Donoghue, G., & Stokes, E. (2014). Motivational strategies for physiotherapists. *Physical Therapy Reviews*, *19*(2), 136–142. doi: 10.1179/1743288X13Y.0000000117

NICE (2014). Physical activity: Exercise referral scheme, public health guideline. National Institute for Health and Care excellence. Retrieved from https://www.nice.org.uk/guidance/ph54/resources/physical-activity-exercise-referral-schemes-1996418406085

Novak, I. (2011). Effective home programme intervention for adults: A systematic review. *Clinical Rehabilitation*, *25*(12), 1066–1085. doi: 10.1177/0269215511410727

Otoo, S. K. W., Hendrick, P., & Ribeiro, D. C. (2015). The comparative effectiveness of advice/education compared to active physiotherapy (manual therapy and exercise) in the management of chronic non-specific low back pain. *Physical Therapy Reviews*, *20*(1), 16–26. doi: 10.1179/1743288X14Y.0000000164

Page, C. J., Hinman, R. S., & Bennell, K. L. (2011). Physiotherapy management of knee osteoarthritis. *International Journal of Rheumatic Diseases*, *14*(2), 145–151. doi:10.1111/j.1756-185x.2011.01612.x

Patwardhan, A., Davis, J., Murphy, P., & Ryan, S. F. (2013). Comparison of waiting and consultation times in convenient care clinics and physician offices: A cross-sectional study. *Journal of Primary Care & Community Health*, 4(2), 124–128. doi: 10.1177/2150131912450030

Peek, K., Sanson-Fisher, R., Mackenzie, L., & Carey, M. (2015). Patient adherence to physiotherapist prescribed self-management strategies: A critical review. *International Journal of Therapy and Rehabilitation*, *22*(11), 535–543. doi:10.12968/ijtr.2015.22.11.535.

Peek, K., Carey, M., Sanson-Fisher, R., & Mackenzie, L. (2016). Physiotherapists' perceptions of patient adherence to prescribed self-management strategies: A cross-sectional survey of Australian physiotherapists. *Disability and Rehabilitation*, *12*, 1–7. doi:10.1080/09638288.2016.1212281

Peek, K. Sanson-Fisher, R., Mackenzie, L., & Carey, M. (2016a). Interventions to aid patient adherence to physiotherapist prescribed self-management strategies: A systematic review. *Physiotherapy* *102*(2), 127–135. doi: http://dx.doi.org/10.1016/j.physio.2015.10.003

Perreault, K. D., Clermont E., Rossignol, M., Poitras, S., & Morin, D. (2014). Physiotherapy practice in the private sector: Organizational characteristics and models. *BMC Health Services Research*, 14(1), 1–13. doi: 10.1186/1472-6963-14-362

Price, D., Brusselle, G., Roche, N., Freeman, D., & Chisholm, A. (2015). Real-world research and its importance in respiratory medicine. *Breathe*, *11*(1), 26–38. doi: 10.1183/20734735.015414

Sandford, F., Barlow, N., & Lewis, J. (2008). A study to examine patient adherence to wearing 24-hour forearm thermoplastic splints after tendon repairs. *Journal of Hand Therapy*, 21(1), 44–53. doi: 10.1197/j.jht.2007.07.004

Searle, A., Spink, M., Ho, A., & Chuter, V. (2015). Exercise interventions for the treatment of chronic low back pain: A systematic review and meta-analysis of randomised controlled trials. *Clinical Rehabilitation*, *29*(12), 1155–1167. doi: 10.1177/0269215515570379

Smidt, N., de Vet, H. C., Bouter, L. M., Dekker, J., Arendzen, J. H., de Bie, R. A., … Exercise Therapy Group (2005). Effectiveness of exercise therapy: A best-evidence summary of systematic reviews. *Australian Journal of Physiotherapy*, *51*(2), 71–85. doi:10.1016/s0004-9514(05)70036-2

Taylor, N. F., Dodd, K. J., Shields, N., & Bruder, A. (2007). Therapeutic exercise in physiotherapy practice is beneficial: A summary of systematic reviews 2002–2005. *Australian Journal of Physiotherapy*, *53*(1), 7–16. doi: 10.1016/s0004-9514(07)70057-0

Tunwattanapong, P., Kongkasuwan, R., & Kuptniratsaikul, V. (2016). The effectiveness of a neck and shoulder stretching exercise program among office workers with neck pain: A randomized controlled trial. *Clinical Rehabilitation*, *30*(1), 64–72. doi: 10.1177/0269215515575747

van der Velde, G., Yu, H., Paulden, M., Côté, P., Varatharajan, S., Shearer, H. M., & Taylor-Vaisey, A. (2015). Which interventions are cost-effective for the management of whiplash-associated and neck pain-associated disorders? A systematic review of the health economic literature by the Ontario Protocol for Traffic Injury Management (OPTIMa) Collaboration. *Spine*, *16*(12), 1582–1597. doi: 10.1016/j.spinee.2015.08.025

Vandenbroucke, J. P., von Elm, E., Altman, D. G., Gotzsche, P. C., Mulrow, C. D., Pocock, S. J., ... Eggar, M. (2007). Strengthening the reporting of observational studies in epidemiology (STROBE): Explanation and elaboration. *Epidemiology*, *18*(6), 805–835. doi: 10.1097/EDE.0b013e3181577511

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APPENDIX 1

Coding checklist and guideline used to collect descriptive data regarding number and type of self-management strategies prescribed by physiotherapists during the observed physiotherapist-patient consultations

Patient identification number:				
Physiotherapist identification number:				
1. Reason patient consulting with physiotherapist:				
2. Location of patient injury:				
3. Patient gender	Male Female			
4. Patient age				
5. Is this consultation a new patient assessment?	Yes No	If no, please list number of previous consultations		
6. Consultation time (in whole minutes):	Start time:	Finish time:	Total:	Minutes
a. Total time spent on self-management strategies (in whole minutes)				
7. Did the physiotherapist prescribe a self-management strategy to this patient?	No Yes If yes, please specify all:			
8. Was supplementary printed information regarding the self-management strategy provided to this patient?				

Instructions:
Q1–5 to be obtained from physiotherapist once patient has consented to participate
Q6–8 to be noted during observed physiotherapist–patient consultation
Additional information:
Self-management strategies (SMS) are defined as "any strategy that the physiotherapist prescribes to the patient specifically for them to complete independently, away from the clinic". An SMS should be deemed as having been prescribed to the patient if enough instruction (either verbal, written or through practical demonstration) is given to the patient for them to be able to complete it at home.
For example, 'Here is a wrist splint that I would like you to wear at night' (list "splint" as an SMS), versus 'You could try a night splint; perhaps next week, if your wrist is not better, we could discuss this treatment option further' (do **not** list "splint" as an SMS).

Other SMS may include (but are not restricted to):
Advice: Only list advice as an SMS if it is clear that this advice relates to an activity/ action which the physiotherapist is specifically telling the patient to follow at home, such advice about rest or refraining from certain activities, posture etc. For example, "I would like you to rest from playing basketball this week". Do not include advice which is non-specific or conversational; for example, the physiotherapist may suggest that, in the future, the patient could try an orthotic but does not actually prescribe one (see splint example above).
Exercise: List exercise as an SMS if the physiotherapist expects the patient to complete them at home. This may include stretches. Do not include exercises which are completed/supervised during the consultation but are not given to the patient to complete/continue with at home.
Brace/splint/orthotics: List as an SMS if the physiotherapist actually provides a brace or splint or orthotic for the patient to wear at home. If the physiotherapist advises the patient to get a brace/splint/orthotic/heel wedge etc. from reception or the local pharmacy but does not actually provide it to the patient, then list it under advice – brace/splint/orthotic.
Ice: Include ice as an SMS if the physiotherapist specifically tells the patient to use ice at home – for example, "Put an ice pack on your knee for 10 minutes at home".
Heat: Include heat as an SMS if the physiotherapist specifically tells the patient to use heat at home – for example, "Put a heat pack on your shoulder for 10 minutes at home".
Rest: Rest is to be included as advice rest/refrain from (specified) activity. See "advice" above.
Self-taping: List self-taping as a specific SMS if tape is provided. If the physiotherapist prescribes self-taping but does not provide tape, then list under advice – self-taping. If a third person/partner is required to tape, please note whether the partner was included in the demonstration and practice.
Self-mobilization: List as an SMS if the patient is prescribed this to complete at home (such as patella mobilization). If a third person/partner is required to assist with mobilization, please note whether the partner was included in the demonstration and practice.
Self-massage: List as an SMS if the patient is prescribed this to do at home (including transverse frictions or scar massage). If a third person/partner is required to massage, please note whether the partner was included in the demonstration and practice.
N.B. Medication: Do not include medication as an SMS. The physiotherapist may suggest this but it is deemed outside of the current scope of physiotherapy practice.

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Appendix 1.3: Data collection Sheet

Coding checklist and guideline used to collect descriptive data regarding number and type of self-management strategies prescribed by physiotherapists during the observed physiotherapist-patient consultations

<table>
<tr><td>Patient Identification Number:</td><td colspan="6"></td></tr>
<tr><td>Physiotherapist Identification Number:</td><td colspan="6"></td></tr>
<tr><td>1. Reason patient consulting with physiotherapist:</td><td colspan="6"></td></tr>
<tr><td>2. Location of patient injury:</td><td colspan="6"></td></tr>
<tr><td>3. Patient gender</td><td colspan="6">Male Female</td></tr>
<tr><td>4. Patient age</td><td colspan="6"></td></tr>
<tr><td>5. Is this consultation a new patient assessment?</td><td>Yes
No</td><td colspan="5">If no, please list number of previous consultations.</td></tr>
<tr><td>6. Consultation time (in whole minutes):</td><td>Start time:</td><td></td><td>Finish time:</td><td></td><td>Total:</td><td>Minutes</td></tr>
<tr><td>a. Total time spent on self-management strategies (in whole minutes)</td><td colspan="6"></td></tr>
<tr><td>7. Did the physiotherapist prescribe a self-management strategy to this patient?</td><td colspan="6">No
Yes If yes, please specify all:</td></tr>
<tr><td>8. Was supplementary printed information regarding the self-management strategy provided to this patient?</td><td colspan="6"></td></tr>
</table>

Instructions:

Q1-5 to be obtained from physiotherapist once patient has consented to participate

Q6-8 to be noted during observed physiotherapist-patient consultation

Additional information:

Self-management strategies (SMS) are defined as "any strategy that the physiotherapist prescribes to the patient specifically for them to complete independently, away from the clinic". A SMS should be deemed as having been prescribed to the patient if enough instruction (either verbal, written or through practical demonstration) is given to the patient for them to be able to complete at home.

For example, 'here is a wrist splint that I would like you to wear at night' (list 'splint' as a SMS)

Versus 'you could try a night splint, perhaps next week if your wrist is not better we could discuss this treatment option further' (do **not** list 'splint' as a SMS)

Other SMS may include (but not restricted to):

Advice: Only list advice as a SMS if it is clear that this advice relates to an activity/ action which the physiotherapist is specifically telling the patient to follow at home such advice about rest or refraining from certain activities, posture etc. For example 'I would like you to rest from playing basketball this week.'

Do not include advice which is non-specific or conversational such as the physiotherapist may suggest that in the future the patient could try an orthotic but does not actually prescribe one (see splint example above).

Exercise: List exercise as a SMS if the physiotherapist expects the patient to complete them home. This may include stretches. Do not include exercises which are completed/ supervised during the consultation but are not given to the patient to complete/ continue with at home.

Brace/ Splint/ orthotics: List as a SMS if the physiotherapist actually provides a brace or splint or orthotic for the patient to wear at home. If the physiotherapist advises the patient to get a brace/splint/orthotic/heel wedge etc. from reception or local pharmacy but does not actually provide it to the patient then list under advice- brace/splint/orthotic.

Ice: Include ice as a SMS if the physiotherapist specifically tells the patient to use ice at home i.e. 'put an ice pack on your knee for 10 minutes at home'.

Heat: Include heat as a SMS if the physiotherapist specifically tells the patient to use heat at home i.e. 'put a heat pack on your shoulder for 10 minutes at home'.

Rest: Rest is to be included as advice rest/ refrain from (specified) activity. See 'advice' above.

Self-taping: List self-taping as a specific SMS if tape is provided. If the physiotherapist prescribes self-taping but does not provide tape then list under advice-self-taping. If a third person/ partner is required to tape please make note whether the partner was included in the demonstration and practice.

Self-mobilisation: List as a SMS if the patient is prescribed this to complete at home (such as patella mobilisation). If a third person/ partner is required to assist with mobilisation please make note whether the partner was included in the demonstration and practice.

Self-massage: List self-massage as a SMS if the patient is prescribed this to do at home (including transverse frictions or scar massage). If a third person/ partner is required to massage please make note whether the partner was included in the demonstration and practice.

N.B Medication: Do not include medication as a SMS. The physiotherapist may suggest this but this is deemed outside of the current scope of physiotherapy practice.

Appendix 2: Paper two

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Peek, K., Carey, M., Sanson-Fisher, R. & Mackenzie, L. "Physiotherapists' perceptions of patient adherence to physiotherapist prescribed self-management strategies: A national survey." Disability and Rehabilitation (2016)
https://doi.org/10.1080/09638288.2016.1212281

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Title: Physiotherapists' perceptions of patient adherence to prescribed self-management strategies: a cross-sectional survey of Australian physiotherapists

Author: Kerry Peek, Mariko Carey, Robert Sanson-Fisher, et al

Publication: DISABILITY & REHABILITATION

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Appendix 2.3: Survey instrument

Dear Physiotherapist,

Thank you for completing this survey regarding your perceptions of patient adherence to prescribed self-management strategies.

1) Please indicate your gender *(circle your response below).*
    a) Male
    b) Female

2) Do you work as a clinical physiotherapist for more than 15 hours during an average week? *(Circle your response below).*
    a) Yes
    b) No. **Thank you, you have now completed the survey.**
    Please return to the research team using the pre-paid envelope.

3) Do adult patients make up more than 80% of your clinical case load? *(Circle your response below).*
    a) Yes
    b) No. **Thank you, you have now completed the survey.**
    Please return to the research team using the pre-paid envelope.

4) Please circle the range that best describes the number of years since you graduated as a physiotherapist.
    a) 0-2
    b) 3-5
    c) 6-10
    d) 11-15
    e) 16-20
    f) 21-30
    g) >30

5) Please indicate where you obtained your entry level physiotherapy qualification. *(Circle your response below).*
    a) Australia
    b) Other country, please specify: ___________________________

6) Do you hold any post-graduate physiotherapy qualifications? *(Circle your response below).*

    a) Yes, please specify: ___________________________
    b) No

7) Please indicate where your primary place of work as a clinical physiotherapist is located (i.e. where you spend more than 50% of your time). *(Circle your response below).*

a) Hospital
b) Rehabilitation centre
c) Community health centre
d) Aged care centre
e) Private physiotherapy practice
f) Occupational rehabilitation
g) University or research centre
h) Other, please specify: ____________________

8) Please indicate which State/ Territory you work in as a physiotherapist. *(Circle your response below).*
   a) Australian Capital Territory
   b) New South Wales
   c) Northern Territory
   d) South Australia
   e) Tasmania
   f) Victoria
   g) Western Australia
   h) Queensland

9) Please indicate which area best describes where you work. *(Circle your response below).*
   a) Metropolitan (>100,000 population)
   b) Rural or Regional (<99,999)

The following questions relate to patient adherence to physiotherapist prescribed self-management strategies. For this study:

'Adherence' is defined as the extent to which a patient follows the self-management strategy recommended by you, their physiotherapist. This term can be used inter-changeably with 'compliance'.

'Self-management strategies' are any strategies prescribed by you, their physiotherapist, specifically for the patient to complete independently at home.

10) Please indicate the extent to which you agree or disagree with the following statements by circling the number that corresponds to your answer in the boxes below.

Treatment outcomes can be positively impacted by patients adhering to:	**Strongly agree**	**Agree**	**Disagree**	**Strongly disagree**
Independent exercise programs (e.g. specific exercises you have prescribed verbally or in writing)	1	2	3	4
Independent self-taping (e.g. patella or ankle taping)	1	2	3	4
Use of removable bracing (e.g. lumbar support brace, knee or ankle brace, wrist splint, ankle foot orthosis (AFO).)	1	2	3	4
Verbal or written advice (e.g. advice to reduce sitting time, increase general exercise, avoid certain activities)	1	2	3	4
Other, please specify:	1	2	3	4

11) Please think about the last 10 patients to whom you prescribed the listed self-management strategies.
How many patients do you believe adhered to at least 80% of your prescribed self-management strategy? *Please circle the number that corresponds to your answer below.*

Number of patients you believed adhered to at least 80% of your prescribed:												
exercise program	None adhered	1	2	3	4	5	6	7	8	9	All 10	Have never prescribed this
self-taping	None adhered	1	2	3	4	5	6	7	8	9	All 10	Have never prescribed this
removable bracing	None adhered	1	2	3	4	5	6	7	8	9	All 10	Have never prescribed this
advice	None adhered	1	2	3	4	5	6	7	8	9	All 10	Have never prescribed this

12) How important do you think the following categories are in determining whether patients adhere to physiotherapist-prescribed self-management strategies? Please rank the following 5 categories in order of importance (**1 as most important and 5 as least important**).

	1	**2**	**3**	**4**	**5**
Patient characteristics – non-modifiable (ones that you cannot change): Including age, gender, ethnicity, presence of co-morbidities					
Patient characteristics – modifiable (ones that you can change): Including self-motivation, self-confidence, belief the exercises will help, willingness to exercise					
Social factors Including emotional support / encouragement from family / friends, work place support, assistance with household tasks (if needed) from family/ friends					
Characteristics of the self-management strategy Including ease to complete, individualised to patient, lack of pain when completing, flexibility of strategy					
Physiotherapist characteristics Including communication skills, use of reminders, time devoted to prescribing strategy, monitoring of adherence, skill and knowledge of physiotherapist, motivation and confidence of the physiotherapist					

13) How important do you think the following methods are to improving patient adherence to physiotherapist-prescribed self-management strategies? Please rank the following in order of importance by placing a tick in the corresponding box (**1 as most important and 8 as least important**).

	1	2	3	4	5	6	7	8
a) **Individualising the self-management strategy to the patient** (e.g. reduction in complexity, tailoring to patient lifestyle, modification for pain response, individually tailored information)								
b) **Providing patient education** (either printed or verbal) including providing clear rationale for the strategy, expected outcomes, supportive materials or links to additional information								
c) **Practicing the strategy within the consultation** including physiotherapist demonstration, patient practice and feedback, checking the patient understands the instructions								
d) **Providing professional support to the patient** including motivational support/counselling, questioning the patient about barriers to adherence and ways to overcome these								
e) **Monitoring of patient adherence**, including use of reminders, follow up (face to face or via telephone), use of exercise diaries								
f) **Addressing the general health of the patient**, including referral to GP or Allied Health colleague regarding issues which may impact on adherence such co-morbidities, medication or diet								
g) **Involvement of the patient's support person**, e.g. including them in the consultation, showing them how to assist with use of strategy (e.g. donning/ doffing brace), exercising alongside the patient.								
h) **Physiotherapist communication skills**, including active listening and being more empathetic or persuasive with the patient.								

14) Do any of the following barriers prevent you from employing methods to improve patient adherence to a self-management strategy? Please indicate the extent to which you agree or disagree with the following statements by circling the number which best describes your response to a-j below.

	Strongly agree	**Agree**	**Disagree**	**Strongly disagree**
a) I do not have enough time to assess patient adherence with prescribed strategies	1	2	3	4
b) I have limited knowledge/ skills in assessing patient adherence	1	2	3	4
c) I do not have enough time to provide adherence aiding strategies	1	2	3	4
d) I am uncomfortable discussing adherence with patients	1	2	3	4
e) I have limited knowledge/ skills in providing adherence aiding strategies	1	2	3	4
f) I have limited access to resources such as patient educational materials	1	2	3	4
g) There can be a lack of continuity of care; patients often see different physiotherapists	1	2	3	4
h) I don't believe that I can alter patient adherence-either patients adhere or they don't	1	2	3	4
i) I don't believe that adherence is a problem with my patients	1	2	3	4
j) I don't believe that improving patient adherence is relevant to physiotherapy practice	1	2	3	4

Thank you for completing this survey.
Your time and views are greatly appreciated.
Please return this survey to the research team using the pre-paid envelope.

For further information regarding this research project please contact Kerry Peek:

Kerry.Peek@uon.edu.au

Appendix 3: Paper Three

Peek, K., Carey, M., Mackenzie, L. & Sanson-Fisher, R. "Predictors of high levels of patient adherence to physiotherapist-prescribed self-management strategies."

Currently under review with Physiotherapy (UK).

Appendix 3.1: **Coding instructions for completing the data collection sheet**

Key: SMS= Self-management strategies; 'Y' = yes; 'N' = no; 'N/A'= not applicable

Name of self-management strategy: **(repeat a-j below for each named strategy)**	
Did the physiotherapist…?	
a) Provide rationale for the SMS?	Code 'Y' if a rationale is given as to why the patient should complete the SMS at home (such as these exercises will help you to increase your range of movement) Code 'N' if no rationale is given
b) Give the patient clear instructions on how they were to follow the SMS at home?	Code 'Y' if clear verbal or written instruction provided so the patient knows **exactly how** to complete the SMS once they are home (such as for how long, how many times a day/week etc) Code 'N' if any part of the instructions are unclear or any instruction detail is missing
c) Give the patient clear instructions on when they were to follow the SMS at home?	Code 'Y' if clear verbal or written instruction provided so the patient knows **exactly when** to complete the SMS once they are home (such as when to wear a brace- all the time/ only at night, when to exercise/time of day/ before or after a warm-up, when to apply a heat pack etc) Code 'N' if instructions regarding 'when' are unclear or missing
d) Question the patient about any barriers to following the SMS?	Code 'Y' if the patient was specifically asked about their own potential barriers to following the SMS at home**.** Code 'N' if the patient was not asked specifically about their own barriers.
e) Demonstrate the SMS?	Code 'Y' if the physio demonstrated the SMS Code "N' if the physio did not demonstrate the SMS Code N/A if demonstration is not possible such as with advice
f) Allow time for the patient to practice the SMS?	Code 'Y' if the patient is given time to practice the SMS Code 'N' if no patient practice occurred Code N/A if practice is not possible such as with advice
g) Ask the patient to recall the details of the SMS	Code 'Y' if the patient was asked to repeat back the instructions relating to the SMS (such as "can you tell me what I would like you to do at home?") Code 'N' if the patient was not specifically asked to repeat back the instructions relating to the SMS N.B. This **must** be an open ended question requiring a detailed response from the patient.
h) Give the patient printed information about the SMS	Code 'Y' if information was provided in written/diagrammatic printed format Code 'N' if no printed information given

Appendix 3.2: **Univariate associations between patient, physiotherapist, consultation and prescription characteristics and high levels of patient self-reported adherence to prescribed self-management strategies (n=232).**

Characteristic	**Univariate analysis**		
	Unadjusted odds ratio	**95% CI**	***p*-value**
Patient characteristics			
Patient gender			
- **Male**	1.00	Ref	0.88
- **Female**	0.96	0.55-1.66	
Patient age			
- **18-30**	1.00	Ref	0.78
- **31-45**	1.22	0.38-3.94	
- **46-60**	0.98	0.29-3.31	
- **61-75**	1.00	0.29-3.38	
- **≥76**	1.39	0.34-5.66	
Reason for patient attending treatment			
- **Had physiotherapy before**	1.00	Ref	0.43
- **Medical referral**	1.33	0.73-2.41	
- **Family recommended**	1.38	0.53-3.64	
- **Other**	0.79	0.33-1.85	
Location of injury			
- **Spine**	1.00	Ref	0.47
- **Upper limb**	1.08	0.56-2.07	
- **Lower limb**	0.89	0.31-2.61	
Physiotherapist characteristic			
Physiotherapist possession of post-graduate qualification	1.00	Ref	0.22*
- **No**	1.48	0.79-2.76	
- **Yes**			
Consultation characteristics			
Number of previous consultations			
- **0**	1.00	Ref	0.66
- **1-5**	1.33	0.20-8.92	
- **6-10**	0.78	0.13-4.88	
- **11-20**	1.07	0.13-8.79	
- **≥21**	0.83	0.11-6.25	
Length of consultation time spent on self-			

management strategies - **<5 minutes** - **≥5 minutes**	 1.00 1.14	 Ref 0.68-1.92	 0.25
Prescription characteristics			
Number of strategies prescribed - **1** - **2** - **3** - **4**	 1.00 0.92 0.87 0.64	 Ref 0.36-2.33 0.41-1.84 0.30-2.91	 0.14*
Type of strategy - **Exercise** - **Advice** - **Other**	 1.00 0.20 0.39	 Ref 0.10-0.42 0.17-0.90	 <0.001 *
Rationale for completing strategy - **No** - **Yes**	 1.00 1.46	 Ref 0.77-2.78	 0.25
Questioning patient about barriers to adherence - **No** - **Yes**	 1.00 1.99	 Ref 1.09-3.64	 0.02*
Clear verbal instructions regarding when to complete the strategy - **No** - **Yes**	 1.00 0.88	 Ref 0.50-1.53	 0.64
Clear verbal instructions regarding how to complete the strategy - **No** - **Yes**	 1.00 1.91	 Ref 1.12-3.24	 0.04*
Demonstration of the strategy - **No** - **Yes**	 1.00 3.02	 Ref 1.03-8.87	 0.04*
Opportunity for patient to practice the strategy - **No** - **Yes**	 1.00 2.97	 Ref 0.95-9.30	 0.06*
Asking the patient to recall the details of the strategy - **No** - **Yes**	 1.00 7.30	 Ref 3.71-14.36	 <0.001 *
Printed information - **No** - **Yes**	 1.00 4.09	 Ref 2.17-7.72	 <0.001 *

Notes: = variables included in the initial multiple mixed-effects logistic regression model*

Appendix 4: Paper Four

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Peek, K, Sanson-Fisher, R, Mackenzie, L. & Carey, M. "Patient adherence to physiotherapist prescribed self-management strategies: A critical review"; International Journal of Therapy and Rehabilitation. 22.11 (2015) 535-543. https://doi.org/10.12968/ijtr.2015.22.11.535

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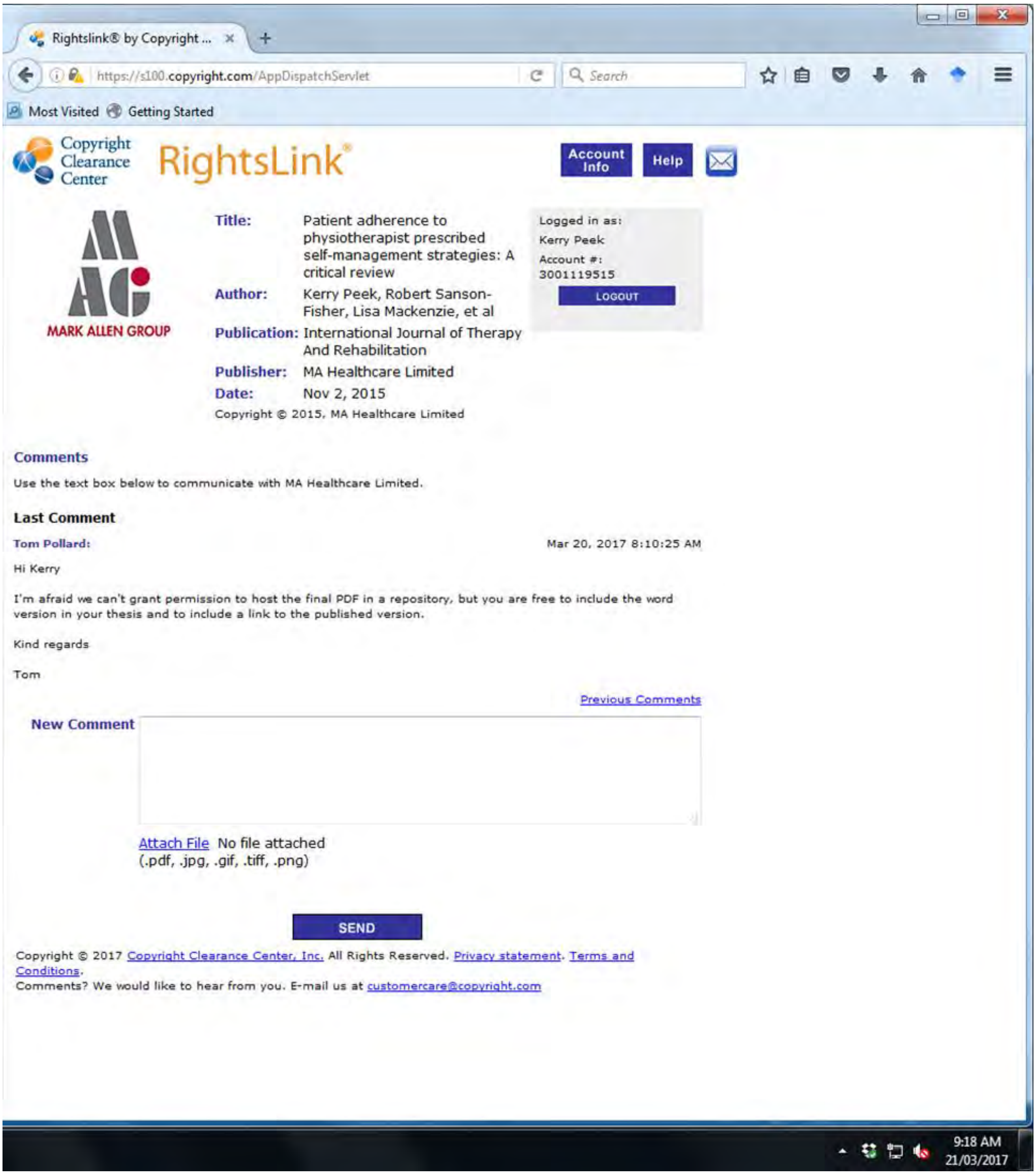

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Author: Kerry Peek, Robert Sanson-Fisher, Lisa Mackenzie, et al

Publication: International Journal of Therapy And Rehabilitation

Publisher: MA Healthcare Limited

Date: Nov 2, 2015

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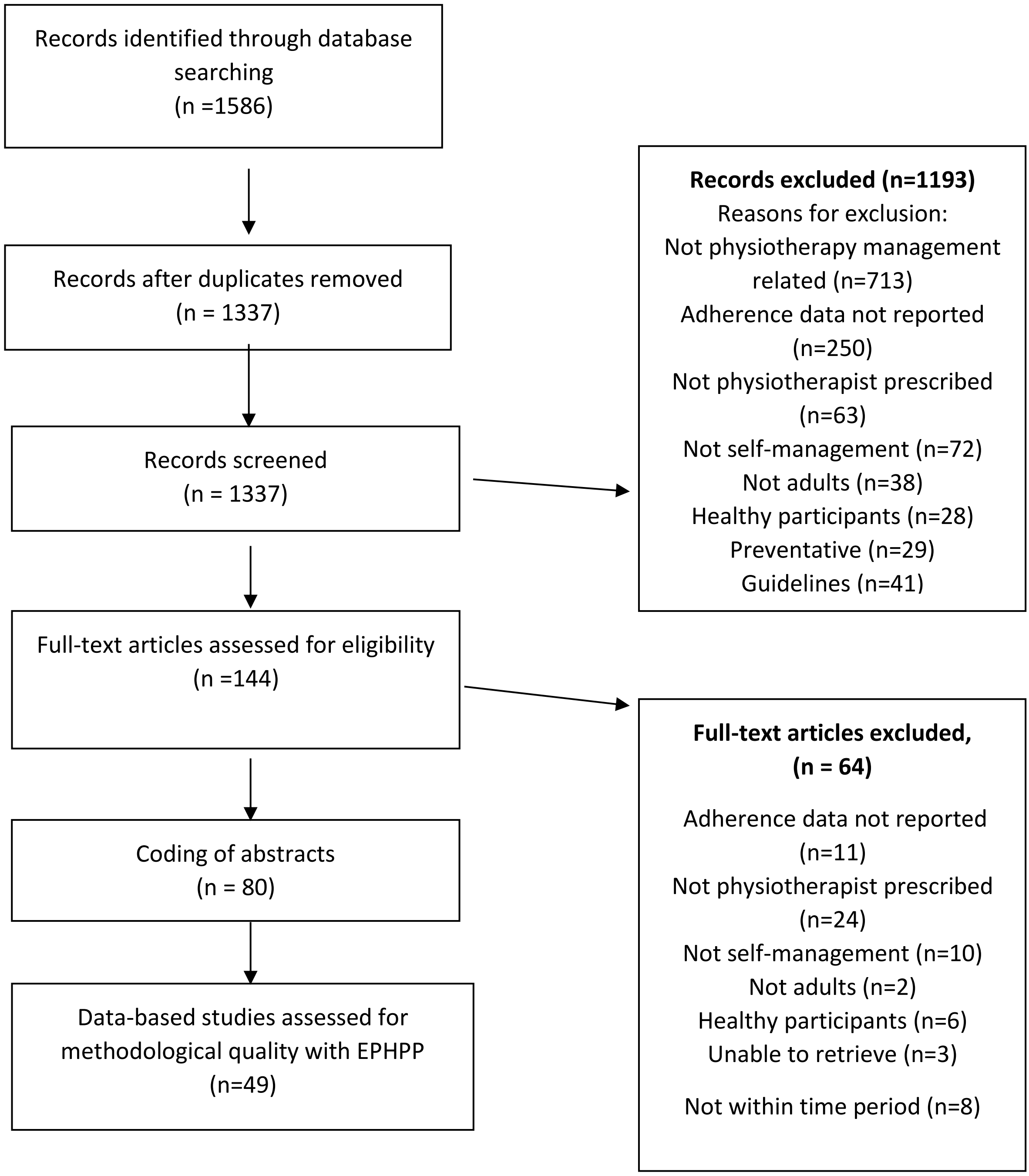
21/03/2017

Appendix 4.2: Flow chart of the literature search



Appendix 4.3

Included Studies:

1. Non-data based, this includes commentaries and opinion –based Paper;

1. Bassett S. The assessment of patient adherence to physiotherapy rehabilitation. NZ J physiother. 2003; 31(2):60-6.

2. Crandall S, Howlett S, Keysor J. Exercise adherence interventions for adults with chronic musculoskeletal pain. Phys Ther. 2013; 93(1):17-21.

3. DiGiacomo M. Patient Adherence: Sharing the Responsibility. PT: Mag Phys Ther. 2008; 16(7):28-30.

4. Grindley EJ, Zizzi SJ, Nasypany AM. Author Response. Phys Ther. 2008; 88(12):1543-4.

5. Kettler LJ, Sawyer SM, Winefield HR, Greville HW. Determinants of adherence in adults with cystic fibrosis. Thorax. 2002; 57(5):459-64.

6. Liddle SD. Compliance with Exercise in Low Back Pain: Aspiration or Achievable Goal? Phys Ther Rev. 2004; 9(4):181-2.

7. Nijs J, Roussel N, Paul van Wilgen C, Köke A, Smeets R. Thinking beyond muscles and joints: Therapists' and patients' attitudes and beliefs regarding chronic musculoskeletal pain are key to applying effective treatment. Man Ther. 2013; 18(2):96-102.

8. O'Brien L. The evidence on ways to improve patient's adherence in hand therapy. J Hand Ther. 2012; 3:247-50.

9. Page CJ, Hinman RS, Bennell KL. Physiotherapy management of knee osteoarthritis. Int J Rheum Dis. 2011; 14(2):145-51.

10. Spetch LA, Kolt GS. Adherence to sport injury rehabilitation: implications for sports medicine providers and researchers. Phys Ther Sport. 2001; 2(2):80-90.

11. Walker A. Patient compliance and the placebo effect. Physiother. 1995; 81(3):120-6.

2. Data based, no new data: Reviews

1. Beinart NA, Goodchild CE, Weinman JA, Ayis S, Godfrey EL. Individual and intervention-related factors associated with adherence to home exercise in chronic low back pain: a systematic review. Spine J. 2013; 13(12):1940-50.

2. Bennell KL, Hinman RS. A review of the clinical evidence for exercise in osteoarthritis of the hip and knee. J Sci Med Sport. 2011; 14(1):4-9.

3. Brus H, van de Laar M, Taal E, Rasker J, Wiegman O. Compliance in rheumatoid arthritis and the role of formal patient education. Semin Arthritis Rheum. 1997; 26(4):702-10.

4. Jack K, McLean SM, Moffett JK, Gardiner E. Barriers to treatment adherence in physiotherapy outpatient clinics: a systematic review. Man Ther. 2010; 15(3):220-8.

5. Jordan JL HM, Mason EEJ, Foster NE. Interventions to improve adherence to exercise for chronic musculoskeletal pain in adults (review). Cochrane Database Syst Rev 2010, issue 1. 2010.

6. Kingston G, Gray MA, Williams G. A critical review of the evidence on the use of videotapes or DVD to promote patient compliance with home programmes. Disabil Rehabil: Assist Tech. 2010; 5(3):153-63.

7. McLean SM, Burton M, Bradley L, Littlewood C. Interventions for enhancing adherence with physiotherapy: a systematic review. Man Ther. 2010; 15(6):514-21.

8. Middleton A. Chronic Low Back Pain: Patient Compliance with Physiotherapy Advice and Exercise, Perceived Barriers and Motivation. Phys Ther Rev. 2004; 9(3):153-60.

3. Data based, new data

i. Qualitative study designs

1. Campbell R, Evans M, Tucker M, Quilty B, Dieppe P, Donovan JL. Why don't patients do their exercises? Understanding non-compliance with physiotherapy in patients with osteoarthritis of the knee. Journal of Epidemiology & Community Health. 2001; 55(2):132-8.

2. Carr L, Smith RE, Pryor JA, Partridge C. Cystic fibrosis patients' views and beliefs about chest clearance and exercise -- a pilot study. Physiother. 1996; 82(11):621-7.

3. Dean SG, Smith JA, Payne S, Weinman J. Managing time: An interpretative phenomenological analysis of patients' and physiotherapists' perceptions of adherence to therapeutic exercise for low back pain. Disabil Rehabil. 2005; 27(11):625-36.

4. Emtner M, Hedin A. Adherence to and effects of physical activity on health in adults with asthma. Adv Physiother. 2005; 7(3):123-34.

5. Escolar-Reina P, Medina-Mirapeix F, Gascon-Canovas JJ, Montilla-Herrador J, Jimeno-Serrano FJ, de Oliveira Sousa SL, et al. How do care-provider and home exercise program characteristics affect patient adherence in chronic neck and back pain: a qualitative study. BMC Health Serv Res. 2010; 10:60.

6. Kåringen I, Dysvik E, Furnes B. The elderly stroke patient's long-term adherence to physiotherapy home exercises. Adv Physiother. 2011; 13(4):145-52.

7. Karnad P MS. Physiotherapists' perceptions of patient adherence to home exercises in chronic musculoskeletal rehabilitation. Int J Physiother Rehabil. 2011; Nov: 28-32.

8. Medina-Mirapeix F, Escolar-Reina P, Gascón-Cánovas JJ, Montilla-Herrador J, Collins SM. Personal characteristics influencing patients' adherence to home exercise during chronic pain: a qualitative study. J Rehabil Med. 2009; 41(5):347-52.

9. Myers LB, Horn SA. Adherence to chest physiotherapy in adults with cystic fibrosis. J Health Psychol. 2006; 11(6):915-26.

10. Pizzari T, McBurney H, Taylor NF, Feller JA. Adherence to Anterior Cruciate Ligament Rehabilitation: A Qualitative Analysis. J Sport Rehabil. 2002; 11(2):90-102.

11. Quinn L, Busse M, Khalil H, Richardson S, Rosser A, Morris H. Client and therapist views on exercise programmes for early-mid stage Parkinson's disease and Huntington's disease. Disabil Rehabil. 2010; 32(11):917-28.

12. Veenhof C, van Hasselt TJ, Koke AJA, Dekker J, Bijlsma JWJ, Van den Ende CHM. Active involvement and long-term goals influence long-term adherence to behavioural

graded activity in patients with osteoarthritis: a qualitative study. J Physiother. 2006; 52(4):273-8.

ii. Non-intervention study designs

1. Abbott J, Dodd M, Gee L, Webb K. Ways of coping with cystic fibrosis: implications for treatment adherence. Disabil Rehabil. 2001; 23(8):315-24.

2. Alewijnse D, Mesters I, Metsemakers J, van den Borne B. Predictors of long-term adherence to pelvic floor muscle exercise therapy among women with urinary incontinence. Health Educ Res. 2003; 18(5):511-24.

3. Alexandre NM, Nordin M, Hiebert R, Campello M. Predictors of compliance with short-term treatment among patients with back pain. Rev Panam Salud Publica. 2002; 12(2):86-94.

4. Brewer BW, Cornelius AE, Raalte JLV, Brickner JC, Sklar JH, Corsetti JR, et al. Rehabilitation adherence and anterior cruciate ligament reconstruction outcome. Psych, Health Med. 2004; 9(2):163-75.

5. Burns A, Burridge J, Pickering R, Turk R. Does the use of a constraint mitten to encourage use of the hemiplegic upper limb improve arm function in adults with subacute stroke? Clin Rehabil. 2007; 21(10):895-904.

6. Chan D, Can F. Patients' adherence/compliance to physical therapy home exercises. Fizyoterapi Rehabilitasyon. 2010; 21(3):132-9.

7. Chen CY, Neufeld PS, Feely CA, Skinner CS. Factors influencing compliance with home exercise programs among patients with upper-extremity impairment. Am J Occup Ther. 1999; 53(2):171-80.

8. Deutscher D, Horn SD, Dickstein R, Hart DL, Smout RJ, Gutvirtz M, et al. Associations Between Treatment Processes, Patient Characteristics, and Outcomes in Outpatient Physical Therapy Practice. Arch Phys Med Rehabil. 2009; 90(8):1349-63.

9. Engström LO, Öberg B. Patient adherence in an individualized rehabilitation programme: a clinical follow-up. Scand J Public Health. 2005; 33(1):11-8.

10. Escolar-Reina P, Medina-Mirapeix F, Gascón-Cánovas JJ, Montilla-Herrador J, Valera-Garrido JF, Collins SM. Self-Management of Chronic Neck and Low Back Pain and Relevance of Information Provided During Clinical Encounters: An Observational Study. Arch Phys Med Rehabil. 2009; 90(10):1734-9.

11. Forkan R, Pumper B, Smyth N, Wirkkala H, Ciol MA, Shumway-Cook A. Exercise Adherence Following Physical Therapy Intervention in Older Adults With Impaired Balance. Phys Ther. 2006; 86(3):401-10.

12. Groeneveldt L, Mein G, Garrod R, Jewell AP, Van Someren K, Stephens R, et al. A mixed exercise training programme is feasible and safe and may improve quality of life and muscle strength in multiple myeloma survivors. BMC Cancer. 2013; 13:31.

13. Hartigan C, Rainville J, Sobel JB, Hipona M. Long-term exercise adherence after intensive rehabilitation for chronic low back pain. / Adhesion a la pratique d'une activite physique a long terme, apres une reeducation intensive pour cause de lombalgie chronique. Med Sci Sports Exerc. 2000; 32(3):551-7.

14. Huang K, Sparto PJ, Kiesler S, Siewiorek DP, Smailagic A. iPod-based in-home system for monitoring gaze-stabilization exercise compliance of individuals with vestibular hypofunction. J Neuro Eng Rehabil. 2014; 11(1):69.

15. Hunter J, Singh SJ, Morgan MDL. Objective monitoring of adherence with home exercise training during pulmonary rehabilitation for chronic obstructive pulmonary disease. Physiother. 2006; 92(1):50-4.

16. Khalil H, Quinn L, van DR, Martin R, Rosser A, Busse M. Adherence to use of a home-based exercise DVD in people with Huntington disease: Participants' perspectives. Phys Ther. 2012; 92(1):69-82.

17. Kolt GS, McEvoy JF. Adherence to rehabilitation in patients with low back pain. Man Ther. 2003; 8(2):110-6.

18. Mailloux J, Finno M, Rainville J. Long-Term Exercise Adherence in the Elderly with Chronic Low Back Pain. Am J Phys Med Rehabil. 2006; 85(2):120-6.

19. Mannion AF, Helbling D, Pulkovski N, Sprott H. Spinal segmental stabilisation exercises for chronic low back pain: programme adherence and its influence on clinical outcome. Eur Spine J. 2009; 18(12):1881-91.

20. Milne M, Hall C, Forwell L. Self-efficacy, imagery use, and adherence to rehabilitation by injured athletes. J Sport Rehabil. 2005; 14(2):150-67.

21. Niven A, Nevill A, Sayers F, Cullen M. Predictors of rehabilitation intention and behavior following anterior cruciate ligament surgery: an application of the Theory of Planned Behavior. Scand J Med Sci Sports. 2012; 22(3):316-22.

22. Pickering RM, Fitton C, Ballinger C, Fazakarley L, Ashburn A. Self-reported adherence to a home-based exercise programme among people with Parkinson's disease. Parkins Rel Disord. 2013; 19(1):66-71.

23. Pizzari T, Taylor NF, McBurney H, Feller JA. Adherence to Rehabilitation after Anterior Cruciate Ligament Reconstructive Surgery: Implications for Outcome. J Sport Rehabil. 2005; 14(3):201.

24. Sandford F, Barlow N, Lewis J. A Study to Examine Patient Adherence to Wearing 24-Hour Forearm Thermoplastic Splints after Tendon Repairs. J Hand Ther. 2008; 21(1):44-53.

25. Simard C, Tu le M. Long-term efficacy of pelvic floor muscle rehabilitation for older women with urinary incontinence. J Obstet Gynaecol Can. 2010; 32(12):1163-6.

26. Taylor AH, May S. Threat and coping appraisal as determinants of compliance with sports injury rehabilitation: An application of Protection Motivation Theory. J Sports Sci. 1996; 14(6):471-82.

27. Wesch N, Hall C, Prapavessis H, Maddison R, Bassett S, Foley L, et al. Self-efficacy, imagery use, and adherence during injury rehabilitation. Scand J Med Sci Sports. 2012; 22(5):695-703.

28. White D, Stiller K, Haensel N. Adherence of adult cystic fibrosis patients with airway clearance and exercise regimens. J Cystic Fibrosis. 2007; 6(3):163-70.

iii. Intervention study designs

1. Alewijnse D, Metsemakers JFM, Mesters IEPE, van den Borne B. Effectiveness of pelvic floor muscle exercise therapy supplemented with a health education program to

promote long-term adherence among women with urinary incontinence. Neurourol Urodyn. 2003; 22(4):284-95.

2. Bassett SF, Petrie KJ. The Effect of Treatment Goals on Patient Compliance with Physiotherapy Exercise Programmes. Physiother. 1999; 85(3):130-7.

3. Bassett SF, Prapavessis H. A test of an adherence-enhancing adjunct to physiotherapy steeped in the protection motivation theory. Physiother Theory Pract. 2011; 27(5):360-72.

4. Ben Salah Frih Z FY, Jellad A, Boudoukhane S, Rejeb N. Efficacy and treatment compliance of a home based rehabilitation program for chronic low back pain. Annals Phys Rehabil Med. 2009; 52:485-96.

5. Bennell KL, Matthews B, Greig A, Briggs A, Kelly A, Sherburn M, et al. Effects of an exercise and manual therapy program on physical impairments, function and quality-of-life in people with osteoporotic vertebral fracture: a randomised, single-blind controlled pilot trial. BMC Musculoskel Disord. 2010; 11:36.

6. Borello-France D, Burgio KL, Goode PS, Wen Y, Weidner AC, Lukacz ES, et al. Adherence to Behavioral Interventions for Stress Incontinence: Rates, Barriers, and Predictors. Phys Ther. 2013; 93(6):757-73.

7. Evans L, Hardy L. Injury rehabilitation: a goal-setting intervention study. Res Q Exerc Sport. 2002; 73(3):310-9.

8. Friedrich M, Gittler G, Halberstadt Y, Cermak T, Heiller I. Combined exercise and motivation program: effect on the compliance and level of disability of patients with chronic low back pain: a randomized controlled trial. Arch Phys Med Rehabil. 1998; 79(5):475-87.

9. Goss DL, Moore JH. Compliance wearing a heel lift during 8 weeks of military training in cadets with limb length inequality. J Ortho Sports Phys Ther. 2004; 34(3):126-31.

10. Goto M, Takedani H, Haga N, Kubota M, Ishiyama M, Ito S, et al. Self-monitoring has potential for home exercise programmes in patients with haemophilia. Haemophilia. 2014; 20(2):e121-e7.

11. Johansson AC, Linton SJ, Bergkvist L, Nilsson O, Cornefjord M. Clinic-based training in comparison to home-based training after first-time lumbar disc surgery: a randomised controlled trial. Euro Spine J 2009 Mar; 18(3):398-409. 2009.

12. Littlewood C, Malliaras P, Mawson S, May S, Walters SJ. Self-managed loaded exercise versus usual physiotherapy treatment for rotator cuff tendinopathy: a pilot randomised controlled trial. Physiother. 2014; 100(1):54-60.

13. Lysack C, Dama M, Neufeld S, Andreassi E. A compliance and satisfaction with home exercise: a comparison of computer-assisted video instruction and routine rehabilitation practice. J Allied Health. 2005; 34(2):76-82.

14. McClellan R, Ada L. A six-week, resource-efficient mobility program after discharge from rehabilitation improves standing in people affected by stroke: placebo-controlled, randomised trial. J Physiother. 2004; 50(3):163-7.

15. O'Brien D BS, McNair P. The effect of action and coping plans on exercise adherence in people with lower limb osteoarthritis: a feasibility study. NZ J physiother. 2013; 41(2):49-57.

16. Pisters MF, Veenhof, C., de Bakker, D.H., Schellevis, F.G., Dekker, J. Behavioural graded activity results in better exercise adherence and more physical activity than usual care in people with osteoarthritis. J Physiother. 2010; 56:41-7.

17. Roddey TS, Olson SL, Gartsman GM, Hanten WP, Cook KF. A randomized controlled trial comparing 2 instructional approaches to home exercise instruction following arthroscopic full-thickness rotator cuff repair surgery. J Ortho Sports Phys Ther. 2002; 32(11):548-59.

18. Salo P, Ylönen-Käyr N, Häkkinen A, Kautiainen H, Mälki E, Ylinen J. Effects of long-term home-based exercise on health-related quality of life in patients with chronic neck pain: A randomized study with a 1-year follow-up. Disabil Rehabil. 2012; 34(23):1971-7.

19. Schneiders AG ZM, Singer KP. Exercise therapy compliance in acute low back pain patients. Man Ther. 1998; 3(3):147-52.

20. Schoo AMM, Morris ME, Bui QM. The effects of mode of exercise instruction on compliance with a home exercise program in older adults with osteoarthritis. Physiother. 2005; 91(2):79-86.

21. Steele BG, Belza B, Cain KC, Coppersmith J, Lakshminarayan S, Howard J, et al. A Randomized Clinical Trial of an Activity and Exercise Adherence Intervention in Chronic Pulmonary Disease. Arch Phys Med Rehabil. 2008; 89(3):404-12.

Appendix 5: Paper Five

Peek, K., Carey, M., Mackenzie, L. & Sanson-Fisher, R. "Patient adherence to an exercise program for chronic low back pain measured by patient-report, physical therapist perception and observational data."

Currently under review with Musculoskeletal Science and Practice

Appendix 6: Paper Six

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Peek K., Sanson-Fisher R., Mackenzie L., & Carey, M. Interventions to aid patient adherence to physiotherapist prescribed self-management strategies: A systematic review. Physiotherapy. (2016); 102(2):127-35. https://doi.org/10.1016/j.physio.2015.10.003

Appendix 6.1: Published Paper

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Physiotherapy

Physiotherapy 102 (2016) 127–135

Systematic review

Interventions to aid patient adherence to physiotherapist prescribed self-management strategies: a systematic review

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Abstract

Background Physiotherapist prescribed self-management strategies are an important adjunct to 'hands on' treatment. However, treatment outcomes are likely to be related to whether patients adhere to the prescribed strategy. Therefore, physiotherapists should be aware of adherence aiding interventions designed to maximise patient outcomes underpinned by quality research studies.

Objective To conduct a systematic review of the interventions used to aid patient adherence to all physiotherapist prescribed self-management strategies.

Data sources The search included the databases CINAHL, EMBASE, MEDLINE, PUBMED, PSYCINFO, SPORTSDiscus, the Cochrane Central Register of Controlled Trials, PEDro and Mednar for randomised controlled trials (RCTs) published in a peer reviewed journal from inception to November 2014.

Data extraction and synthesis Data were extracted using a standardised form from twelve included RCTs for patient adherence rates to self-management strategies for interventions used to aid patient adherence and usual care. Two independent reviewers conducted methodological quality assessment.

Results Twelve different interventions to aid patient adherence to exercise were recorded from twelve fair to high quality RCTs. Potential adherence aiding interventions include an activity monitor and feedback system, written exercise instructions, behavioural exercise programme with booster sessions and goal setting.

Conclusion and implications of key findings Despite a number of studies demonstrating interventions to positively influence patient adherence to exercise, there is insufficient data to endorse their use in clinical practice. No RCTs examining adherence aiding interventions to self-management strategies other than exercise were identified, indicating a significant gap in the literature.

Systematic review registration number PROSPERO CRD42015014516.

Keywords: Patient adherence; Self-management; Physiotherapist; Review; Exercise; Advice

Background

Physiotherapy is a profession integral to health promotion, illness and injury prevention, acute care, rehabilitation and self-management and as such, it is an essential component of a holistic health care system [1,2]. Self-management can be defined as the management of the day-to-day impact of a condition, which is often a lifelong task [3]. Effective self-management is often dependent on the collaboration between the patient and physiotherapist. It is this collaborative approach that helps the patient to acquire the skills and confidence to manage their condition; provides self-management strategies and allows for routine assessment of problems and accomplishments [3]. Self-management strategies form an important part of physiotherapy treatment plans because patients will spend more time away from the physiotherapist than receiving clinic or hospital based care.

There are a range of self-management strategies that physiotherapists recommend to their patients. Advice ranked as the most commonly provided supplement to clinic-based

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0031-9406/

treatment provided to patients with chronic low back pain by physiotherapists [4]. Knee and elbow braces, taping and orthotics are also commonly prescribed by physiotherapists [5,6]. Despite this diversity of self-management strategies, past research on physiotherapist prescribed self-management strategies has tended to focus on exercise.

The efficacy of a self-management strategy can only be determined if the patient adheres to it in the first place (*i.e.* treatment fidelity). Adherence has been defined as 'the extent to which a person's behaviour… corresponds with agreed recommendations from a healthcare provider' [7]. Poor treatment adherence is a problem across a number of healthcare disciplines including physiotherapy [8]. Although adherence to physiotherapist-prescribed exercise programmes has been shown to be an important predictor of treatment outcome [9,10], 50–70% of patients are either non-adherent or only partially adherent to their home physiotherapy programmes [10,11]. Patient adherence assumes importance in physiotherapy because it may bring about potential savings in treatment costs, and avoidable morbidity [12].

Education, effective communication, patient–therapist rapport, social support and encouragement, goal setting, treatment efficacy and tailoring have all been shown to have an impact on patient adherence rates [13]. A number of systematic reviews have assessed strategies for improving patient adherence with exercise for musculoskeletal conditions [8,14,15]. However, it is important to ascertain whether adherence aiding strategies can positively impact on patient adherence to a range of self-management strategies (including but not limited to exercise) and for a range of patient conditions.

Objective

The objective of this systematic review is to examine the effectiveness of interventions used to aid patient adherence to all physiotherapist prescribed self-management strategy.

Method

This review followed a systematic review protocol (PROSPERO reference no: CRD42015014516). The PRISMA guidelines were used as a reference for the design and reporting of this review [16,17].

Eligibility criteria

Papers were assessed for relevance according to the following criteria:

- *Types of participants*: included adult patient population who were prescribed a self-management strategy by a physiotherapist to perform independently, away from the physiotherapy clinic or other supervised environment. Studies using preventative strategies, paediatric or healthy participants were excluded.
- *Types of interventions*: included any intervention implemented within the study to aid patient adherence to a physiotherapist prescribed self-management strategy such as goal setting, supplemented education material, motivational programme.
- *Types of control*: this included usual care; in other words, a physiotherapist prescribed self-management strategy without an adherence aiding intervention.
- *Types of outcomes*: the main outcome of interest was a comparison of the reported rate of patient adherence to physiotherapist prescribed self-management strategies for adherence aiding interventions and usual care.
- *Types of studies*: only Randomised Controlled Trials (RCTs) or Quasi-RCTs published in English which met pre-determined methodological criteria for design quality were included in this review.

Information sources and search criteria

A systematic search strategy was utilised for this systematic review. The initial search included the databases CINAHL, EMBASE, MEDLINE, PUBMED, PSYCINFO, SPORTSDiscus, the Cochrane Central Register of Controlled Trials and PEDro (see online supplementary Table S1 for more information on the database search strategy). The search for unpublished or grey literature was conducted using Mednar. Databases were searched for full texts from inception to November 2014. Initial key words used were 'physiotherapy,' 'patient adherence,' 'self-management,' 'compliance' with additional terms: 'physical therapy,' 'physical activity,' 'exercise,' 'tape,' 'advice,' 'brace,' 'splint'

This was followed by an analysis of the text words contained within the title and abstract, and of the index terms used to describe the study.

A second search using all identified keywords and indexed terms was then commenced across all included databases. The third step included hand searching and screening of the included studies for any additional studies.

Study selection and data extraction

The first author scanned titles and abstracts based on the pre-specified inclusion criteria. A second reviewer independently assessed a random sample of 15% of the identified abstracts. Full texts were assessed independently by the first author and a second reviewer. Kappa was computed to determine inter-rater reliability of study selection. A Kappa of 0.78 indicated a substantial level of agreement. A third reviewer was available to consult if there were any discrepancies.

The first author undertook all the data extraction using a standardised data extraction form. The data extraction form extracted data on study (author, year) participants (population group), self-management strategy, adherence aiding intervention and control, results and author conclusions.

Methodological quality assessment

The quality assessment scale developed by the Physiotherapy Evidence Database (PEDro) was used to assess the methodological quality of the RCTS and quasi RCTs included in this systematic review. The PEDro scale uses the following criteria: (a) eligibility criteria, (b) random allocation, (c) concealed allocation, (d) baseline comparability, (e) blinding of subjects, (f) blinding of therapists, (g) blinding of assessors, (h) adequate follow-up, (i) intention-to-treat analysis, (j) between-group comparisons, and (k) point estimates and variability. The methodological quality of the studies was tabulated and given a rating of high (eight or more), moderate (six or more), fair (four or more) and low (three or less) using the overall PEDro score. Studies were required to receive a rating of fair or above (four or more out of ten) to be considered as having met accepted methodological criteria for design quality and therefore, included in this review. Methodological quality for the included RCTs was conducted independently by two reviewers, and any disagreements were discussed and resolved without the need for a third reviewer.

Data synthesis

Due to the heterogeneity of the interventions to aid adherence, patient population and type of self-management strategy, results are summarised narratively. The results for the interventions to aid patient adherence have been grouped using the Behaviour Change Technique Taxonomy [18]. This taxonomy was developed using a delphi-type exercise with one of the aims being to provide systematic reviews with a reliable method for extracting and synthesising information associated with effectiveness [18].

Results

In total 1586 citations were identified; 1437 were removed following review of title, abstract and removal of duplicates. The full texts of 149 papers were retrieved for further evaluation; 137 of these did not meet the inclusion criteria leaving a total of 12 studies which were included and assessed for methodological quality using the PEDro scale. A flow chart of the study retrieval and selection process is presented in Fig. S1.

Results of methodological quality assessment

Twelve studies were assessed using criteria outlined in the PEDro scale. The PEDro scale gives a score out of 10 (eligibility criteria is not used in determination of the final score). Kappa was computed to determine inter-rater reliability of methodological quality assessment between the two reviewers. Kappa of 0.71 indicated a substantial level of agreement [19]. All 12 studies met the methodological quality criteria cut-point and therefore, were included. However, 50% of the included studies only scored fair (four or five out of 10), with 42% scoring moderate and 8% (or one study) receiving a high score.

All 12 studies met the criteria for randomisation. Only one study adequately concealed allocation. Groups were similar at baseline for nine of the included studies. Blinding of subjects, therapists and/or assessors were also low scoring criteria in all of the included studies; with none of the included studies describing blinding of subjects. However, one study reported blinding of therapists and encouragingly six studies described blinding of assessors. Measures were obtained for at least one outcome in nine studies, although only five studies reported that all subjects included with outcome measures received the treatment or control. All 12 studies provided results of between-group statistics for at least one outcome and all but one study provided both point measures and measures of variability (Table 1).

All 12 studies included exercise as the self-management strategy. The patient population used for the included studies ranged from patients with musculoskeletal conditions (both acute and chronic), urinary incontinence, haemophilia, post-orthopaedic surgery and chronic lung disease. There were 12 different adherence aiding interventions used in the 12 included studies. Three studies involved participants with hip and knee osteoarthritis (OA) although they used different adherence aiding interventions (Table 2). The results regarding the interventions to aid patient adherence are presented below using the Behaviour Change Technique Taxonomy [18] and the *strength* of evidence following assessment of methodological quality [20].

Shaping knowledge

Two fair quality studies examined the impact of an education programme on patient adherence using behavioural advice [21] and protection motivational theory [22], respectively. Both studies showed that there were no statistically significant differences between the intervention and control groups for patient adherence.

One moderate quality study [12] showed that provision of verbal instruction supplemented with written material improved adherence relative to verbal instruction alone. Two fair quality studies indicated that that adherence rates were not improved by the addition of a video tape or audiotape to usual care (verbal instruction with supplementary written material [23,24]).

Goals and planning

Two studies examined the effect of goal setting processes with conflicting results. One fair quality study by Bassett and Petrie [25] compared physiotherapist–patient collaborative and physiotherapist mandated goals with no formally set goals. Neither of the goal setting interventions resulted in improvements in adherence rates compared to usual care [25]. In contrast, a moderate quality study by Evans and Hardy [26] concluded that those allocated to a goal setting group (supported by a sports psychologist) adhered significantly more to their rehabilitation programme compared to those allocated to a social support group (supported by a sport psychologist but no goal setting) and to a usual care control group (no sport psychologist support). There were differences between the studies regarding patient population (age and type of injury) and the goal setting process involved which may have

Table 1
Results of methodological quality assessment using PEDro scale.

Author, year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	Overall PEDro score	Rating
Alewijnse *et al.*, 2003 [21]	1	1	0	0	0	0	0	1	1	1	1	5	Fair
Bassett and Prapavessis, 2011 [22]	1	1	0	1	0	0	0	1	0	1	1	5	Fair
Bassett and Petrie, 1999 [25]	0	1	0	0	0	0	1	0	0	1	1	4	Fair
Evans and Hardy, 2002 [26]	1	1	0	1	0	0	1	0	1	1	1	6	Moderate
Friedrich *et al.*, 1998 [29]	1	1	0	1	0	0	1	0	1	1	1	6	Moderate
Goto *et al.*, 2014 [27]	1	1	0	1	0	0	0	1	0	1	1	5	Fair
Lysack *et al.*, 2005 [24]	1	1	0	0	0	0	0	1	0	1	1	4	Fair
O'Brien *et al.*, 2013 [28]	1	1	0	1	0	1	1	1	0	1	1	7	Moderate
Pisters *et al.*, 2010 [9]	1	1	1	1	0	0	1	1	1	1	1	8	High
Schneiders *et al.*, 1998 [12]	1	1	0	1	0	0	1	1	0	1	1	6	Moderate
Schoo *et al.*, 2005 [23]	1	1	0	1	0	0	0	1	0	1	0	4	Fair
Steele *et al.*, 2008 [30]	1	1	0	1	0	0	0	1	1	1	1	6	Moderate

Key: (a) eligibility criteria, (b) random allocation, (c) concealed allocation, (d) baseline comparability, (e) blinding of subjects, (f) blinding of therapists, (g) blinding of assessors, (h) adequate follow-up, (i) intention-to-treat analysis, (j) between-group comparisons, (k) point estimates and variability.

impacted on the results. Motivation to adhere and expedite their recovery may have been a factor in the study by Evans and Hardy [26] which involved an injured athletic population who were significantly younger than the study by Bassett and Petrie [25]. In addition, this study used a sports psychologist (who also provided some counselling support) to set individually motivated goals based on the assessment by the physiotherapist which may account for the difference in results.

Feedback and monitoring

One fair quality [27] study included an objective measure to provide self-monitoring and visual feedback. The results indicate that patient adherence can be positively influenced using an activity monitor to provide the patient with visual feedback regarding their level of physical activity as well as monitoring their exercise frequency [27].

Social support

One high quality [9], two moderate quality [28,29] and one fair quality [30] studies involved either counselling; action and coping plans; motivational support; or weekly phone calls and home visits to aid patient adherence. The high quality study which used a behavioural exercise programme tailored to the patient with up to seven booster sessions to aid adherence reported better exercise adherence and a greater amount of physical activity compared to the control group both in the short and long term [9]. The use of weekly phone calls and home visits to aid exercise adherence in a fair quality study also demonstrated short term improvement [30]. However, a moderate quality study concluded that exercise adherence was not significantly improved by the use of action and coping plans [28]. No improvement in long term adherence was demonstrated in a moderate quality study which used five motivational adherence enhancing interventions including counselling, reinforcement techniques, 'treatment contracts', visual reminders and exercise reporting [29].

Discussion

Key findings and implications of key findings

This review provides some guidance as to the effectiveness of interventions used to aid patient adherence to physiotherapist prescribed self-management strategies. However, of the twelve studies included in this review, all included exercise as the self-management strategy, highlighting an important gap in the research. The available evidence suggests that strategies such as using an activity monitor and feedback system, written exercise instructions, behavioural exercise programme with booster sessions and goal setting may be effective in promoting adherence to exercise. However, due to the small number of studies examining any one type of intervention, there is insufficient data to endorse any of these interventions as part of routine clinical practice. Combining interventions and tailoring them to specific needs of individual patients rather than a group of patients may also improve adherence.

The variable quality of studies limited the conclusions which can be drawn from this review. Notably, only half of the included studies received a fair score (four or more out of ten). An earlier study of the Physiotherapy Evidence Database reported that the total score using the PEDro tool has been increasing by an average of 0.6 points for each decade between 1960 and 2009 although further improvement is still necessary [31]. Their results were consistent with the findings of this review that reporting of blinding (particularly subjects and therapists) and concealed allocation was generally poor whereas random allocation and reporting of results of between-group statistical comparisons was much more prevalent [31]. A further study which looked at PEDro scores across all sub-disciplines of physiotherapy also report low prevalence of blinding because physiotherapy interventions by nature are difficult to blind effectively [32]. However, researchers should be encouraged to meet more readily achievable design standards for random allocation, concealed allocation, blinding of assessors, intention-to-treat

Table 2
Results of data extraction from the included studies.

Author, year	Participant population	Self-management strategy	Measure of adherence	Intervention/s	Control	Results	Conclusions
Alewijnse *et al.*, 2003 [21]	Urinary incontinence	Pelvic floor muscle exercise (PFME) therapy, with behavioural advice	Questionnaire and diary	PFME with 1 of 3 health education programmes to promote long term adherence (reminder group; reminder and self-help guide group; reminder, self-help guide and counselling group)	PFME therapy only	The health education programmes had no impact on treatment outcome or adherence	Results suggest that a standardised protocol checklist for physiotherapists covering all aspects of PFME may optimise outcome and adherence behaviour without the need for an additional health education programme
Bassett and Prapavessis, 2011 [22]	Ankle sprains	1. Exercise 2. Ice 3. Advice 4. Brace 5. Elevation	Survey with self report on a 5-point Likert scale	A. Protection Motivation Theory (PMT) video information B. Non-PMT information	C. No formal information	There were no significant differences between the three groups for their adherence to the home-based physiotherapy	Results suggest a positive adherence-treatment outcomes relationship
Bassett and Petrie, 1999 [25]	Upper and lower limb injuries	Exercise	Diary	A. Physiotherapist–patient collaborative goals B. Physiotherapist mandated goals	C. No formally set goals	Data showed there were no significant differences between the 3 groups on overall adherence	Treatment goals may not be a suitable motivational tool for all people
Evans and Hardy, 2002 [26]	Sports related injuries	Exercise	Diary	A. Goal setting B. Social support	C. No goals or social support	Means adherence for each group. A. 79% B. 52% C. 49%	The group involving goal setting with a sports psychologist adhered significantly more to rehabilitation programme
Friedrich *et al.*, 1998 [29]	CLBP	Exercise	Diary	Motivation group (MG); including five adherence enhancing interventions	No adherence enhancing intervention (CG)	Mean adherence at 4 months: MG 77% CG 69%	There was no significant differences between MG and CG with reference to long term compliance
Goto *et al.*, 2014 [27]	Haemophilia	Exercise	Activity monitor	Self-monitoring group (SG) with feedback and activity monitor	Activity monitor with no display (CG)	Means adherence at 8 weeks: SG 79% CG 33%	A home exercise self-monitoring programme has the potential for increased exercise adherence in haemophiliacs.
Lysack *et al.*, 2005 [24]	TKR, THR	Exercise	Questionnaire	Customised video tape of exercises (CV)	No video tape of exercises (CG)	Number of adherent patients. Accuracy of exercises CV 5/18 (27%) CG 7/14 (50%) Frequency of exercises CV 8/18 (44%) CG 5/22 (22%)	There is no evidence that the videotape method offered any clear benefit over routine practices.

Table 2 (*Continued*)

Author, year	Participant population	Self-management strategy	Measure of adherence	Intervention/s	Control	Results	Conclusions
O'Brien *et al.*, 2013 [28]	Hip/knee OA	Exercise	Self-report on a 5-point Likert scale	Action and coping plans (AP)	No action and coping plans (CG)	Stretching AP 4/5 (74%) CG 4/5 (78%) Walking AP 4/5 (72%) CG 4/5 (70%)	Exercise adherence was not significantly improved by the use of action and coping plans.
Pisters *et al.*, 2010 [9]	Hip/knee OA	Exercise	Self-report scale based on a 5-point Likert scale	Behavioural exercise programme tailored to the patient with up to 7 booster sessions over the following year (BE)	Generic exercise programme and no booster sessions (CG)	Adherent participants at week 13: BE 75% CG 44% At week 65: BE 59% CG 34%	Behavioural graded activity with booster sessions results in better exercise adherence and a greater amount of physical activity than usual physiotherapy both in the short and long term.
Schneiders*et al.*, 1998 [12]	Acute LBP	Exercise	Exercise diary	Verbal and written exercise instructions (WG)	Verbal instructions only (CG)	Mean adherence: WG 77% CG 38%	The use of written and illustrated exercise instructions as an educational strategy to improve compliance to exercise therapy for LBP is clearly shown to be effective in this study.
Schoo *et al.*, 2005 [23]	Hip/knee OA	Exercise	Exercise log sheets and correctness of exercise performance scale	Verbal instructions plus B-Exercise brochure and audiotape of exercises C-Exercise brochure and video tape of exercises	Verbal instructions plus A-Exercise brochure	Mean adherence: Between 1 and 4 weeks A 93% B 92% C 89% Between 5 and 8 weeks A 90% B 82% C 87%	Older people with OA who received face to face instructions and a brochure on how to perform and comply with an 8 week home exercise programme did not show additional benefits from other modes of instruction.
Steele *et al.*, 2008 [30]	Chronic lung disease	Exercise	Diary and accelerometer	12 week adherence intervention with weekly phone calls and home visits following pulmonary rehab programme (HV)	Pulmonary rehab programme only (CG)	Mean adherence Short term – week 20 HV 32 minutes CG 16 minutes Long term – Week 52 HV 33 minutes CG 22 minutes	The adherence intervention provided only limited short-term improvement in exercise capacity and self-reported maintenance of exercise after pulmonary rehabilitation. No long-term benefits were evident.

Key: CG: Control Group; CLBP: chronic low back pain.

analysis, between-group comparisons and point estimates and variability; giving studies a potential minimum PEDro score of 6 [31,32].

A wide variation was seen in the rates of adherence. Mean adherence rates varied from 33% in the control group of one study [27] to 93% in another using a home exercise brochure [23]. However, of the studies which reported mean percentage rates of adherence to home exercise programmes, the average rate of adherence between studies was 67%. This range of adherence to exercise is similar to another review (57–88%) which also looked at rate of adherence to nutritional guidelines (22–97%), airway clearance techniques (33–91%) and medication (31–85%) [34]. The challenge for adherence research is to establish what level of adherence is required to achieve a good therapeutic outcome for a variety of conditions [13].

Strengths and limitations

The strength of this systematic review on adherence to physiotherapy is that it did not limit to a particular physiotherapy patient population or self-management strategy and therefore, provides a more comprehensive over view of the literature. This has in turn allowed for a comparison of adherence rates to a number of adherence aiding interventions for a number of different patient populations. This review also highlighted the paucity in literature on self-management strategies other than exercise which may be an important research gap to address.

The limitations of this review are that although it looked at adherence rates to adherence aiding interventions, it did not discuss the measures of adherence used and the impact that these can have on the results. There is currently no 'gold standard' for the measurement of patient adherence and therefore, the measurement of adherence remains problematic. A recent systematic review reported 61 measures of patient adherence to home based exercise programmes with almost all lacking psychometric validation [38]. This review also did not address the barriers to adherence and why some patients are more likely to adhere than others although this has been reported elsewhere [14].

It should be argued that just because one component of study design (such as blinding of subjects and/or therapists) cannot be successfully applied in many physiotherapy intervention studies, it does not mean that physiotherapy research is inferior [32,33]. Despite these limitations, the PEDro scale was specifically developed for physiotherapy research and thus its use here facilitates comparison with other physiotherapy reviews.

Clinical implications

Patient adherence has been positively linked to treatment outcomes. Therefore, physiotherapists should specifically question their patients about their level of adherence when prescribing self-management strategies and consider using interventions to maximise adherence and potentially improve treatment outcomes.

All studies included in this review used exercise in some form. Physiotherapists prescribe a number of different patient self-management strategies. Advice ranked as the most common treatment provided to patients with low back pain by physiotherapists [4,35]. The type of advice may include staying active, to refrain from or limit exposure to certain activities, posture, seeking further help or support [35]. Patient adherence to initial advice may reduce the severity and burden of injury and expedite recovery which can only be to the benefit of patients. However, unless high quality research with good methodological rigour is conducted to establish effective ways to promote adherence to self-management advice it is possible that physiotherapists are simply wasting their breath.

The use of a brace for symptomatic relief in knee OA and tennis elbow may also be of benefit and provide a cost effective treatment adjunct [5,6]. However, the cost of purchasing these devices is redundant if the patient does not wear them. A systematic review on adherence to therapeutic splint wear in acute hand injury found a mean adherence rate of 85% with evidence to suggest that immediacy of benefit, splint comfort and minimising interference with lifestyle and daily living activities can improve splint adherence [36].

However, while our review indicated insufficient evidence to recommend any interventions for improving adherence to exercise, it is encouraging to note that two out of the four interventions identified as showing promise in this review would be simple to implement. For example, provision of written information is something that could, pending further research to confirm its impact, be easily and cheaply integrated into routine practice. Similarly, activity monitors, if confirmed by future research to be effective, are likely to be simple to use. Further, with increasing integration of technology into everyday lives (such as smart phone applications), this type of intervention is likely to be increasingly acceptable to patients. In contrast, the use of a behavioural exercise programme or goal setting are likely to require more specialised skills to implement. If these interventions were confirmed to be effective on the basis of future research then physiotherapists may need additional training and/or to work collaboratively with other disciplines to design such programmes.

Research implications

Research with improved methodological rigour will enhance understanding of behavioural change interventions used in other professional domains such as occupational therapy and medicine, which may also aid adherence in a physiotherapy setting [37]. Further high quality research is required regarding interventions to aid patient adherence in physiotherapy. An important research gap exists regarding patient adherence to self-management strategies including but not limited to exercise.

Conclusions

This review provides some insight into the interventions used to aid patient adherence to physiotherapist prescribed self-management strategies. Despite studies which used an activity monitor and feedback system, written exercise instructions, behavioural exercise programme with booster sessions and goal setting demonstrating positive influence on patient adherence to exercise, there is insufficient data to endorse their use in clinical practice. Further studies are needed to confirm the value of these interventions. Additionally, there is a need to examine interventions for improving adherence for a range of self-management strategies used in physiotherapy practice, not just exercise.

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Conflicts of interest

There are no conflicts of interest to disclose.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.physio.2015.10.003.

References

[1] Higgs J, Refshauge K, Ellis E. Portrait of the physiotherapy profession. J Interprof Care 2001;15(1):79–89.
[2] AIHW (Australian Institute of Health and Welfare). Allied health work force 2013. National health workforce series, vol. 5. Canberra: AIHW; 2013.
[3] Cooper K, Smith B, Hancock E. Patients' perceptions of self-management of chronic low back pain: evidence for enhancing patient education support. Physiotherapy 2009;95:43–50.
[4] Liddle SD, Baxter GDJHG. Physiotherapists' use of advice and exercise for the management of chronic low back pain: a national survey. Man Ther 2009;14:189–96.
[5] Struijs PA, Korthals-de Bos IB, van Tulder MW, van Dijk CN, Bouter LM, Assendelft WJ. Cost effectiveness of brace, physiotherapy, or both for treatment of tennis elbow. Br J Sports Med 2006;40(7):637–43, discussion 43.
[6] Page CJ, Hinman RS, Bennell KL. Physiotherapy management of knee osteoarthritis. Int J Rheum Dis 2011;14(2):145–51.
[7] WHO. Adherence to long-term therapies: evidence for action. WHO Library; 2003.
[8] McLean SM, Burton M, Bradley L, Littlewood C. Interventions for enhancing adherence with physiotherapy: a systematic review. Man Ther 2010;15(6):514–21.
[9] Pisters MF, Veenhof C, de Bakker DH, Schellevis FG, Dekker J. Behavioural graded activity results in better exercise adherence and more physical activity than usual care in people with osteoarthritis. J Physiother 2010;56:41–7.
[10] Beinart NA, Goodchild CE, Weinman JA, Ayis S, Godfrey EL. Individual and intervention-related factors associated with adherence to home exercise in chronic low back pain: a systematic review. Spine J 2013;13(12):1940–50.
[11] Bassett S. The assessment of patient adherence to physiotherapy rehabilitation. NZ J Physiother 2003;31(2):60–6.
[12] Schneiders A, Zusman M, Singer K. Exercise therapy compliance in acute low back pain patients. Man Ther 1998;3(3):147–52.
[13] Spetch LA, Kolt GS. Adherence to sport injury rehabilitation: implications for sports medicine providers and researchers. Phys Ther Sport 2001;2(2):80–90.
[14] Jack K, McLean SM, Moffett JK, Gardiner E. Barriers to treatment adherence in physiotherapy outpatient clinics: a systematic review. Man Ther 2010;15(3):220–8.
[15] Jordan JLHM, Mason EEJ, Foster NE. Interventions to improve adherence to exercise for chronic musculoskeletal pain in adults (review). Cochrane Database Syst Rev 2010;(1).
[16] Moher D, Liberati A, Tetzlaff J, Altman DG, Group P. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Med 2009;6(7):e1000097.
[17] Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gotzsche PC, Ioannidis JP, *et al.* The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. J Clin Epidemiol 2009;62(10):e1–34.
[18] Michie S, Richardson M, Johnston M, Abraham C, Francis J, Hardeman W, *et al.* The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. Ann Behav Med 2013;46(1):81–95.
[19] Viera AJ, Garrett JM. Understanding interobserver agreement: the kappa statistic. Fam Med 2005;37(5):360–3.
[20] NHMRC (National Health & Medical Research Council). How to use the evidence: assessment and application of scientific evidence. Canberra: Commonwealth of Australia Australian Government Publisher; 2000.
[21] Alewijnse D, Metsemakers JFM, Mesters IEPE, van den Borne B. Effectiveness of pelvic floor muscle exercise therapy supplemented with a health education program to promote long-term adherence among women with urinary incontinence. Neurourol Urodyn 2003;22(4):284–95.
[22] Bassett SF, Prapavessis H. A test of an adherence-enhancing adjunct to physiotherapy steeped in the protection motivation theory. Physiother Theory Pract 2011;27(5):360–72.
[23] Schoo AMM, Morris ME, Bui QM. The effects of mode of exercise instruction on compliance with a home exercise program in older adults with osteoarthritis. Physiotherapy 2005;91(2):79–86.
[24] Lysack C, Dama M, Neufeld S, Andreassi E. A compliance and satisfaction with home exercise: a comparison of computer-assisted video instruction and routine rehabilitation practice. J Allied Health 2005;34(2):76–82.
[25] Bassett SF, Petrie KJ. The effect of treatment goals on patient compliance with physiotherapy exercise programmes. Physiotherapy 1999;85(3):130–7.
[26] Evans L, Hardy L. Injury rehabilitation: a goal-setting intervention study. Res Q Exerc Sport 2002;73(3):310–9.
[27] Goto M, Takedani H, Haga N, Kubota M, Ishiyama M, Ito S, *et al.* Self-monitoring has potential for home exercise programmes in patients with haemophilia. Haemophilia 2014;20(2):e121–7.
[28] O'Brien D, Bassett SPM. The effect of action and coping plans on exercise adherence in people with lower limb osteoarthritis: a feasibility study. NZ J Physiother 2013;41(2):49–57.
[29] Friedrich M, Gittler G, Halberstadt Y, Cermak T, Heiller I. Combined exercise and motivation program: effect on the compliance and level of disability of patients with chronic low back pain: a randomized controlled trial. Arch Phys Med Rehabil 1998;79(5):475–87.

[30] Steele BG, Belza B, Cain KC, Coppersmith J, Lakshminarayan S, Howard J, *et al.* A randomized clinical trial of an activity and exercise adherence intervention in chronic pulmonary disease. Arch Phys Med Rehabil 2008;89(3):404–12.

[31] Moseley AM, Herbert RD, Maher CG, Sherrington C, Elkins MR. Reported quality of randomized controlled trials of physiotherapy interventions has improved over time. J Clin Epidemiol 2011;64(6):594–601.

[32] Moseley AM, Elkins MR, Janer-Duncan L, Hush JM. The quality of reports of randomized controlled trials varies between subdisciplines of physiotherapy. Physiother Can 2014;66(1):36–43.

[33] Bhogal SK, Teasell RW, Foley NC, Speechley MR. The PEDro scale provides a more comprehensive measure of methodological quality than the Jadad scale in stroke rehabilitation literature. J Clin Epidemiol 2005;58(7):668–73.

[34] O'Donohoe R, Fullen BM. Adherence of subjects with cystic fibrosis to their home program: a systematic review. Respir Care 2014;59(11):1731–46.

[35] Fidvi NMS. Physiotherapy management of low back pain in India – a survey of self-reported practice. Physiother Res Int 2010;15:150–9.

[36] O'Brien L. Adherence to therapeutic splint wear in adults with acute upper limb injuries: a systematic review. J Hand Ther 2010;15(March (1)):3–12.

[37] Horne R, Weinman J, Barber N, Elliott R, Morgan M, Cribb A, *et al.* Concordance, adherence and compliance in medicine taking. London: NCCSDO; 2005. p. 40–6.

[38] Bollen J, Dean S, Siegert R, Howe T, Goodwin V. A systematic review of measures of self-reported adherence to unsupervised home-based rehabilitation exercise programmes, and their psychometric properties. BMJ Open 2014:4.

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Appendix 6.3 Online Supplementary Table 1: Example of Search strategy used in MEDLINE

1. Patient Compliance/
2. (patient* adj3 (adher* or complia* or concordance or co-operat* or cooperat*)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]
3. 1 or 2
4. Physical Therapists/
5. physiotherap*.mp.
6. Physical Therapy Modalities/
7. 4 or 5 or 6
8. Self Care/
9. self manag*.mp.
10. Ambulatory Care/
11. Attitude to Health/
12. Exercise/
13. Health Behavior/
14. Patient Education as Topic/
15. empowerment.mp.
16. Self Efficacy/
17. self mobili*.mp.
18. Splints/
19. self*.tw.
20. Athletic Tape/
21. orthotic devices/ or athletic tape/ or braces/ or foot orthoses/
22. (strateg* adj5 manage*).tw.
23. advice.tw.
24. instruct*.tw.
25. 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24
26. 3 and 7 and 25
27. limit 26 to (english language and "all adult (19 plus years)")
28. from 27 keep 3,5,10-11,20-21,26,35,37,41,44,46,55-57,60-67,69

29. from 27 keep 72,76,79,90-91,97,99,101,106-107,109,111,116-118,122,125-127,133,136-137,144,146-150,152-154,156,158,160,164,168,172

Appendix 7: Paper Seven

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Peek, K., Carey, M., Sanson-Fisher, R. & Mackenzie, L. "Aiding patient adherence to physiotherapist-prescribed self-management strategies: An evidence-based behavioural model in practice." Physical Therapy Reviews 21.2 (2016): 124-130. https://doi.org/10.1080/10833196.2016.1226537

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Author:	Kerry Peek, Mariko Carey, Robert Sanson-Fisher, et al
Publication:	Physical Therapy Reviews
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Appendix 8: Statements of Contribution from Co-authors

Appendix 8.1: Associate Professor Mariko Carey

I, Associate Professor Mariko Carey, attest that Research Higher Degree candidate, Ms Kerry Peek, contributed substantially to manuscript conceptualisation, Paper design, data collection, data analysis and manuscript preparation to meet *British Medical Journal* authorship guidelines for the following manuscripts:

Paper 1

Peek, K., Carey, M., Mackenzie, L. & Sanson-Fisher, R. "An observational Paper of Australian private practice physiotherapy consultations to explore the prescription of self-management strategies." *Musculoskeletal Care.* (2017)
https://doi.org/10.1002/msc.1181

Paper 2

Peek, K., Carey, M., Sanson-Fisher, R. & Mackenzie, L. "Physiotherapists' perceptions of patient adherence to physiotherapist prescribed self-management strategies: A national survey." *Disability and Rehabilitation* (2016)
https://doi.org/10.1080/09638288.2016.1212281

Paper 3

Peek, K., Carey, M., Mackenzie, L. & Sanson-Fisher, R. "Predictors of high levels of patient adherence to physiotherapist-prescribed self-management strategies." *Under review*

Paper 4

Peek, K., Sanson-Fisher, R., Mackenzie, L. & Carey, M. "Patient adherence to physiotherapist prescribed self-management strategies: A critical review"; *International Journal of Therapy and Rehabilitation*. 22.11 (2015) 535-543.
https://doi.org/10.12968/ijtr.2015.22.11.535

Paper 5

Peek, K., Carey, M., Mackenzie, L. & Sanson-Fisher, R. "Patient adherence to an exercise program for chronic low back pain measured by patient-report, physical therapist perception and observational data." Under review

Paper 6

Peek K., Sanson-Fisher R., Mackenzie L., & Carey, M. "Interventions to aid patient adherence to physiotherapist prescribed self-management strategies: A systematic review." *Physiotherapy.* (2016); 102(2):127-35.
https://doi.org/10.1016/j.physio.2015.10.003

Paper 7

Peek, K., Carey, M., Sanson-Fisher, R. & Mackenzie, L. "Aiding patient adherence to physiotherapist-prescribed self-management strategies: An evidence-based behavioural model in practice." *Physical Therapy Reviews* 21.2 (2016): 124-130.
https://doi.org/10.1080/10833196.2016.1226537

27|4|2017

Associate Professor Mariko Carey (Co-Author) **Date**

26th April 2017

Ms Kerry Peek (Candidate) **Date**

28/4/17

Professor Robert Callister (Assistant Dean Research & Research Training) **Date**

Appendix 8.2: Laureate Professor Robert Sanson-Fisher

I, Laureate Professor Robert Sanson-Fisher, attest that Research Higher Degree candidate, Ms Kerry Peek, contributed substantially to manuscript conceptualisation, Paper design, data collection, data analysis and manuscript preparation to meet *British Medical Journal* authorship guidelines for the following manuscripts:

Paper 1

Peek, K., Carey, M., Mackenzie, L. & Sanson-Fisher, R. "An observational Paper of Australian private practice physiotherapy consultations to explore the prescription of self-management strategies." *Musculoskeletal Care.* (2017) https://doi.org/10.1002/msc.1181

Paper 2

Peek, K., Carey, M., Sanson-Fisher, R. & Mackenzie, L. "Physiotherapists' perceptions of patient adherence to physiotherapist prescribed self-management strategies: A national survey." *Disability and Rehabilitation* (2016) https://doi.org/10.1080/09638288.2016.1212281

Paper 3

Peek, K., Carey, M., Mackenzie, L. & Sanson-Fisher, R. "Predictors of high levels of patient adherence to physiotherapist-prescribed self-management strategies." *Under review*

Paper 4

Peek, K., Sanson-Fisher, R., Mackenzie, L. & Carey, M. "Patient adherence to physiotherapist prescribed self-management strategies: A critical review"; *International Journal of Therapy and Rehabilitation*. 22.11 (2015) 535-543. https://doi.org/10.12968/ijtr.2015.22.11.535

Paper 5

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Paper 7

Peek, K., Carey, M., Sanson-Fisher, R. & Mackenzie, L. "Aiding patient adherence to physiotherapist-prescribed self-management strategies: An evidence-based behavioural model in practice." *Physical Therapy Reviews* 21.2 (2016): 124-130.
https://doi.org/10.1080/10833196.2016.1226537

26th April 2016

Laureate Professor Robert Sanson-Fisher (Co-Author) **Date**

26th April 2017

Ms Kerry Peek {Candidate) **Date**

28/4/17

Professor Robert Callister (Assistant Dean Research & Research Training) **Date**

Appendix 8.3: Dr Lisa Mackenzie

I, Dr Lisa Mackenzie, attest that Research Higher Degree candidate, Ms Kerry Peek, contributed substantially to manuscript conceptualisation, Paper design, data collection, data analysis and manuscript preparation to meet *British Medical Journal* authorship guidelines for the following manuscripts:

Paper 1

Peek, K., Carey, M., Mackenzie, L. & Sanson-Fisher, R. "An observational Paper of Australian private practice physiotherapy consultations to explore the prescription of self-management strategies." *Musculoskeletal Care.* (2017)
https://doi.org/10.1002/msc.1181

Paper 2

Peek, K., Carey, M., Sanson-Fisher, R. & Mackenzie, L. "Physiotherapists' perceptions of patient adherence to physiotherapist prescribed self-management strategies: A national survey." *Disability and Rehabilitation* (2016)
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Paper 3

Peek, K., Carey, M., Mackenzie, L. & Sanson-Fisher, R. "Predictors of high levels of patient adherence to physiotherapist-prescribed self-management strategies." *Under review*

Paper 4

Peek, K., Sanson-Fisher, R., Mackenzie, L. & Carey, M. "Patient adherence to physiotherapist prescribed self-management strategies: A critical review"; *International Journal of Therapy and Rehabilitation*. 22.11 (2015) 535-543.
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Paper 5

Peek, K., Carey, M., Mackenzie, L. & Sanson-Fisher, R. "Patient adherence to an exercise program for chronic low back pain measured by patient-report, physical therapist perception and observational data." Under review

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Paper 7

Peek, K., Carey, M., Sanson-Fisher, R. & Mackenzie, L. "Aiding patient adherence to physiotherapist-prescribed self-management strategies: An evidence-based behavioural model in practice." *Physical Therapy Reviews* 21.2 (2016): 124-130.
https://doi.org/10.1080/10833196.2016.1226537

27/4/2017

Dr Lisa Mackenzie (Co-author) **Date**

26th April 2017

Ms Kerry Peek (Candidate) **Date**

28/4/17

Professor Robert Callister (Assistant Dean Research & Research Training) **Date**

Appendix 9: Additional Information

Appendix 9.1: Conference listings/ abstracts

World Congress in Public Health, Melbourne 2017

Tuesday 4 April 2017

1354 - 1406 Women without children: Stigma, stereotyping and social exclusion
Melissa Graham

1406 - 1418 'Nudging' women toward their breast screen
Matthew Scanlon

1418 - 1430 Trends in the incidence and mortality of endometrial cancer in New Zealand from 1996-2012
Oliver Scott

1430 - 1442 The predominant reason why women in Indonesia to be heavy smoker: a secondary data analysis of Indonesia Family Life Health Survey 2014/2015 (IFLS 5)
Renie Cuyno Mellen

1442 - 1454 Factors influencing adoption or rejection of a cervical self-sampling program in Kenya
Irene Podolak

1454 - 1506 Health and work of kindergarten principals: impact of menopausal symptoms on kindergarten management
Heesoo Yoon

1330 – 1530 **OR43 Health care** *Room 203*

1330 - 1342 Closing the knowledge-practice gap: evidence-based hospital services for acute stroke care in Ghana
Leonard Baatiema

1342 - 1354 Disparities and trends in hospitalisations for sepsis
Timothy Ore

1354 - 1406 High Prevalence, Poor Awareness and Suboptimal Management of Diabetes and Hypertension in India: Findings from a Large Community-based Study, UDAY.
Sailesh Mohan

1406 - 1418 Public health investigation into seven patients with possible endotoxin poisoning following infusion of glutathione
Emma Quinn

1418 – 1430 Medical specialist distribution in a large private hospital network in Thailand
Nantana Suppapitnarm

1430 - 1442 Hospital Discharge Recidivism, An examination of the effects in: New Zealand, USA and Sweden
Ashley Burrowes

1442 - 1454 Barriers and enablers affecting patient adherence to physiotherapist-prescribed self-management strategies
Kerry Peek

1454 - 1506 Extra cost attributable to chronic care in Australian hospitals
Michael Hart

1506 - 1518 A critical review of health promotion competencies within dentistry
Stacey Bracksley-O'Grady

1330 – 1530 **OR44 Health Systems** *Room 204*

1330 - 1342 The distribution of healthcare facilities in a mega city in Bangladesh
Shaikh Mehdi Hasan

1342 - 1354 Organizational culture and quality management at a Thai public health institute
Vallerut Pobkeeree

1354 - 1406 The prevalence and determinants of traditional, complementary and alternative medicine provider use among adults from 32 countries
Supa Pengpid

1406 - 1418 Factors influencing women's preference for health facility deliveries in India: a cross sectional analysis
Sanghita Bhattacharyya

1418 - 1430 Psychosocial burden of care among relatives of patients attending palliative care unit of Ahmadu Bello University teaching hospital Zaria, Nigeria
Muhammad Bello Garba

1430 - 1442 Medicare and the chamber of secrets: analyzing the legal and administrative complexities of australian medical billing under medicare
Margaret Faux

1442 - 1454 The WHO safe hospital initiative: applying the revised global tool in four hospitals in the philippines
Alistair Humphrey

1454 - 1506 Determinants of household hunger in a lake sub-watershed area in the Philippines
Amiel Nazer Bermudez

1506 - 1518 Performance of computer coded verbal autopsy in identifying causes of adult mortality
Rajesh Kumar

National Primary Health Care Conference, Melbourne 2016.

Results: People who had a long-term health condition were more likely to visit an ED, irrespective of the person's age, where they lived and experiences with primary health care. People with three or more long-term health conditions were almost three times more likely to visit an ED compared to those with none. After accounting for health status, a person's age and where they lived were also associated with ED attendance.

Service use results were displayed geospatially across Statistical Area Level 3 and Primary Health Network catchments showing variation in the use of ED and GP services by time of day.

Next steps: This report can be used by PHNs and Local Hospital Networks to enhance collaboration across the primary health care and hospital sectors, inform coordination and integration activities and to identify system improvements.

Observational study of physiotherapist-patient consultations to explore the prescription of self-management strategies

Presenter: Kerry Peek

Authors: Ms Kerry Peek[1], Dr Mariko Carey[1], L/Prof Robert Sanson-Fisher[1], Dr Lisa Mackenzie[1]

Affiliations: [1]*Health Behaviour Research Group, University Of Newcastle, HMRI, Locked Bag 1000, New Lambton, Australia*

Abstract:

Introduction and Objective: To broaden knowledge of physiotherapist-prescribed self-management strategies in Australian physiotherapy practice, this research study explored the number and types of prescribed strategies per injury location; as well as the time spent per strategy during physiotherapist-patient consultations.

Methods: Cross-sectional, observational study of physiotherapist-patient consultations was undertaken. Fourteen physiotherapists from four physiotherapy clinics were recruited. In total, 113 physiotherapist-patient consultations were observed. Data were analysed using descriptive statistics.

Results: In total 108 patients (96%) received one or more self-management strategies; most commonly in the form of exercise and advice. The most common injury locations were the neck (n=40) and lower back (n=39). Overall, the mean self-management prescription time was 5.8 minutes per consultation with the mean number of strategies prescribed being 2 per consultation. Time spent prescribing self-management strategies and number of strategies prescribed was statistically significant (p=0.03).

Conclusion: Physiotherapists regularly prescribe patient self-management strategies; suggesting that patient self-management is considered an important adjunct to in-clinic treatment.

Practice Implications: Physiotherapists should reflect on whether the number and type of prescribed self-management strategies are grounded in empirical research regarding efficacy in improving treatment outcome; and whether the allocation of consultation time to patient self-management is likely to optimise patient adherence to each strategy.

Australian Physiotherapy Association, Research Symposium (ACT), Canberra 2015.

APA ACT Research Symposium 2015

Program

8.30am	**Registration**
9.00am	**Welcome and Opening** Associate Professor Jennie Scarvell, Head of Discipline, Physiotherapy, University of Canberra
9.15am - 9.30am	Perriman, Diana: *Do volar plates improve outcome in elderly patients with distal radius fractures?*
9.30am - 9.45am	Parker, Joelie: *Specialised exercise programs for patients with chronic kidney disease: Is Australia delivering best practice?*
9.45am - 10.00am	Key, Josephine: *A different take on tendinopathies: What can qualitative clinical evidence tell us in* *the case of lower limb tendinopathies?*
10.00am - 10.30am	**Morning Tea and Poster Display Viewing**
10.30am - 10.45am	Peek, Kerry: *Patient adherence to physiotherapist prescribed self-management strategies: A critical review*
10.45am - 11.00am	Perriman, Diana: *Ischial spine sign alone predicts improvement after surgery for femoroacetabular* *impingement*
11..00am - 11.15am	Green, Margot: *Mobilising mechanically ventilated patients: Does pushing the boundaries in ICU result in better functional results?*
11.15am - 12.15pm	**Sleep matters in tetraplegia; from clinical problem to understanding and treatment** Dr David Berlowitz, Cardiorespiratory and Research Physiotherapist, Victorian Respiratory Support Service; Institute for Breathing and Sleep, Austin Hospital, Melbourne
12.15pm - 1.15pm	**Lunch and Poster Display Viewing**

9

Appendix 9.2: Poster listings

International Congress of Behavioural Medicine, Melbourne 2016

Poster Program

Poster Program correct at time of print

Poster Viewing Session # 3

Friday 9 December 2016
1:00pm–2:30pm

Adherence

Poster Board #	Presenter	Title
1	Miquelon, P.	P461: Motivational regulations and observance of physical activity recommendations among adults with type 2 diabetes
2	Arita, N.	P462: The concordance rate between numerical improvement in physical function and actual feelings in elderly people
3	Mangyo, R.	P463: Factors influencing changes in frail elderly females' motor function levels after exercise
4	Leung, A.W.Y.	P464: Identifying psychosocial predictors of adherence to a lifestyle modification program among Chinese overweight and obese adult participants
5	Mullens, A.	P465: Does depression and/or anxiety mediate between HIV stigma and medication adherence among HIV-positive men?
6	Hawking, M.K.D.	P466: Investigating patients' perspectives towards and adherence to non-vitamin k antagonist oral anticoagulants (NOACS) for atrial fibrillation: A UK based prospective mixed methods study.
7	Morrison, V.	RC929: Application of behavioural models to understanding medication adherence: Results of the ABC project
8	Peek, K.	RC956: Barriers and enablers affecting patient adherence to physiotherapist-prescribed self-management strategies.
9	Suzuki, T.	RC996: Practical report of a trans-diagnostic outpatient group program of prevention of recurrent psychological symptoms
10	Holloway, E.	RC1003: Improving engagement with problem solving treatment for integrated depression management in low vision rehabilitation

Ageing

Poster Board #	Presenter	Title
11	Zhao, Y.N.	P467: A canonical correlation analysis on the relationships between functional fitness and quality of life in older adults
12	Brookland, R.	P468: How can we best help older people maintain driving independence and minimize impact of driving cessation?
13	Sak, G.	P469: The effects of physician's facilitation of patients' involvement in healthcare decisions on patient satisfaction: An experimental study
14	Sanchez, J.	P470: Social functioning indicators among baby boomers and the likelihood to screen for hepatitis C in a primary care setting
15	Yamada T.	RC995: Effect of 1-year and 2-year participation in a health-enhancing exercise program for physically handicapped persons and the frail elderly

Appendix 10: Study Ethics Approvals

Appendix 10.1: University of Newcastle Certificates of Human Research Ethics Approval

HUMAN RESEARCH ETHICS COMMITTEE

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

Notification of Expedited Approval

To Chief Investigator or Project Supervisor:	**Laureate Professor Robert Sanson-Fisher**
Cc Co-investigators / Research Students:	**Doctor Mariko Carey** **Doctor Lisa Mackenzie** **Mrs Kerry Peek**
Re Protocol:	**Physiotherapists' perceptions of patient adherence to physiotherapist prescribed self-management strategies.**
Date:	**17-Nov-2014**
Reference No:	**H-2014-0351**
Date of Initial Approval:	**17-Nov-2014**

Thank you for your **Response to Conditional Approval (minor amendments)** submission to the Human Research Ethics Committee (HREC) seeking approval in relation to the above protocol.

Your submission was considered under **Expedited** review by the Ethics Administrator.

I am pleased to advise that the decision on your submission is **Approved** effective **17-Nov-2014**.

In approving this protocol, the Human Research Ethics Committee (HREC) is of the opinion that the project complies with the provisions contained in the National

Statement on Ethical Conduct in Human Research, 2007, and the requirements within this University relating to human research.

Approval will remain valid subject to the submission, and satisfactory assessment, of annual progress reports. *If the approval of an External HREC has been "noted" the approval period is as determined by that HREC.*

The full Committee will be asked to ratify this decision at its next scheduled meeting. A formal *Certificate of Approval* will be available upon request. Your approval number is **H-2014-0351**.

If the research requires the use of an Information Statement, ensure this number is inserted at the relevant point in the Complaints paragraph prior to distribution to potential participants You may then proceed with the research.

Conditions of Approval

This approval has been granted subject to you complying with the requirements for *Monitoring of Progress*, *Reporting of Adverse Events*, and *Variations to the Approved Protocol* as detailed below.

PLEASE NOTE:
In the case where the HREC has "noted" the approval of an External HREC, progress reports and reports of adverse events are to be submitted to the External HREC only. In the case of Variations to the approved protocol, or a Renewal of approval, you will apply to the External HREC for approval in the first instance and then Register that approval with the University's HREC.

- ***Monitoring of Progress***

  Other than above, the University is obliged to monitor the progress of research projects involving human participants to ensure that they are conducted according to the protocol as approved by the HREC. A progress report is required on an annual basis.
  Continuation of your HREC approval for this project is conditional

upon receipt, and satisfactory assessment, of annual progress reports. You will be advised when a report is due.

- ***Reporting of Adverse Events***

1. It is the responsibility of the person **first named on this Approval Advice** to report adverse events.

2. Adverse events, however minor, must be recorded by the investigator as observed by the investigator or as volunteered by a participant in the research. Full details are to be documented, whether or not the investigator, or his/her deputies, consider the event to be related to the research substance or procedure.

3. Serious or unforeseen adverse events that occur during the research or within six (6) months of completion of the research, must be reported by the person first named on the Approval Advice to the (HREC) by way of the Adverse Event Report form (via RIMS at https://rims.newcastle.edu.au/login.asp) within 72 hours of the occurrence of the event or the investigator receiving advice of the event.

4. Serious adverse events are defined as:

    - Causing death, life threatening or serious disability.
    - Causing or prolonging hospitalisation.
    - Overdoses, cancers, congenital abnormalities, tissue damage, whether or not they are judged to be caused by the investigational agent or procedure.
    - Causing psycho-social and/or financial harm. This covers everything from perceived invasion of privacy, breach of confidentiality, or the diminution of social reputation, to the creation of psychological fears and trauma.
    - Any other event which might affect the continued ethical

acceptability of the project.

5. Reports of adverse events must include:
    - o Participant's study identification number;
    - o date of birth;
    - o date of entry into the study;
    - o treatment arm (if applicable);
    - o date of event;
    - o details of event;
    - o the investigator's opinion as to whether the event is related to the research procedures; and
    - o action taken in response to the event.
6. Adverse events which do not fall within the definition of serious or unexpected, including those reported from other sites involved in the research, are to be reported in detail at the time of the annual progress report to the HREC.

- ***Variations to approved protocol***

If you wish to change, or deviate from, the approved protocol, you will need to submit an *Application for Variation to Approved Human Research* (via RIMS at https://rims.newcastle.edu.au/login.asp). Variations may include, but are not limited to, changes or additions to investigators, study design, study population, number of participants, methods of recruitment, or participant information/consent documentation. **Variations must be approved by the (HREC) before they are implemented** except when Registering an approval of a variation from an external HREC which has been designated the lead HREC, in which case you may proceed as soon as you receive an acknowledgement of your Registration.

Linkage of ethics approval to a new Grant

HREC approvals cannot be assigned to a new grant or award (ie those that were not identified on the application for ethics approval) without confirmation of the approval from the Human Research Ethics Officer on behalf of the HREC.

Best wishes for a successful project.

Professor Allyson Holbrook

Chair, Human Research Ethics Committee

For communications and enquiries:

Human Research Ethics Administration

Research Services

Research Integrity Unit

The Chancellery

The University of Newcastle

Callaghan NSW 2308

T +61 2 492 17894

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Human-Ethics@newcastle.edu.au

RIMS website - https://RIMS.newcastle.edu.au/login.asp

Linked University of Newcastle administered funding:

Funding body	Funding project title	First named investigator	Grant Ref

HUMAN RESEARCH ETHICS COMMITTEE

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

Notification of Expedited Approval

To Chief Investigator or Project Supervisor:	**Laureate Professor Robert Sanson-Fisher**
Cc Co-investigators / Research Students:	**Doctor Lisa Mackenzie** **Doctor Mariko Carey** **Mrs Kerry Peek**
Re Protocol:	**Patient adherence to physiotherapist prescribed self-management strategies.**
Date:	**16-Mar-2015**
Reference No:	**H-2015-0030**
Date of Initial Approval:	**16-Mar-2015**

Thank you for your **Response to Conditional Approval (minor amendments)** submission to the Human Research Ethics Committee (HREC) seeking approval in relation to the above protocol.

Your submission was considered under **Expedited** review by the Ethics Administrator.

I am pleased to advise that the decision on your submission is **Approved** effective **16-Mar-2015**.

In approving this protocol, the Human Research Ethics Committee (HREC) is of the opinion that the project complies with the provisions contained in the National Statement on Ethical Conduct in Human Research, 2007, and the requirements within this University relating to human research.

Approval will remain valid subject to the submission, and satisfactory assessment, of annual progress reports. *If the approval of an External HREC has been "noted" the approval period is as determined by that HREC.*

The full Committee will be asked to ratify this decision at its next scheduled meeting. A formal *Certificate of Approval* will be available upon request. Your approval number is **H-2015-0030**.

If the research requires the use of an Information Statement, ensure this number is

inserted at the relevant point in the Complaints paragraph prior to distribution to potential participants You may then proceed with the research.

Conditions of Approval

This approval has been granted subject to you complying with the requirements for *Monitoring of Progress*, *Reporting of Adverse Events*, and *Variations to the Approved Protocol* as detailed below.

PLEASE NOTE:
In the case where the HREC has "noted" the approval of an External HREC, progress reports and reports of adverse events are to be submitted to the External HREC only. In the case of Variations to the approved protocol, or a Renewal of approval, you will apply to the External HREC for approval in the first instance and then Register that approval with the University's HREC.

- ***Monitoring of Progress***

Other than above, the University is obliged to monitor the progress of research projects involving human participants to ensure that they are conducted according to the protocol as approved by the HREC. A progress report is required on an annual basis. Continuation of your HREC approval for this project is conditional upon receipt, and satisfactory assessment, of annual progress reports. You will be advised when a report is due.

- ***Reporting of Adverse Events***

1. It is the responsibility of the person **first named on this Approval Advice** to report adverse events.
2. Adverse events, however minor, must be recorded by the investigator as observed by the investigator or as volunteered by a participant in the research. Full details are to be documented, whether or not the investigator, or his/her deputies, consider the event to be related to the research substance or procedure.
3. Serious or unforeseen adverse events that occur during the research or within six (6) months of completion of the research, must be reported by the person first named on the Approval Advice to the (HREC) by way of the Adverse Event Report form (via RIMS at https://rims.newcastle.edu.au/login.asp) within 72 hours of the occurrence of the event or the investigator receiving advice of the event.
4. Serious adverse events are defined as:
    - Causing death, life threatening or serious disability.
    - Causing or prolonging hospitalisation.

- Overdoses, cancers, congenital abnormalities, tissue damage, whether or not they are judged to be caused by the investigational agent or procedure.
- Causing psycho-social and/or financial harm. This covers everything from perceived invasion of privacy, breach of confidentiality, or the diminution of social reputation, to the creation of psychological fears and trauma.
- Any other event which might affect the continued ethical acceptability of the project.

5. Reports of adverse events must include:
    - Participant's study identification number;
    - date of birth;
    - date of entry into the study;
    - treatment arm (if applicable);
    - date of event;
    - details of event;
    - the investigator's opinion as to whether the event is related to the research procedures; and
    - action taken in response to the event.

6. Adverse events which do not fall within the definition of serious or unexpected, including those reported from other sites involved in the research, are to be reported in detail at the time of the annual progress report to the HREC.

- ***Variations to approved protocol***

If you wish to change, or deviate from, the approved protocol, you will need to submit an *Application for Variation to Approved Human Research* (via RIMS at https://rims.newcastle.edu.au/login.asp). Variations may include, but are not limited to, changes or additions to investigators, study design, study population, number of participants, methods of recruitment, or participant information/consent documentation. **Variations must be approved by the (HREC) before they are implemented** except when Registering an approval of a variation from an external HREC which has been designated the lead HREC, in which case you may proceed as soon as you receive an acknowledgement of your Registration.

Linkage of ethics approval to a new Grant

HREC approvals cannot be assigned to a new grant or award (ie those that were not identified on the application for ethics approval) without confirmation of the approval from the Human Research Ethics Officer on behalf of the HREC.

Best wishes for a successful project.

Professor Allyson Holbrook

Chair, Human Research Ethics Committee

For communications and enquiries:

Human Research Ethics Administration

Research Services
Research Integrity Unit
The Chancellery
The University of Newcastle
Callaghan NSW 2308
T +61 2 492 17894
F +61 2 492 17164
Human-Ethics@newcastle.edu.au

RIMS website - https://RIMS.newcastle.edu.au/login.asp

Linked University of Newcastle administered funding:

Funding body	Funding project title	First named investigator	Grant Ref

HUMAN RESEARCH ETHICS COMMITTEE

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

Notification of Expedited Approval

To Chief Investigator or Project Supervisor:	**Laureate Professor Robert Sanson-Fisher**
Cc Co-investigators / Research Students:	**Doctor Mariko Carey** **Doctor Lisa Mackenzie** **Mrs Kerry Peek**
Re Protocol:	**Physiotherapist and patient perceptions of a physiotherapist prescribed exercise program for chronic low back pain.**
Date:	**14-May-2015**
Reference No:	**H-2015-0064**
Date of Initial Approval:	**14-May-2015**

Thank you for your **Response to Conditional Approval (minor amendments)** submission to the Human Research Ethics Committee (HREC) seeking approval in relation to the above protocol.

Your submission was considered under **Expedited** review by the Ethics Administrator.

I am pleased to advise that the decision on your submission is **Approved** effective **14-May-2015**.

In approving this protocol, the Human Research Ethics Committee (HREC) is of the opinion that the project complies with the provisions contained in the National Statement on Ethical Conduct in Human Research, 2007, and the requirements within this University relating to human research.

Approval will remain valid subject to the submission, and satisfactory assessment, of annual progress reports. *If the approval of an External HREC has been "noted" the approval period is as determined by that HREC.*

The full Committee will be asked to ratify this decision at its next scheduled meeting. A formal *Certificate of Approval* will be available upon request. Your approval number is **H-2015-0064**.

If the research requires the use of an Information Statement, ensure this number is inserted at the relevant point in the Complaints paragraph prior to distribution to potential participants You may then proceed with the research.

Conditions of Approval

This approval has been granted subject to you complying with the requirements for *Monitoring of Progress*, *Reporting of Adverse Events*, and *Variations to the Approved Protocol* as detailed below.

PLEASE NOTE:
In the case where the HREC has "noted" the approval of an External HREC, progress reports and reports of adverse events are to be submitted to the External HREC only. In the case of Variations to the approved protocol, or a Renewal of approval, you will apply to the External HREC for approval in the first instance and then Register that approval with the University's HREC.

- ***Monitoring of Progress***

Other than above, the University is obliged to monitor the progress of research projects involving human participants to ensure that they are conducted according to the protocol as approved by the HREC. A progress report is required on an annual basis. Continuation of your HREC approval for this project is conditional upon receipt, and satisfactory assessment, of annual progress reports. You will be advised when a report is due.

- ***Reporting of Adverse Events***

1. It is the responsibility of the person **first named on this Approval Advice** to report adverse events.

2. Adverse events, however minor, must be recorded by the investigator as observed by the investigator or as volunteered by a participant in the research. Full details are to be documented, whether or not the investigator, or his/her deputies, consider the event to be related to the research substance or procedure.

3. Serious or unforeseen adverse events that occur during the research or within six (6) months of completion of the research, must be reported by the person first named on the Approval Advice to the (HREC) by way of the Adverse Event Report form (via RIMS at https://rims.newcastle.edu.au/login.asp) within 72 hours of the occurrence of the event or the investigator receiving advice of the event.

4. Serious adverse events are defined as:

    - Causing death, life threatening or serious disability.

- Causing or prolonging hospitalisation.
- Overdoses, cancers, congenital abnormalities, tissue damage, whether or not they are judged to be caused by the investigational agent or procedure.
- Causing psycho-social and/or financial harm. This covers everything from perceived invasion of privacy, breach of confidentiality, or the diminution of social reputation, to the creation of psychological fears and trauma.
- Any other event which might affect the continued ethical acceptability of the project.

5. Reports of adverse events must include:
   - Participant's study identification number;
   - date of birth;
   - date of entry into the study;
   - treatment arm (if applicable);
   - date of event;
   - details of event;
   - the investigator's opinion as to whether the event is related to the research procedures; and
   - action taken in response to the event.
6. Adverse events which do not fall within the definition of serious or unexpected, including those reported from other sites involved in the research, are to be reported in detail at the time of the annual progress report to the HREC.

- ***Variations to approved protocol***

If you wish to change, or deviate from, the approved protocol, you will need to submit an *Application for Variation to Approved Human Research* (via RIMS at https://rims.newcastle.edu.au/login.asp). Variations may include, but are not limited to, changes or additions to investigators, study design, study population, number of participants, methods of recruitment, or participant information/consent documentation. **Variations must be approved by the (HREC) before they are implemented** except when Registering an approval of a variation from an external HREC which has been designated the lead HREC, in which case you may proceed as soon as you receive an acknowledgement of your Registration.

Linkage of ethics approval to a new Grant

HREC approvals cannot be assigned to a new grant or award (ie those that were not identified on the application for ethics approval) without confirmation of the approval from the Human Research Ethics Officer on behalf of the HREC.

Best wishes for a successful project.

Professor Allyson Holbrook

Chair, Human Research Ethics Committee

For communications and enquiries:

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F +61 2 492 17164
Human-Ethics@newcastle.edu.au

RIMS website - https://RIMS.newcastle.edu.au/login.asp

Linked University of Newcastle administered funding:

Funding body	Funding project title	First named investigator	Grant Ref

Appendix 10.2: University of Newcastle Safety Clearance Notification

Health and Safety Team

http://www.newcastle.edu.au/unit/human-resource-services/health-safety

Safety Review Form for UoN Activities

Including Research, Teaching, and other activities / events

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

v 1.10 Updated 18 May 2015

Instructions: for using this form are available via this button. Please save a copy to your desktop or another location to prevent any data loss.

REQUIREMENTS: Please read requirements first and then work through each section of the form sequentially

To comply with the requirements of the Work Health and Safety Act 2011, all staff responsible for University of Newcastle related activities (Research, Teaching related, or other activities such as events or an overseas placement) which may involve hazards or risk are required to undertake a risk assessment for each project or activity (this is irrespective of funding source and includes unfunded projects or activities). The risk assessments must be reviewed under the direction and authority of a suitable officer of the University (Head of School, Research Institute Director, or Pro Vice-Chancellor) before the project or activity commences and include consideration of all health and safety risks and hazards and how these will be controlled. There are two levels of assessment review:

Local Assessment Reviews are managed by the School / Faculty / Discipline / Research Institute or Priority Research Centre
Escalated Assessment Reviews are directed to the Health and Safety Team for referral to a Technical Committee (IBC or CRTC), Technical Specialist, Deputy Vice-Chancellor, or other appropriate agency for assessment of hazards or risks and control measures which are either unable to be assessed at the local level, or involve GMOs, pathogens of risk group 2 or higher, or hazardous chemicals or radiation.

Further details regarding Assessment Reviews are available via the button in section E. Hyperlinks to other websites or documents appear underlined in blue. Complete all applicable fields within the form, and indicate Yes or No for each question wherever required.

L1 149/2015 | Finalised | Research | New Project/ Activity

Section A - Project or Activity Details:

Is this activity or project related to Research, Teaching, or another type of activity such as an event or overseas placement? (●) Research ( ) Teaching ( ) Another activity type (for eg an Event)

Is this a new activity or project, variation to an existing project (within 5 years) or resubmission of a project (due to age greater than 5 years)? Indicate using button: (●) New ( ) Variation ( ) Resubmission

Activity or Project Title:	Patient adherence to physiotherapist prescribed self-management strategies: An observational study
Activity or Project Start Date	27 July 2015
End Date	31 December 2015
Granting Body (if funded)	
Grant Number (if funded)	G
Supervisor responsible for activity or project name:	L/Prof Robert Sanson-Fisher
Supervisor Phone:	02 4042 0713
Supervisor Email	rob.sanson-fisher@newcastle.edu.au
School or other entity	School of Medicine and Public Health
Faculty, Division, PRC/Institute	PRC - Health Behaviour Research Centre
HOS, PVC or Director	HOS Ian Symonds

Section B - Project or Activity Summary: (Primary site, Team members, and Project or Activity Summary / Overview)

Site location	HMRI Building
Building Name	HMRI
Room Number	W4
Additional location information:	Private physiotherapy practices- to be determined after recruitment

Are you the assigned responsible Supervisor for the Site(s) or Facilities? (●) Yes ( ) No ( ) N/A

Page 1 of 8

If you are not the responsible Supervisor for the Site or Facility, you have documentation indicating authorised approval for use of the area for the activity / project / event ? (•) Yes ( ) No ( ) N/A

Does the equipment to be used within this site or facility or area meet the relevant standards for quality and safety for the purposes of the project or activity ? (•) Yes ( ) No ( ) N/A

Add Team Members: Title, Name, Role, Email address, and other relevant Team Member information	Phone contact #
Ms Kerry Peek, Student investigator Kerry.peek@uon.edu.au	02 4042 0616
Dr Lisa Mackenzie, Co-supervisor lisa.mackenzie@newcastle.edu.au	02 4042 0710
Dr Mariko Carey, co-supervisor mariko.carey@newcastle.edu.au	02 4042 0702

Any additional relevant Team information (Experience, training, licencing, training requirements etc) can be added here:

Activity or Project Summary: Provide a high level overview of the project or activity with as much detail as necessary to briefly describe the proposed activity or project. Further specific detail will be provided in other sections of this form.

Design:

A cross sectional direct observational study of patient-physiotherapy consultations with a follow-up patient computer assisted telephone interview (CATI) will be used for this research.

Significance:

Patient adherence is an issue in health care as a whole. It is planned that by observing the methods physiotherapists employ to aid patient adherence and the affect that these have on patient self-report of adherence, physiotherapists can be better informed when making decisions regarding their own clinical practice. It will also guide future research to address this evidence practice gap.

Description of Study Participants (Do not list names):

Physiotherapists: Eligible physiotherapists will work clinically within a physiotherapy private practice, see a general adult out-patient case mix, and be located within 150km radius of the central business district of Sydney, Adelaide, Newcastle. These cities have been chosen as they each have Universities with under-graduate physiotherapy courses and they all appear in the top 8 of the largest urban areas by population as defined by the Australian Bureau of Statistics in the 2011 national census. The Australian Physiotherapy Association 'find a physio' locator will be used to locate private physiotherapists.

Exclusion criteria for physiotherapists will include specialist physiotherapists, such as women's health or paediatrics.

Patients: Eligible patients will be aged 18 years and older, who are attending for an initial or follow up physiotherapy consultation, are able to complete a telephone survey in English, and physical and mentally able to give informed consent will be eligible.

How are participants being recruited:
Recruitment will be conducted by PhD candidate Ms Kerry Peek.

Physiotherapists: The Australian Physiotherapy Association 'find a physio' locator will be used to locate private physiotherapists. Principle/ practice owners of private physiotherapy practices as well as individual physiotherapists recruited for the study must give informed consent to be eligible. The private physiotherapists will be randomly selected and approached until 29 physiotherapists have signed an agreement to participate. Private Physiotherapists will be approached initially by letter with an attached Organisational and Physiotherapist Participant Information Statements regarding the study and asking them to contact the researcher to participate. This will be followed up with a further letter requesting study participation and then a phone call in order to maximise the response rate.

Patients: Eligible patients will be identified by the receptionist at the time of their attendance for their physiotherapy appointment. It is common that patients to wait on average 10-15 minutes for a physiotherapy appointment and we shall utilise this time for recruitment. Patients will then be approached by the researcher to discuss participation in the study regarding patient adherence and physiotherapist prescribed self-management strategies. A private space will be requested for use during patient recruitment. Patients will be given a Patient Participant Information sheet which they will be asked to read prior to giving signed, written consent. Patients will have the opportunity to decline participation or request additional time to read the Participant Information Statement and therefore, defer participation, if applicable.

What is required of participants?

Physiotherapists: Physiotherapists will initially be asked to agree to participate in a study regarding patient adherence to physiotherapist prescribed self-management strategies. This will involve completing a one-off short 5 minute survey on a touch screen computer tablet and allowing a researcher to observe 10 of their patient consultations. Physiotherapist characteristics such as years since graduation, gender, place of work and case mix will be collected via the touch screen computer survey.

Patients: Eligible patients will be identified by the receptionist at the time of their attendance for their physiotherapy appointment. Patients will then be approached by the researcher to discuss participation in the study regarding patient adherence to physiotherapist prescribed self-management strategies. Consenting participants will have a researcher (Kerry Peek) observe their physiotherapy consultation, and will be asked to provide their telephone contact details in order to participate in a computer assisted telephone interview (CATI) within the following 2 weeks conducted by the same researcher (Kerry Peek).

Section C - Hazard Identification

Answer the following questions by pressing Yes or No as applicable. You must indicate Yes or No for each question. Provide the required information on the additional pages and questions which appear. **Does the Project or Activity........?**

	Yes	No
Involve work with a genetically modified organism (GMO) ?	○	◉
Involve work with hazardous microorganisms or biological toxins ?	○	◉
Involve work with animals or animal body fluids, tissues, or cell lines ?	○	◉
Involve work with human body fluids or tissues or cell lines ?	○	◉
Involve the use of chemically hazardous materials ? Chemicals of Security Concern, Explosives, Fireworks Security Sensitive Dangerous Goods; Materials requiring Health Monitoring (WHS Regulation Schedule 14); Prohibited or Restricted Carcinogens and Restricted Hazardous Chemicals (WHS Reg Sch 10); Dangerous Goods Packing Group 1 (PG 1 - High Danger - refer to transportation section of SDS for PG Classification) eg Ethidium Bromide or Hydrofluoric/ Picric/ Nitric Acid; Schedule 4, 7, 8, or 9 substances (includes illicit drugs, chemotherapy agents, anaesthetics); Category 1 chemical diversion into illicit drug manufacture.	○	◉
Involve the use of radioisotopes / unsealed sources ?	○	◉
Involve the use of ionising radiation / sealed sources, e.g. X-rays ?	○	◉
Involve the use of non-ionising radiation, e.g. Lasers, RF-heating, microwaves, sonic, MRI ?	○	◉
Involve offsite radiation work ?	○	◉
Involve the use of Nanoparticles or Nanomaterial ?	○	◉
Involve an offsite activity ? (e.g. Fieldwork, Site Visits, SCUBA Diving, Boating, Home Visits, Interviews)	◉	○
Involve International Travel or research or another activity in a location outside of Australia ?	○	◉
Involve any hazard(s) not covered by another category, such as a process (e.g. welding, cash handling or participant reimbursement, physical activity), location (workshop, factory), event/exercise (filming, mining construction, structural modification, high voltage electrical work), or equipment (appliance, plant, tool), or which require a Permit to Work to be issued by Infrastructure and Facilities Services ?	○	◉

OFFSITE ACTIVITY HAZARD INFORMATION

Fieldwork occuring away from University Sites or Premises

Please indicate the nature of the activity by checking one or more of the boxes below:

Fieldwork / Fieldtrip to a remote location	Yes	• No	Fieldwork / Fieldtrip non-remote location	Yes	• No
Work Placement	Yes	• No	Overseas Travel - Ref University Travel Policy	Yes	• No
Boating, Canoeing / Kayaking, Rafting:	Yes	• No	Water activities such as SCUBA Diving and Snorkelling: Refer SCUBA Diving Manual	Yes	• No
Abseiling, Caving, Canyoning	Yes	• No	Participant reimbursement for participation Link to Reimbursement Guidelines	Yes	• No

Offsite Visit / Interview / Focus Group - Refer to Link to Guidelines then read and complete checklist • Yes No

Other:

Offsite Activity Start Date: 27/07/2015 Offsite Activity End Date: 31/12/2015

Location(s) details and other location specific useful information:

Private physiotherapy practice sites to be determined following recruitment. Site specific approval will be obtained to conduct this research at each identified practice prior to commencement.

Do you require/ have human ethics clearance for this project or are you applying for it ? • Yes No Applying HREC App # or DOA: H-2015-0064

Is the Fieldwork planned to occur in a Public Area or on Private Property ? ☒ Public Area ☐ Private Property

Have you obtained formal approval from the relevant authority or property owner if required ? ☐ Yes ☒ No ☐ N/A

Attachments - Important information: You must include / attach all relevant documentation such as Risk Assessment, Standard Operating Procedures (SOPs) or Safe Work Method Statements (SWMS) as well as applicable induction / training records, approvals etc) with this application. Failure to do so will lead to delay in processing your application. Instructions on how to attach documents appear in section E of this form.

Any relevant Risk Assessment documentation relating to the offsite activity should also be attached, covering travel, location / environmental hazards (eg insect / animal hazards, weather conditions, landscape, remoteness, communication, contactability and communication arrangements) as well as risk assessment relating to the activity itself.

For fieldwork, participants should complete a Fieldwork Medical Questionnaire to identify any health issues such as allergies or other conditions and provide this to the Activity Supervisor for reference in case of a medical emergency.

Reviewer use only: The controls described appear to be appropriate for the activity.

Reviewer Name / ID: Neill Bourne Review Date: 16 July 2015

Section D - Risk Assessment and documentation

From the summary of the project or activity details, all of the hazards that may arise from the activities must be risk assessed. A template and further information is available via: Risk Assessment Templates and Information
For simple activities a risk assessment/hazard identification/control list template is available via this checkbox: Show R/A ☒ Hide R/A ☐

Add a new row (or move/delete) using the buttons	Step of activity/ process occuring / item of equipment	What are the associated or potential hazards ?	What will be done to control the hazards and prevent illness or injury ?	Does any hazard remain ?	What risk level remains ? (refer Matrix) ?
	Driving to and from physiotherapy practices	getting lost, breaking down, running out of petrol	use of car satellite navigation system, ensuring car has sufficient petrol, car recently serviced, use of mobile phone , never to park in deserted area, to conduct research in daylight hours only	minimal risk of road traffic accident due to others negligent driving	low
	Interviewing participants	adverse participant behaviour	ensure never alone in physiotherapy practice, use of itinerary (supervisors to know where Kerry Peek is and when, Kerry Peek to call supervisors on arrival and departure, to provide supervisors with home contact details such as NOK details). Kerry Peek will receive guidance from senior researchers about how to respond appropriately to people who become distressed or irritable during recruitment or interview.	no	low

Documentation - Have all of the processes or safety related issues been assessed to identify all hazards and risk, and required controls listed in this form or another risk assessment document ? ◉ Yes ◯ No ◯ N/A

Are the activities and safety control methods covered by existing documents such as Standard Operating Procedures (SOP) or Safe Work Method Statements (SWMS) ? You must attach these. ◉ Yes ◯ No ◯ N/A

Please Note: SOP and SWMS templates vary between Schools, Faculties etc based on local area requirements. You should consult your Local Safety Contact Person regarding this (refer bottom of section E of this form for Safety Contact Person list) or contact the Health and Safety team for advice if your project or activity has different SOP or SWMS requirements.

New Procedures - where a component of the project requires a new Standard Operating Procedure (SOP) or Safe Work Method Statement (SWMS) please document these in the table below and include these documents with form submission).

Add SOP or SWMS	SOP or SWMS details (Complete docs should be included as attachments when submitting form)
	OFFSITE VISIT/INTERVIEW SAFETY GUIDELINES. Appendix 7.2 attached
	OFFSITE VISIT/INTERVIEW SAFETY GUIDELINES. Appendices 7.3 and 7.4 will be used during research period

Previously reviewed Procedures - where a component of the project exists as a Standard Operating Procedure (SOP) or Safe Work Method Statement (SWMS) which has previously been reviewed please document these in the table below.

Add SOP or SWMS	Prereviewed SOP or SWMS details (SOP/SWMS Reference # and title)	Safety Review reference #

Any additional information regarding the Risk Assessment or any other associated documentation, or references to other information (legislation or websites) can be added to this field in the area below. **Notes regarding attachments** that you will be including with your email submission of this form can also be added to this field in the area below.

This research will be conducted at private physiotherapy practices and relevant approval from practice owners will be sought once practices have been recruited for this study.

Section E - Submission for review

As the Responsible Supervisor for this project or activity please confirm:

	Yes	No	N/A
All participants involved with this project or activity will be inducted and trained in how to participate safely, with training details recorded and available to be produced upon request:	◉	○	○
All relevant hazardous activities have been identified in this application form and I will notify all affected staff, students & others associated with this project or activity or event of these hazards:	◉	○	○
I have included/attached/referenced all relevant documentation relating to the project/activity including SOPs, SWMS, and other Risk Assessment documents (if applicable):	◉	○	○
Details of work to be performed in collaboration with, and at, another institution is covered in this application and shall also comply with the safety requirements of that institution:	◉	○	○
I have obtained permission to use facilities other than my own as listed in this application and have advised the facility supervisor of the activity / project details and associated hazards:	○	○	◉

Recommendation of Review Level and submission of form for review: Follow steps 1 - 5 below to submit form by email

1/ Read the guidelines relating to Assessment and Review levels available via this button : (guidelines will appear under the very last page of form) and then; Show Review Guidelines | Hide Review Guidelines

2/ Answer this question: Does this project / activity meet the criteria for Local Level Review ? (Based on guidelines relating to assessment and review, and information you have provided) then; ○ No ◉ Yes

Review level recommended by Responsible Supervisor (this will auto fill based on selections above): Local Review

3/ List any persons who should be copied into correspondence regarding this submission: (for eg "all team members", "Human Ethics" or "Animal Ethics" Office, "Research Grants Office")

Human ethics, Kerry Peek

4/ Complete the submission field below in confirmation and endorsement of the content of this form: and then

L/Prof Rob Sanson-Fisher 14/07/15

5/ Save and send a copy of this form by email as an attachment along with any other attachments to:

SafetyClearance@newcastle.edu.au **(Escalated review) ..or to..** Local-Safety-Review@newcastle.edu.au **(Local level review)**

If you require assistance with finalising the form please contact one of the Local Safety Contact persons listed below;

School of Medicine & Public Health: Elisabetta.Scarabelli@newcastle.edu.au ph: 4042 0609

Meeting dates for the IBC and CRTC are available via this link

ASSESSMENT and REVIEW

Hazard Summary

The fields below have been populated based on the selections and review comments made above in section C.

										Offsite /		

Offsite Activity/Fieldwork hazard review summary:	The controls described appear to be appropriate for the activity.

Health and Safety confirm whether Local or Escalated Review applies: (●) Local ( ) Escalated | Local Review

Local Level Review Confirmation

The Health and Safety Team have assessed this Safety Review Application and confirm that the review process can be completed as a local level review, based on the guidelines for assessment and review.

The review reference number L1 #/2014 (located at the top of this form) and the name of the responsible supervisor should be quoted in all communication relating to this project or activity (and in the title of any email correspondence)

Your activity or project can proceed as planned, on the basis of this review advice from the Health and Safety team, **unless contrary advice from the relevant local area is received**, from your local Safety Contact person or elsewhere from within your School / Faculty / Centre / Institute. Depending on local area procedures, further review by an appropriate person in the School / Faculty / Centre / Institute (such as a Subject Matter Expert as determined by the HOS, PVC, or Director) may be required in order to confirm or modify the assessment advice which appears below. All local area procedures for the management of local level review should be followed as required.

Where applicable, Research Grants or Human Ethics Office have been provided with this review advice, and any relevant supporting documentation is now available as an attachment within this form, via the paperclip icon (top left side).

Recommendation of reviewer

This section is to be completed by the reviewer (Local or Escalated Review)

The training and experience of the project team for carrying out this work are considered adequate, based on the details and information provided in this Safety Review form and associated documents:	(●) Yes ( ) No
The control measures described in relation to identified hazards and risks are considered appropriate in order to allow the project to proceed:	(●) Yes ( ) No
The Project or Activity is recommended to proceed according to the detail provided within the application form and any associated documentation as well as any conditions specified below:	(●) Yes ( ) No

Recommendation: Recommended to proceed in accordance with assessment overview and conditions described below:

Assessment overview and conditions that must be adhered to during the conduct of the work:

Assessment Overview:	As per the detail provided in the hazard assessment area which appears above - unless an overarching assessment statement is required which can be placed here.
Conditions to be adhered to:	As per the detail provided in the hazard assessment area which appears above - unless an overarching conditions statement is required which can be placed here.

Assessment ID Reference:	L1 149/2015	Date of Review:	16 July 2015
Reviewer Name:	Neill Bourne	Reviewer Phone:	17330
Reviewer Email:	Neill.Bourne@newcastle.edu.au		

Additional information or notes regarding the Assessment and Review process can be added here:

Review Summary: These fields are for the Health and Safety Team to track review period and processing times.

Date that form was initially submitted:	Date all supporting documents & necessary information received:	Date of designated IBC Meeting:	Date of designated CRTC Meeting:	Review Timings:
14 July 2015	14 July 2015			IBC: <1, 1, 2,>2 Chem: <1, 1, 2,>2 Rad: <1, 1, 2,>2

Biosafety reviewed:	Chemical reviewed:	Radiation reviewed:	Other SME reviewed:	Entire review period:	Attachments Button
			16 July 2015		

GM Classification info:

Health and Safety Team

http://www.newcastle.edu.au/unit/human-resource-services/health-safety

Safety Review Form for UoN Activities

Including Research, Teaching, and other activities / events

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

v 1.10 Updated 18 May 2015

Instructions: for using this form are available via this button. Please save a copy to your desktop or another location to prevent any data loss.

REQUIREMENTS: Please read requirements first and then work through each section of the form sequentially

To comply with the requirements of the Work Health and Safety Act 2011, all staff responsible for University of Newcastle related activities (Research, Teaching related, or other activities such as events or an overseas placement) which may involve hazards or risk are required to undertake a risk assessment for each project or activity (this is irrespective of funding source and includes unfunded projects or activities). The risk assessments must be reviewed under the direction and authority of a suitable officer of the University (Head of School, Research Institute Director, or Pro Vice-Chancellor) before the project or activity commences and include consideration of all health and safety risks and hazards and how these will be controlled. There are two levels of assessment review:

Local Assessment Reviews are managed by the School / Faculty / Discipline / Research Institute or Priority Research Centre
Escalated Assessment Reviews are directed to the Health and Safety Team for referral to a Technical Committee (IBC or CRTC), Technical Specialist, Deputy Vice-Chancellor, or other appropriate agency for assessment of hazards or risks and control measures which are either unable to be assessed at the local level, or involve GMOs, pathogens of risk group 2 or higher, or hazardous chemicals or radiation.

Further details regarding Assessment Reviews are available via the button in section E. Hyperlinks to other websites or documents appear underlined in blue. Complete all applicable fields within the form, and indicate Yes or No for each question wherever required.

L1 140/2015 | Finalised | Research | New Project/ Activity

Section A - Project or Activity Details:

Is this activity or project related to Research, Teaching, or another type of activity such as an event or overseas placement ? (●) Research ( ) Teaching ( ) Another activity type (for eg an Event)

Is this a new activity or project, variation to an existing project (within 5 years) or resubmission of a project (due to age greater than 5 years) ? Indicate using button: (●) New ( ) Variation ( ) Resubmission

Activity or Project Title:	Physiotherapist and patient perceptions of a physiotherapist prescribed exercise program for chronic low back pain.		
Activity or Project Start Date	27 July 2015	End Date	31 December 2015
Granting Body (if funded)		Grant Number (if funded)	G
Supervisor responsible for activity or project name:	L/Prof Robert Sanson-Fisher	Supervisor Phone:	02 4042 0713
Supervisor Email	rob.sanson-fisher@newcastle.edu.au		
School or other entity	School of Medicine and Public Health		
Faculty, Division, PRC/Institute	PRC - Health Behaviour Research Centre		
HOS, PVC or Director	HOS Ian Symonds		

Section B - Project or Activity Summary: (Primary site, Team members, and Project or Activity Summary / Overview)

Site location	HMRI Building	Building Name	HMRI	Room Number	W4

Additional location information: Private physiotherapy practices- to be determined after recruitment

Are you the assigned responsible Supervisor for the Site(s) or Facilities ? (●) Yes ( ) No ( ) N/A

If you are not the responsible Supervisor for the Site or Facility, you have documentation indicating authorised approval for use of the area for the activity / project / event ? ◉ Yes ◯ No ◯ N/A

Does the equipment to be used within this site or facility or area meet the relevant standards for quality and safety for the purposes of the project or activity ? ◉ Yes ◯ No ◯ N/A

Add Team Members: Title, Name, Role, Email address, and other relevant Team Member information	Phone contact #
Ms Kerry Peek, Student investigator Kerry.peek@uon.edu.au	02 4042 0616
Dr Lisa Mackenzie, Co-supervisor lisa.mackenzie@newcastle.edu.au	02 4042 0710
Dr Mariko Carey, co-supervisor mariko.carey@newcastle.edu.au	02 4042 0702

Any additional relevant Team information (Experience, training, licencing, training requirements etc) can be added here:

Activity or Project Summary: Provide a high level overview of the project or activity with as much detail as necessary to briefly describe the proposed activity or project. Further specific detail will be provided in other sections of this form.

A cross-sectional study design will be used with data collected via physiotherapist surveys, patient interviews and patient exercise demonstrations.

Significance:
Poor patient adherence is not unique to physiotherapy or exercise. However, it is important to maximise the rate of patient adherence to physiotherapist prescribed exercise programs, given that CLBP is a common condition and that research has indicated a correlation between exercise adherence and improved patient outcomes. It is planned that by gathering data on rates of patient adherence to physiotherapist prescribed exercise programs using a multi-faceted approach that this will inform clinical assessment of patient adherence and help to guide future research and clinical practice.

Description of Study Participants (Do not list names):
Physiotherapists: Eligible physiotherapists will work clinically either full or part time within a physiotherapy private practice, see a general adult out-patient case mix including patients with chronic low back pain, have a receptionist and be located within 150km radius of the central business district of Sydney, Adelaide and Newcastle. Eligible physiotherapists will also need to be able to provide a private space or clinic area within the practice for the research physiotherapist to be able to conduct the patient face to face interview. Physiotherapists working in specialist physiotherapy clinics, such as women's health or paediatric service, will be excluded.

Patients: Eligible patients will be aged 18 years and over; attending for a follow up physiotherapy consultation (i.e. within 2 weeks of their previous physiotherapy consultation for chronic (> 12 week duration) or recurring (more than 1 episode previously) low back pain; able to complete a touch screen computer survey in English and be physically able to demonstrate an exercise program.

How are participants being recruited:
Recruitment will be conducted by PhD candidate Ms Kerry Peek.
Physiotherapists: A list of potentially eligible physiotherapists will be generated using the "find-a-physio" online tool. The physiotherapists will be randomly selected and approached until 29 physiotherapists have signed an agreement to participate. Physiotherapists will be approached initially by letter with an attached Physiotherapist Participant Information Statement regarding the study and asking them to contact the research team in order to participate. This will be followed up with a further letter requesting study participation two weeks later and then a phone call at four weeks. Practice owners/ managers of the private physiotherapy practices as well as individual physiotherapists recruited for the study must give informed consent to participate.

Patients: Eligible patients will be identified by the practice receptionist. The receptionist will confirm with the patients whether they are willing to be approached by the research physiotherapist to discuss participation in a research project. If the patient agrees, the research physiotherapist will then approach the identified patient to discuss their participation and provide them with a Patient Participant Information Statement. If the patient gives informed consent to participate, they will be asked to attend an immediate 10 minute face to face interview and exercise demonstration with the research physiotherapist (prior to attending their physiotherapy consultation).

What is required of participants?
Once the physiotherapist and practice owner/ manager has given their consent to participate in the study, the research physiotherapist will request a copy of all the individual exercises/ formatted exercise programs for low back pain which the physiotherapists within the practice provide to their patients. These will be used as a reference guide when the individual patients are requested by the research physiotherapist to demonstrate their exercises.
Consenting physiotherapists and patient participants will each be assigned a unique identification number in order to link physiotherapist survey data to patient interview data and observed exercise demonstration.
Physiotherapists: Participating physiotherapists will initially be asked to complete a one off 5 minute demographic survey. In addition, participating physiotherapists will be asked to further complete a patient specific survey regarding whether they gave the patient an exercise program in the previous consultation and if so, what type of exercise was prescribed, and whether they felt that the patient had adhered to it. Physiotherapists will be asked to complete the survey within 24 hours of the patient attending for their follow up consultation. Physiotherapists can consult their patient records when completing the survey. The survey is specific to each patient so a comparison can be made between the physiotherapist's perception of their patient's adherence, the patient's self-report on their adherence and the patient's actual ability to demonstrate the exercises to an independent researcher. Both physiotherapist surveys will be self-administered by the treating physiotherapist on a touchscreen computer tablet which will provided by the research team for use during the whole in-clinic research period.
Patients: Consenting patients will be asked to complete a face to face interview with a research physiotherapist while waiting for their follow up appointment regarding their low back pain treatment. The research physiotherapist will record interview responses using a touch screen computer tablet. Patients who indicate that they were given an exercise program will then be asked by the research physiotherapist a number of questions related to adherence and asked to demonstrate one each of the prescribed exercises. The interview and demonstration will occur in a clinic/ private room away from the main reception area to allow for space and privacy. Patients will complete the survey and demonstration prior to their follow up consultation with their physiotherapist.

Section C - Hazard Identification

Answer the following questions by pressing Yes or No as applicable. You must indicate Yes or No for each question. Provide the required information on the additional pages and questions which appear. **Does the Project or Activity........?**

	Yes	No
Involve work with a genetically modified organism (GMO) ?	○	◉
Involve work with hazardous microorganisms or biological toxins ?	○	◉
Involve work with animals or animal body fluids, tissues, or cell lines ?	○	◉
Involve work with human body fluids or tissues or cell lines ?	○	◉
Involve the use of chemically hazardous materials ? Chemicals of Security Concern, Explosives, Fireworks Security Sensitive Dangerous Goods; Materials requiring Health Monitoring (WHS Regulation Schedule 14); Prohibited or Restricted Carcinogens and Restricted Hazardous Chemicals (WHS Reg Sch 10); Dangerous Goods Packing Group 1 (PG 1 - High Danger - refer to transportation section of SDS for PG Classification) eg Ethidium Bromide or Hydrofluoric/ Picric/ Nitric Acid; Schedule 4, 7, 8, or 9 substances (includes illicit drugs, chemotherapy agents, anaesthetics); Category 1 chemical diversion into illicit drug manufacture.	○	◉
Involve the use of radioisotopes / unsealed sources ?	○	◉
Involve the use of ionising radiation / sealed sources, e.g. X-rays ?	○	◉
Involve the use of non-ionising radiation, e.g. Lasers, RF-heating, microwaves, sonic, MRI ?	○	◉
Involve offsite radiation work ?	○	◉
Involve the use of Nanoparticles or Nanomaterial ?	○	◉
Involve an offsite activity ? (e.g. Fieldwork, Site Visits, SCUBA Diving, Boating, Home Visits, Interviews)	◉	○
Involve International Travel or research or another activity in a location outside of Australia ?	○	◉

Involve any hazard(s) not covered by another category, such as a process (e.g. welding, cash handling or participant reimbursement, physical activity), location (workshop, factory), event/exercise (filming, mining construction, structural modification, high voltage electrical work), or equipment (appliance, plant, tool), or which require a Permit to Work to be issued by Infrastructure and Facilities Services ?	○ Yes ◉ No

OFFSITE ACTIVITY HAZARD INFORMATION

Fieldwork occuring away from University Sites or Premises

Please indicate the nature of the activity by checking one or more of the boxes below:

Fieldwork / Fieldtrip to a remote location	Yes	● No	Fieldwork / Fieldtrip non-remote location	Yes	● No
Work Placement	Yes	● No	Overseas Travel - Ref University Travel Policy	Yes	● No
Boating, Canoeing / Kayaking, Rafting:	Yes	● No	Water activities such as SCUBA Diving and Snorkelling: Refer SCUBA Diving Manual	Yes	● No
Abseiling, Caving, Canyoning	Yes	● No	Participant reimbursement for participation Link to Reimbursement Guidelines	Yes	● No

Offsite Visit / Interview / Focus Group - Refer to Link to Guidelines then read and complete checklist ● Yes No

Other:

Offsite Activity Start Date 27/07/2015 Offsite Activity End Date 31/12/2015

Location(s) details and other location specific useful information:

Private physiotherapy practice sites to be determined following recruitment. Site specific approval will be obtained to conduct this research at each identified practice prior to commencement.

Do you require/ have human ethics clearance for this project or are you applying for it ? ● Yes No Applying HREC App # or DOA H-2015-0064

Is the Fieldwork planned to occur in a Public Area or on Private Property ? ☒ Public Area ☐ Private Property

Have you obtained formal approval from the relevant authority or property owner if required ? ☐ Yes ☒ No ☐ N/A

Attachments - Important information: You must include / attach all relevant documentation such as Risk Assessment, Standard Operating Procedures (SOPs) or Safe Work Method Statements (SWMS) as well as applicable induction / training records, approvals etc) with this application. Failure to do so will lead to delay in processing your application. Instructions on how to attach documents appear in section E of this form.

Any relevant Risk Assessment documentation relating to the offsite activity should also be attached, covering travel, location / environmental hazards (eg insect / animal hazards, weather conditions, landscape, remoteness, communication, contactability and communication arrangements) as well as risk assessment relating to the activity itself.

For fieldwork, participants should complete a Fieldwork Medical Questionnaire to identify any health issues such as allergies or other conditions and provide this to the Activity Supervisor for reference in case of a medical emergency.

Reviewer use only: Interactions with physiotherapy patients in Private physiotherapy practices. Low risk activity. Offsite visit and intervew safety checklist has been competed and is attached and available via paperclip icon.

Reviewer Name / ID Dylan Mitchell, Senior Health and Safety Advisor Review Date 7 July 2015

Section D - Risk Assessment and documentation

From the summary of the project or activity details, all of the hazards that may arise from the activities must be risk assessed. A template and further information is available via: Risk Assessment Templates and Information
For simple activities a risk assessment/hazard identification/control list template is available via this checkbox: ☒ Show R/A ☐ Hide R/A

Add a new row (or move/delete) using the buttons	Step of activity/ process occuring / item of equipment	What are the associated or potential hazards ?	What will be done to control the hazards and prevent illness or injury ?	Does any hazard remain ?	What risk level remains ? (refer Matrix) ?
→ ↳ ← ↑ ↓	Driving to and from physiotherapy practices	getting lost, breaking down, running out of petrol	use of car satellite navigation system, ensuring car has sufficient petrol, car recently serviced, use of mobile phone , never to park in deserted area, to conduct research in daylight hours only	minimal risk of road traffic accident due to others negligent driving	low
→ ↳ ← ↑ ↓	Interviewing participants	adverse participant behaviour	ensure never alone in physiotherapy practice, use of itinerary (supervisors to know where Kerry Peek is and when, Kerry Peek to call supervisors on arrival and departure, to provide supervisors with home contact details such NOK details). Kerry Peek will receive guidance from senior researchers about how to respond appropriately to people who become distressed or irritable during recruitment or interview.	no	low

Documentation - Have all of the processes or safety related issues been assessed to identify all hazards and risk, and required controls listed in this form or another risk assessment document ? ◉ Yes ○ No ○ N/A

Are the activities and safety control methods covered by existing documents such as Standard Operating Procedures (SOP) or Safe Work Method Statements (SWMS) ? You must attach these. ◉ Yes ○ No ○ N/A

Please Note: SOP and SWMS templates vary between Schools, Faculties etc based on local area requirements. You should consult your Local Safety Contact Person regarding this (refer bottom of section E of this form for Safety Contact Person list) or contact the Health and Safety team for advice if your project or activity has different SOP or SWMS requirements.

New Procedures - where a component of the project requires a new Standard Operating Procedure (SOP) or Safe Work Method Statement (SWMS) please document these in the table below and include these documents with form submission).

Add SOP or SWMS	SOP or SWMS details (Complete docs should be included as attachments when submitting form)
→ ↳ ← ↑ ↓	OFFSITE VISIT/INTERVIEW SAFETY GUIDELINES. Appendix 7.2 attached
→ ↳ ← ↑ ↓	OFFSITE VISIT/INTERVIEW SAFETY GUIDELINES. Appendices 7.3 and 7.4 will be used during research period

Previously reviewed Procedures - where a component of the project exists as a Standard Operating Procedure (SOP) or Safe Work Method Statement (SWMS) which has previously been reviewed please document these in the table below.

Add SOP or SWMS	Prereviewed SOP or SWMS details (SOP/SWMS Reference # and title)	Safety Review reference #

Any additional information regarding the Risk Assessment or any other associated documentation, or references to other information (legislation or websites) can be added to this field in the area below. **Notes regarding attachments** that you will be including with your email submission of this form can also be added to this field in the area below.

This research will be conducted at private physiotherapy practices and relevant approval from practice owners will be sought once practices have been recruited for this study.

Section E - Submission for review

As the Responsible Supervisor for this project or activity please confirm:

	Yes	No	N/A
All participants involved with this project or activity will be inducted and trained in how to participate safely, with training details recorded and available to be produced upon request:	◉	○	○
All relevant hazardous activities have been identified in this application form and I will notify all affected staff, students & others associated with this project or activity or event of these hazards:	◉	○	○
I have included/attached/referenced all relevant documentation relating to the project/activity including SOPs, SWMS, and other Risk Assessment documents (if applicable):	◉	○	○
Details of work to be performed in collaboration with, and at, another institution is covered in this application and shall also comply with the safety requirements of that institution:	◉	○	○
I have obtained permission to use facilities other than my own as listed in this application and have advised the facility supervisor of the activity / project details and associated hazards:	○	○	◉

Recommendation of Review Level and submission of form for review: Follow steps 1 - 5 below to submit form by email

1/ Read the guidelines relating to Assessment and Review levels available via this button : (guidelines will appear under the very last page of form) and then;

Show Review Guidelines | Hide Review Guidelines

2/ Answer this question: Does this project / activity meet the criteria for Local Level Review ? (Based on guidelines relating to assessment and review, and information you have provided) then; ○ No ◉ Yes

Review level recommended by Responsible Supervisor (this will auto fill based on selections above): Local Review

3/ List any persons who should be copied into correspondence regarding this submission: (for eg "all team members", "Human Ethics" or "Animal Ethics" Office, "Research Grants Office")

Human ethics, Kerry Peek

4/ Complete the submission field below in confirmation and endorsement of the content of this form: and then

L/Prof Rob Sanson-Fisher 30/6/15

5/ Save and send a copy of this form by email as an attachment along with any other attachments to:

SafetyClearance@newcastle.edu.au **(Escalated review) ..or to..** Local-Safety-Review@newcastle.edu.au **(Local level review)**

If you require assistance with finalising the form please contact one of the Local Safety Contact persons listed below;

School of Medicine & Public Health: Elisabetta.Scarabelli@newcastle.edu.au ph: 4042 0609

Meeting dates for the IBC and CRTC are available via this link

ASSESSMENT and REVIEW

Hazard Summary

The fields below have been populated based on the selections and review comments made above in section C.

										Offsite /		

Offsite Activity/Fieldwork hazard review summary: Interactions with physiotherapy patients in Private physiotherapy practices. Low risk activity. Offsite visit and interview safety checklist has been competed and is attached and available via paperclip icon.

Health and Safety confirm whether Local or Escalated Review applies: (•) Local ( ) Escalated Local Review

Local Level Review Confirmation

The Health and Safety Team have assessed this Safety Review Application and confirm that the review process can be completed as a local level review, based on the guidelines for assessment and review.

The review reference number L1 #/2014 (located at the top of this form) and the name of the responsible supervisor should be quoted in all communication relating to this project or activity (and in the title of any email correspondence)

Your activity or project can proceed as planned, on the basis of this review advice from the Health and Safety team, **unless contrary advice from the relevant local area is received**, from your local Safety Contact person or elsewhere from within your School / Faculty / Centre / Institute. Depending on local area procedures, further review by an appropriate person in the School / Faculty / Centre / Institute (such as a Subject Matter Expert as determined by the HOS, PVC, or Director) may be required in order to confirm or modify the assessment advice which appears below. All local area procedures for the management of local level review should be followed as required.

Where applicable, Research Grants or Human Ethics Office have been provided with this review advice, and any relevant supporting documentation is now available as an attachment within this form, via the paperclip icon (top left side).

Recommendation of reviewer

This section is to be completed by the reviewer (Local or Escalated Review)

The training and experience of the project team for carrying out this work are considered adequate, based on the details and information provided in this Safety Review form and associated documents: (•) Yes ( ) No

The control measures described in relation to identified hazards and risks are considered appropriate in order to allow the project to proceed: (•) Yes ( ) No

The Project or Activity is recommended to proceed according to the detail provided within the application form and any associated documentation as well as any conditions specified below: (•) Yes ( ) No

Recommendation: Recommended to proceed in accordance with assessment overview and conditions described below:

Assessment overview and conditions that must be adhered to during the conduct of the work:

Assessment Overview: As per the detail provided in the hazard assessment area which appears above - unless an overarching assessment statement is required which can be placed here.

Conditions to be adhered to: As per the detail provided in the hazard assessment area which appears above - unless an overarching conditions statement is required which can be placed here.

Assessment ID Reference: L1 140/2015 | Date of Review: 7 July 2015

Reviewer Name: Dylan Mitchell, Senior Health and Safety Advisor | Reviewer Phone: 49212053

Reviewer Email: Dylan.Mitchell@newcastle.edu.au

Additional information or notes regarding the Assessment and Review process can be added here:

Review Summary: These fields are for the Health and Safety Team to track review period and processing times.

Date that form was initially submitted:	Date all supporting documents & necessary information received:	Date of designated IBC Meeting:	Date of designated CRTC Meeting:	Review Timings: IBC: <1, 1, 2,>2 Chem: <1, 1, 2,>2 Rad: <1, 1, 2,>2
30 June 2015	30 June 2015			

Biosafety reviewed:	Chemical reviewed:	Radiation reviewed:	Other SME reviewed:	Entire review period:	Attachments Button
			7 July 2015	5 days	

GM Classification Info:

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Appendix 10.3: Example information statement and consent form

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

L/Prof Robert Sanson-Fisher
Health Behaviour Research Group
Tel: 02 4042 0713
E-mail: rob.sanson-fisher@newcastle.edu.au

Patient Participant Information Statement for the Research Project:
Patient adherence to physiotherapist prescribed self-management strategies: An observational study.
(Document version 2; dated 26/02/2015)

You have been identified by your physiotherapist to take part in the project as described below.

Why is the research being done?
Physiotherapist prescribed self-management strategies (e.g. exercise, self-taping, advice, bracing) are an important part of physiotherapy treatment. When followed, self-management strategies can help to improve patient outcomes. However, people often encounter difficulties with following self-management strategies at home (e.g. lack of time, difficulty remembering the strategies etc.). This research aims to explore the use of self-management strategies in physiotherapy.

Project overview
This project will compare data collected through observations of physiotherapy consultations and patient perceptions of the provision of physiotherapist prescribed self-management strategy/ies. Any discrepancies between the observed patient-physiotherapy consultation and how it is perceived by patients may highlight areas where communication of self-management strategies may be improved to ensure better recall and comprehension by patients.

The research team
This project is conducted by Laureate Professor Rob Sanson-Fisher, Dr Mariko Carey, Dr Lisa Mackenzie and Ms Kerry Peek from the University of Newcastle. The research is part of Kerry Peek's PhD studies. Kerry, a practicing physiotherapist, is supervised by Rob Sanson-Fisher, Mariko Carey and Lisa Mackenzie from the School of Medicine and Public Health, University of Newcastle.

Who is invited to participate in this project?
We are seeking patients who are attending for a physiotherapy consultation who are aged 18 years and older, who are able to take part in a telephone interview in English and who are able to provide written, informed consent.

What will you be asked to do?
If you agree to participate in this project, a research physiotherapist (registered physiotherapist with the Physiotherapy Board of Australia) will spend time observing one of your patient-physiotherapy consultations. You will be asked to provide your telephone contact details in order that you can be contacted by the same research physiotherapist via telephone to answer a few questions regarding the self-management strategy (if applicable) that was provided to you by your physiotherapist during the consultation observed by the research physiotherapist. The telephone interview will take place within 2 weeks of your physiotherapy consultation. Your treating physiotherapist will not be provided with any of the responses provided by you during the telephone interview.

You do not have to agree to participate. If you would prefer more time to read this Participant Information Statement or you wish to be observed at a later consultation please let the research physiotherapist know.

How much time will it take?
The research physiotherapist will observe one of your physiotherapy consultations which will not impact on the time taken for this consultation. The telephone interview is expected to take 10 minutes.

What are the risks and benefits of participating?
We cannot promise you any benefits from your participation. However, your participation in this project will assist us in further developing physiotherapy research in private practice. This in turn will allow us to develop strategies to assist physiotherapists in future treatment approaches to increase patient adherence and potentially improve patient outcomes.

It is not expected that you will be exposed to any risks by taking part in this research.

What choice do you have?
Participation in this research is entirely your choice. Only patients who give informed consent and sign a consent form will be included in this research. Whether or not you decide to participate, your decision will not disadvantage you. If you do decide to participate, you may withdraw from the project at any time prior to the completion of the telephone interview.

How will your privacy be protected?
All information you provide will be de-identified. That is, it will not be possible to identify you or your physiotherapist from your answers. If you choose to participate in this project, your information will be kept confidential. Data will be retained for at least 7 years after completion of the research project. The data will be kept in locked cabinets and electronic files which will be securely protected so that only the research team will have access to these data. No data will be saved on the computer tablets once it has been transferred to the central server. All data will be securely destroyed once it is no longer required (data collected in electronic format will be deleted from the central server and data collected in paper format will be shredded and disposed of in confidential waste.)

How will the information collected be used?
The information collected via the study will be used to gather information on patient adherence rates to physiotherapist prescribed self-management strategies. Results of the study may be reported in scientific journals and conference Paper. Individual physiotherapists and patients who participate will not be identified in any of the reports arising from this study.

Results collected in this study will form part of Kerry Peek's PhD studies.

You may request a summary of the results by emailing Kerry on kerry.peek@uon.edu.au

***What do you need to do to participate*?**
Please read this Patient Participant Information Statement and make sure that you understand it before you agree to participate. If there is anything that you do not understand, of if you have questions, please contact Kerry Peek. If you agree to participate, please sign the attached Patient Consent Form and return it to the research physiotherapist.

Further information
For more information about this project or if you have any questions about participating in this survey, please contact Kerry Peek on (02) 4042 0616 or via email on kerry.peek@uon.edu.au

Laureate Professor Rob Sanson-Fisher
Health Behaviour Research Group
Physiotherapy
School of Medicine and Public Health
The University of Newcastle

Ms Kerry Peek
BSc (Hons)

PhD Candidate

Concerns about this research

This project has also been approved by the University's Human Research Ethics Committee, Approval No. H-2015-0030.

Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au.

L/Prof Robert Sanson-Fisher
Health Behaviour Research Group
School of Medicine and Public Health
University Drive
Callaghan,NSW 2308.
Tel: 02 4042 0713
E-mail: rob.sanson-fisher@newcastle.edu.au

Patient Consent Form for the Research Project:

Patient adherence to physiotherapist prescribed self-management strategies:
L/Prof Robert Sanson-Fisher, Dr Mariko Carey, Dr Lisa Mackenzie, Ms Kerry Peek

I agree to participate in the above research project and give my consent freely.

I understand that the project will be conducted as described in the Patient Participant Information Statement, a copy of which I have retained.

I understand I can withdraw from the project at any time and do not have to give any reason for withdrawing.

I consent to:

- Allowing the research physiotherapist to observe one of my physiotherapy consultations
- Providing the research physiotherapist with my telephone contact details below in order to participate in a short 10 minute computer assisted telephone interview with the research physiotherapist within 2 weeks of the observed physiotherapy consultation.

I understand that my personal information will remain confidential to the researchers.

I have had the opportunity to have questions answered to my satisfaction.

Print Name: ____

Contact Number for Telephone Interview: ________________________________

Signature: _________________________________ **Date:** ________________

Please return this consent form to Kerry Peek, the research physiotherapist in attendance at the physiotherapy practice.