

Physical activity promotion in physiotherapy practice

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Submitted in total fulfilment of the requirements for the degree of Doctor of Philosophy

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Submitted: 16 February, 2018

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Abstract

Australian physiotherapists promote non-treatment physical activity, which is physical activity used to improve or maintain general health, to patients with musculoskeletal conditions. However, it is unclear how physiotherapists promote non-treatment physical activity and the behaviour change techniques they use to do this. This thesis used four studies to: (i) review the efficacy of physiotherapist-led physical activity interventions; (ii) investigate the factors that influence physiotherapists' choice to promote non-treatment physical activity; and (iii) identify the behaviour change techniques that private practice and outpatient physiotherapists use to promote non-treatment physical activity. Two systematic reviews identified that physiotherapist-led physical activity interventions are efficacious. However, effects were small and not maintained. Additionally, physiotherapists only used a small number of behaviour change techniques when promoting physical activity. National survey and interview studies were used to identify the factors that influence physiotherapists' choice to promote non-treatment physical activity. The survey found that having poor knowledge of how to promote non-treatment physical activity, prioritising other patient problems before non-treatment physical activity and using promotion methods that were not compatible with daily practice significantly and independently reduced the odds of physiotherapists promoting non-treatment physical activity. Interpretative phenomenological analysis was used to design interviews that showed that having a perceived inability to motivate an unmotivated patient and believing that patients expect hands-on therapy instead of non-treatment physical activity promotion complicated treatment choices. The behaviour change techniques Australian physiotherapists used to promote non-treatment physical activity were compared to those used to encourage adherence to rehabilitation exercises in

the survey too. The survey found that physiotherapists used similar behaviour change techniques to promote non-treatment physical activity and encourage adherence to rehabilitation exercises. This thesis provides clinicians and researchers with an understanding of the factors that influence Australian physiotherapists' decision to promote non-treatment physical activity and the behaviour change techniques they use.

Practical implications

1. Physiotherapists can successfully increase patient physical activity levels. However, the effects are small to moderate;
2. Physiotherapists use few behaviour change techniques to promote non-treatment physical activity. The behaviour change techniques used for non-treatment physical activity promotion were very similar to those used to encourage adherence to rehabilitation exercises. Therefore, future physiotherapist-led non-treatment physical activity promotion interventions should include techniques physiotherapists have used for other purposes and test to see if familiarity with the techniques is associated with efficacy;
3. The factors associated with whether or not a physiotherapist will promote non-treatment physical activity (i.e. knowledge, priorities and compatibility) should be accounted for when designing new non-treatment physical activity promotion interventions and education programs; and
4. Marketing strategies (including appropriate advertising and physical activity specific service provision) can make non-treatment physical activity promotion easier for physiotherapists. Ensuring that physiotherapy clinics advertise physical activity sufficiently enough for patients to expect physical activity promotion might make non-treatment physical activity promotion easier.

Statement of authorship and originality

Except where explicit reference is made in the text of the thesis, this thesis contains no material published elsewhere or extracted in whole or in part from a thesis by which I have qualified for or been awarded another degree or diploma. No other person's work has been relied upon or used without due acknowledgement in the main text and the list of references of the thesis. No editorial assistance has been received in the production of the thesis without due acknowledgement. Except where duly referred to, the thesis does not include material with copyright provisions or requiring copyright approvals.



Signed:

BREANNE E KUNSTLER



Signed:

CAROLINE F FINCH

Statement of contribution

This thesis includes four published manuscripts and one submitted manuscript. All published manuscripts were produced by the candidate as first author and have been published in peer-reviewed journals. The writing of all manuscripts was the primary responsibility of the candidate. Several co-authors from three universities (Federation University Australia, La Trobe University and University of Canberra) were involved in the studies included in this thesis due to the variety of specialist areas included (e.g. physiotherapy, psychology and epidemiology). The role of co-authors was primarily to advise on study design and review manuscript drafts, while allowing the candidate to direct the work (see detail below). Each component of this thesis was written by the candidate and reviewed by supervisors (Professor Finch, Professor Cook, Dr Kemp and Dr O'Halloran).

Thesis chapter	Publication/Manuscript title	Nature of candidate's contribution
3	Physiotherapist-led physical activity interventions are efficacious at increasing physical activity levels: A systematic review and meta-analysis	First author; Co-designed and conducted searches; Reviewed all studies; Extracted data from studies; Conducted meta-analyses; Analysed data;
4	Physiotherapists use a small number of behaviour change techniques when promoting physical activity: A systematic review comparing experimental and clinical settings	Wrote manuscripts and submitted them to journals; Presented both reviews at conferences; and Wrote a response to the letter to the editor for the publication in Chapter 3.
6	The self-reported factors that influence Australian physiotherapists' choice to promote non-treatment physical activity to patients with musculoskeletal conditions	Designed the survey; Obtained ethics approval; Applied for, and received, a grant to fund project; Recruited respondents; Analysed data; and

7	The behaviour change techniques used by Australian physiotherapists to promote non-treatment physical activity to patients with musculoskeletal conditions	Wrote two manuscripts and submitted them to journals.
9	<i>“...like you’re pushing the snowball back up hill”</i> – The experiences of physiotherapists promoting non-treatment physical activity: a qualitative study	Designed the study and interview guide; Obtained ethics approval; Recruited interviewees; Conducted interviews; Analysed data; Wrote a manuscript and submitted it to an open access journal to be included in a special edition; and Presented findings at conferences.

Peer-reviewed work emerging from this thesis

Published journal articles

Kunstler, B., Cook, J., Freene, N., Finch, C., Kemp, J., O'Halloran, P., et al. (2017).

Physiotherapist-led physical activity interventions are efficacious at increasing physical activity levels: A systematic review and meta-analysis. *Clin. J. Sport Med*, 28(3), 304-315. doi:10.1097/JSM.0000000000000447

Kunstler, B., Cook, J., Freene, N., Finch, C., Kemp, J., O'Halloran, P., et al. (2018).

Physiotherapists use a small number of behaviour change techniques when promoting physical activity: A systematic review comparing experimental and observational studies. *J. Sci. Med. Sport*, 21(6), 609-615. doi: 10.1016/j.jsams.2017.10.027.

Kunstler, B., O'Halloran, P., Cook, J., Finch, C., & Kemp, J. (2018). "...like you're pushing the snowball back up hill" - the experiences of Australian physiotherapists promoting non-treatment physical activity: A qualitative study. *AIMS Med. Sci.*, 5(3), 224-237. doi:10.3934/medsci.2018.3.224.

Kunstler, B., Cook, J., Kemp, J., O'Halloran, P., & Finch, C. (in press). The behaviour change techniques used by Australian physiotherapists to promote non-treatment physical activity to patients with musculoskeletal conditions. *J. Sci. Med. Sport*. doi:10.3934/medsci.2018.3.224.

Conference presentations

Kunstler, B., Cook, J., Freene, N., Finch, C., Kemp, J., O'Halloran, P., & Gaida, J.

“Physiotherapist-led physical activity interventions are efficacious at increasing physical activity levels: A systematic review and meta-analysis.” Federation University Higher Degree by Research Conference, 2016 July 20; Ballarat.

Honourable mention – Oral presentation.

Kunstler, B. “Behaviour change in physiotherapy.” Cabrini Health Chronic Disease Management PD Day, 2016 November 29; Melbourne.

Kunstler, B., Cook, J., Freene, N., Finch, C., Kemp, J., O'Halloran, P., & Gaida, J.

“Physical activity promotion in physiotherapy practice: A systematic review of the behaviour change techniques used by physiotherapists.” Victorian Allied Health Research Conference, 2017 March 31; Melbourne.

Kunstler, B., Cook, J., Freene, N., Finch, C., Kemp, J., O'Halloran, P., & Gaida, J.

“Physiotherapist-led physical activity interventions are efficacious at increasing physical activity levels: A systematic review and meta-analysis.” World Congress on Public Health, 2017 April 3-7; Melbourne.

Kunstler, B., O'Halloran, P., Cook, J., Kemp, J., & Finch, C. “Pushing the snowball

back uphill: Exploring non-treatment physical activity promotion by

physiotherapists.” Federation University Higher Degree by Research Conference, 2017 July 27; Ballarat. *Honourable mention – Oral presentation.*

Kunstler, B., O’Halloran, P., Cook, J., Kemp, J., & Finch, C. “The experiences of physiotherapists promoting non-treatment physical activity: a qualitative study.” Australian Physiotherapy Association Conference, 2017 October 19-21; Sydney.

Submitted journal articles

Kunstler, B., Cook, J., Kemp, J., O'Halloran, P., & Finch, C. The self-reported factors that influence Australian physiotherapists' choice to promote non-treatment physical activity to patients with musculoskeletal conditions. Under review after returning minor revisions as of 17 July, 2018.

Kunstler, B., Cook, J., Freene, N., Finch, C., Kemp, J., O'Halloran, P., et al.,
Physiotherapist-led physical activity interventions are efficacious at increasing physical activity levels: A systematic review and meta-analysis: Response to the Letter to the Editor. Under production as of 1 August, 2018.

Other works emerging from this thesis

Australian Physiotherapy Association. (June, 2017). PRF grant takes steps towards physical activity. *InMotion*, 46-47 (Appendix 1. 1).

Kunstler, B. (November, 2017). Promoting physical activity: Your patient has the answers. *InTouch*, 6-8 (Appendix 1. 2).

Note:

Permission was obtained via email from Marko Stechiwskyj (Manager of Content and Publishing, Australian Physiotherapy Association) on 18 January 2018 to include the above works within this thesis.

Statement of ethics approval

Federation University Australia Human Research Ethics Committee provided ethics approval for the survey and interview studies (Approval numbers B16 – 026 and B16 – 131, respectively).

Project B16 – 026 had ethics approved on 21/04/2016 and project B16 – 131 had ethics approved on 26/08/2016. Approval for both projects ceased on 05/06/2017 after the submission of final reports.

Acknowledgements

I am writing these acknowledgements towards the end of my 974th day as a PhD student, which also happens to be the 974th day doing something so insightful and intensely encapsulating. I am not going to say that this journey has been a long and arduous one, because it has not been. I have loved doing this PhD and I have several special people to thank for making that possible.

To Jill Cook, who allowed me to go “down the rabbit hole” while following closely behind to patch up any disasters, my sincerest thanks. You have been my guiding light; an inspiring mentor. You helped me progress from being a bright-eyed Biomedical Science student on work experience to a practicing physiotherapist and, finally, to completing a PhD. Your contribution to my life and career path is something I will always be grateful for. Finally, your willingness to learn with me throughout this journey will always be appreciated.

To Caroline Finch, who took a chance on me, I am indebted to you. Thank you for trusting that a humble research assistant could succeed in doing a PhD. You took a risk, and if I do say so myself, it paid off. It was your trust and the risk that you accepted that kept me going in difficult times. Finally, thank you for putting so much effort into improving my writing, your attention to detail is something to be marveled.

To Jo Kemp, who always made me feel like I knew what I was doing, thank you. Your detailed guidance when writing my successful application to the Physiotherapy Research Foundation (and the unsuccessful ones too) will never be forgotten. You were always available, even when your automatic email reply said you were away. Thanks for being there.

To Paul O’Halloran, who filled a very important skills gap in our team, thank you. Out of the hundreds (maybe that is an exaggeration) of drafts I sent you, every single one had

positive feedback that made me feel good about myself. Suddenly coming across the comment “Great paragraph, Brea” made my day. Thank you for joining me on this journey.

To Jamie Gaida, my on-call systematic review expert, thank you for supporting me when I was in need. Despite not knowing me, you willingly guided me throughout the entire process of completing two systematic reviews. I would not have been able to complete these reviews, or remain positive after several rejections of our manuscripts by publishers, without you and Nicole Freene. Your generosity and patience are valuable, and enviable, assets.

I could not have survived the ups and downs of this PhD without the support of my family. To my husband, Ben, you have been a pillar of strength. Thank you for putting your career on hold and paying the bills while I “did nothing at home” (A.K.A completed a PhD). I relied on your listening ear and critical eye. Thank you for trying to solve my data analysis problems, despite not knowing how to use SPSS, and beautifying my ugly sentences. Thank you for discouraging email checking outside of work hours and bragging about me to our friends and family. In return for all of your support, I promise not to get our mail addressed to ‘Dr and Mr Kunstler’ or ask you to tell me what my PhD topic was.

To my friends, parents, siblings, grandparents and in-laws, you have all had important parts to play over the last 3 years. Thank you for your patience, genuine interest, confused nods and unconditional support. In return, I promise that none of you have to read my thesis. Finally, I would like to thank my die-hard radio that has played background music for approximately 4,480 hours over the last 974 days. Rest well, my friend.

Funding acknowledgement

I would like to acknowledge and thank the Physiotherapy Research Foundation for awarding me a 2016 Tagged Grant (Grant ID T16-BS001) to financially support two projects included in my PhD. I would also like to acknowledge Federation University Australia and thank them for supporting me throughout my candidature by providing me with an Australian Government Research Training Program (RTP) Stipend and RTP Fee-Offset Scholarship.

List of abbreviations

BCT	Behaviour Change Technique
BCCTv1	Behaviour Change Technique Taxonomy (version 1)
DIBQ	Determinants of Implementation Behavior Questionnaire
IPA	Interpretative Phenomenological Analysis
NCD	Non-communicable disease
NTPA	Non-treatment physical activity
PA	Physical activity
PLPA	Physiotherapist-led physical activity
TDF	Theoretical Domains Framework

Section 1: Introduction

This section includes an introduction to the content covered in this thesis as well as the significance of the research and the objectives addressed.

Chapter 1: Background

The role of physiotherapists in the Australian context

Physiotherapy, or physical therapy, is a health care profession involved in the diagnosis and treatment of many different health conditions and movement disorders (Australian Physiotherapy Association, 2017b). Physiotherapists are primary care practitioners, meaning they can see patients without a referral from a medical professional. However, they also often treat patients referred to them by other medical professionals, such as general practitioners (Australian Physiotherapy Association, 2017b).

In December 2016, 28 748 physiotherapists (trained locally and internationally) were practicing in Australia; with another 1 256 physiotherapists participating in teaching or research, but not practicing clinically (Physiotherapy Board of Australia, 2016). The majority of physiotherapists were female and aged 25-29 years old (Physiotherapy Board of Australia, 2016). In 2014, 824 685 physiotherapists practiced across all OECD countries, with Finland having the largest number of physiotherapists (2.47 per 1000 people) and Australia having much less at 0.87 physiotherapists per 1000 people (Organisation for Economic Co-operation and Development, 2014). Nineteen universities provide training to students to become physiotherapists in Australia; providing programs at bachelor's, master's and doctorate levels (Australian Health Practitioner Regulation Agency, 2013).

The Australian Physiotherapy Association (APA), the primary organisation in Australia representing physiotherapists and their patients, states that the role of the physiotherapist “extends from health promotion to...occupational health” (Australian Physiotherapy Association, 2017b, paragraph 4). The role of the physiotherapist in health promotion includes promoting non-treatment physical activity (NTPA), which is physical activity (PA) for the purposes of improving and maintaining general health, rather than for

the treatment of a condition, disease or specific impairment (Alexander et al., 2012).

Physiotherapists have been encouraged to promote NTPA worldwide by The World Confederation for Physical Therapy (World Confederation for Physical Therapy, 2012) and locally through campaigns such as the Australia's Biggest Killer campaign (Australian Physiotherapy Association, 2015). Despite this, only a small amount of research exists in the area of NTPA promotion by physiotherapists (Lowe et al., 2018). The purpose of this thesis is to explore the role of the physiotherapist in health and PA promotion or, more specifically, NTPA promotion to patients with musculoskeletal conditions.

Prevalence of musculoskeletal conditions

Musculoskeletal conditions are conditions that affect muscles, bones and attachment sites (including joints) (Australian Institute of Health and Welfare, 2017a) and are often treated by physiotherapists. Musculoskeletal conditions can arise in response to acute trauma (e.g. ankle sprain) or can be chronic in nature (e.g. osteoarthritis). Examples of musculoskeletal conditions include osteoarthritis, and back and neck pain (Australian Institute of Health and Welfare, 2014).

The global years of life lost due to disability (YLDs¹) (in thousands) in 2010 for low back pain, neck pain and osteoarthritis were 83 063 (56 632–111 880), 33 640 (23 469–46 476) and 17 135 (11 884–24 256) respectively (Vos et al., 2013). These values placed low back pain, neck pain and osteoarthritis in first, fourth and eleventh place respectively as

¹ The burden of a disease demonstrates the impact the condition has on a population and can be measured as disability adjusted life years (or DALYs), where one DALY equates to one year of life lost due to premature death, prolonged illness or disability (sum of years of life lost = YLL and years of life lost due to disability = YLD) (Australian Institute of Health and Welfare, 2017b).

leading causes for YLDs globally in 2010 (Vos et al., 2013). Musculoskeletal conditions also contributed largely to the years lived with disability in 2010 in Australasia; low back pain ranked first, neck pain third and osteoarthritis fifteenth (Vos et al., 2013).

In 2011, musculoskeletal conditions led to 12.0% of the total burden of disease and injury (521 286 disability adjusted life years¹) in Australia, becoming the largest contributor to total burden (behind cancer, cardiovascular disease and mental and substance abuse disorders) for Australians (Australian Institute of Health and Welfare, 2017b). The leading causes of this burden were other musculoskeletal conditions (35.0%) (e.g. broad categories such as connective tissue disorders), back pain and associated problems (31.4%) and arthritis (including rheumatoid and osteoarthritis) (32.5%) (Australian Institute of Health and Welfare, 2017b). Total burden was greater in females (55.0%) than males (45.0%) and increased with age (Australian Institute of Health and Welfare, 2017b).

The global prevalence of musculoskeletal conditions, such as low back pain (9.2%), neck pain (4.8%), knee osteoarthritis (3.6%) and other musculoskeletal disorders (8.1%), indicates musculoskeletal conditions are some of the most prevalent diseases and injuries in the world (Vos et al., 2013). In 2011-12, 28.0% of Australians reported having a musculoskeletal condition, with arthritis being the most common, affecting 15.0% of the Australian population (Australian Institute of Health and Welfare, 2014). This increased in 2014-15; 30.0% of Australians reported having a musculoskeletal condition (16.0% had back pain and associated problems where 10.8% had osteoarthritis or rheumatoid arthritis) (Australian Institute of Health and Welfare, 2017a). Of all Australians included in the aforementioned survey, 23.0% had a chronic comorbid condition, such as cardiovascular disease, in addition to their musculoskeletal condition (Australian Institute of Health and

Welfare, 2017a). The apparent relationship between musculoskeletal conditions, poor general health and loss of life quality emphasises the need for physiotherapists to focus not only on treating the patient's musculoskeletal condition during consultations but also on the patient's general health.

The cost of musculoskeletal conditions and associated comorbidity

Musculoskeletal conditions are associated with both direct and indirect costs. Physical inactivity due to having a musculoskeletal condition carries a substantial cost to the Australian economy. The odds of a person with arthritis leaving the workforce, compared to those with no health condition, is 1.64 ($p < 0.0099$) but if they also have three or more comorbidities the odds increase dramatically to 8.68 ($p < 0.0001$) (Schofield et al., 2013). Thus, these adults are retiring earlier, paying less tax, receiving more government financial assistance and have an 81.8% lower income compared to those without a chronic condition and who are working full time (Schofield et al., 2013). In 2009 alone, this reduced income led to \$AU394 million in taxation income lost and an increase of \$AU291 million in government payments; the early retirement of 80 032 people with arthritis cost the Australian economy an additional \$9.4 billion in gross domestic product (GDP) (Schofield et al., 2013). Therefore, the enormous cost that musculoskeletal conditions have on the Australian economy means it is imperative that physiotherapists act to prevent and treat musculoskeletal conditions. One way to do this is by increasing patient PA levels (Hernández-Hernández & Díaz-González, 2016).

The benefits of physical activity

Musculoskeletal conditions

The symptoms of musculoskeletal conditions, such as osteoarthritis, can be largely prevented by having a healthy lifestyle that includes PA (Australian Institute of Health and Welfare, 2014). The more physically active a person is, the less likely they are to suffer musculoskeletal conditions (Morken et al., 2007) such as low back pain (Desouzart et al., 2016; Foley et al., 2016; Shiri & Falah-Hassani, 2017). Moderate-to-vigorous PA can also be protective against poor musculoskeletal function, helping to maintain femoral neck bone mineral density and lower limb muscle strength (Wu et al., 2016), which is important for avoiding falls-induced fracture in older adults. Increasing PA levels in the musculoskeletal population also increases self-reported health-related quality of life (McPhail, Schippers, & Marshall, 2014); a dose-response is seen in middle-aged and elderly adults (Koolhaas et al., 2017). Therefore, to decrease the burden of musculoskeletal conditions and enhance quality of life, physiotherapists need to be active promoters of PA.

Non-communicable disease

Physiotherapists promote PA to patients as a treatment for musculoskeletal conditions, such as lower limb arthritis (Hernández-Hernández et al., 2016). However, the promotion of PA should not be limited to treating the symptoms of musculoskeletal conditions, it should also be used to prevent symptoms returning and to improve the patient's general health and wellbeing (this is an example of promoting NTPA). The promotion of NTPA by physiotherapists is the focus of this thesis.

The health of people worldwide is deteriorating. Levels of overweight and obesity are increasing. In 2014, 13.0% of the world's adult population were obese and 39.0% were

overweight; these values have more than doubled since 1980 (World Health Organisation, 2017b). The prevalence of non-communicable disease (NCD) is also high. Cardiovascular disease, cancers and diabetes are responsible for 28.1 million deaths annually (World Health Organisation, 2017a).

Being physically active, even at low intensity levels and frequencies, can have beneficial effects on obesity, mortality, lipid and glucose metabolism (Füzéki et al., 2017) and reduce worker absenteeism (Kerner et al., 2017). Physical activity assists in lowering mortality and the frequency of NCDs as well as other long-term health conditions (Lear et al., 2017; Leitzmann et al., 2007; Woodcock et al., 2011). Participating in PA also has positive effects on mental health, such as reducing symptoms associated with stress (Tomruk et al., 2016) and depression (Helgadóttir et al., 2016).

The growing prevalence of overweight, obesity and NCDs worldwide and the demonstrated benefits of PA has led to popular media referring to PA as a ‘wonder drug’ and ‘miracle cure’ (Carroll, 2016). Additionally, movements such as ‘Exercise is Medicine’ encourages all healthcare practitioners worldwide to include PA promotion in every consultation (American College of Sports Medicine, 2017) as a ‘vital sign’ (Thornton et al., 2016). The declining health of adults worldwide, the demonstrated ability for PA to improve health, and the popularity of PA as a preventative measure against several NCDs means physiotherapists must make PA promotion an important part of their practice into the future.

Barriers to physical activity for those with musculoskeletal conditions

The presence of a musculoskeletal condition, and the associated symptoms (e.g. pain) and signs (e.g. poor physical condition), can further act as a barrier to being physically active (McPhail, Schippers, Marshall, et al., 2014). For example, 167 Norwegian adults with mainly

lower extremity (48.0%) and upper extremity (29.0%) long-term musculoskeletal pain self-reported participating in significantly less vigorous PA (median = 0, [95%CI 0 – 960]) than population controls (median = 240, [95%CI 0 – 1440]) (Moseng et al., 2014). Hence, experiencing symptoms of a musculoskeletal condition can be associated with low PA levels.

Patients with musculoskeletal complaints also experience barriers to PA that are not specifically related to their condition. Perceived barriers such as time restrictions, lack of motivation, lack of social support, fear, anxiety and reduced access to opportunities for exercise (such as bad weather and financial limitations) can also make participating in PA difficult for those with musculoskeletal conditions (Booth et al., 1997; McPhail, Schippers, Marshall, et al., 2014; Salmon et al., 2003; Stenberg et al., 2014). Therefore, barriers both directly and indirectly associated with the musculoskeletal condition can limit participation in PA.

People with musculoskeletal conditions can also suffer from other co-morbidities that make PA more difficult at a time when adequate PA is very important for the management of their condition. A survey of Australian adults presenting to ambulatory care clinics with musculoskeletal complaints reported that most survey respondents also had other co-morbidities (McPhail & Schippers, & Marshall, 2014). Of the 224 survey respondents, 115 (51.3%) reported having two or more co-morbidities; these co-morbidities were also perceived barriers to being physically active for 51 (23.5%) respondents (McPhail, Schippers, & Marshall, 2014). Almost half of the respondents (110, 49.1%) did not meet minimum recommended PA levels (McPhail, Schippers, & Marshall, 2014). Thus, the barriers associated with comorbidities might also restrict PA.

People suffering from musculoskeletal conditions are likely to require support from a physiotherapist to treat the condition and safely increase their PA levels. The existence of comorbidities and risk factors must be considered when deciding on the most appropriate intervention to increase PA levels safely and effectively. The skills of the physiotherapist in treating and managing musculoskeletal conditions can be extended to overcoming barriers to PA (Wittink et al., 2011) and support safe PA participation.

Physical activity levels of adults and the cost of inactivity

Adults must achieve a certain level of PA weekly to be considered physically active. Physical activity can include various activities, such as going for a casual leisure-time walk, or participating in more organized activities like a spin class at the gym (World Health Organisation, 2010). Adults should participate in 150-300 minutes of moderate intensity activity (e.g. gentle cycling or swimming) or 75-150 minutes of vigorous intensity activity (e.g. running or spin class) weekly, as well as muscle strengthening for all major muscle groups twice weekly, to meet the recommendations (Commonwealth of Australia, 2014). The recommendation for children and adolescents is even higher (Commonwealth of Australia, 2014). Many Australians and adults worldwide are inactive, or not meeting the minimum recommended PA levels to achieve and maintain the expected health benefits.

Adults worldwide report high levels of physical inactivity, or not achieving the minimum recommended PA levels. Self-report data from 2012 suggests 31.1% of adults worldwide are inactive; adults from the Americas are the most inactive (43.3%) while adults from the western Pacific region (including Australia) also score poorly (33.7%) (Hallal et al., 2012). When inactivity data was collected using objective measures, such as accelerometry, the percentage of Americans (specifically, those from the United States) not achieving the

minimum recommended PA levels was greater than 95.0% (Troiano et al., 2008). Recent local data suggests Australians are more inactive than the data published by Hallal et al. (2012) indicates. In 2014-15, 44.5% of Australian adults did not achieve the minimum recommended PA levels; they were either insufficiently active (29.7%) or inactive (14.8%) (Australian Bureau of Statistics, 2015a). The proportion of physically active Australians aged over 15 years declined significantly by 0.2% per year over 1989 to 2011 (Chau et al., 2017).

Physical inactivity is a large contributor to global mortality and morbidity. Physical inactivity is now a significant mortality risk factor, like smoking and obesity (Lee et al., 2012; World Health Organisation, 2010) and it is the fourth leading risk factor for global mortality (World Health Organisation, 2010). In 2008, 9.0% of premature death globally was due to complications of inactivity (Lee et al., 2012). These numbers were as low as 4.9% in the Netherlands where the prevalence of PA is higher (e.g. 60.7% of adults were physically active in 2014 [European Commission & World Health Organisation, 2017]) and as high as 10.1% in Australia where PA levels are lower (e.g. only 43.0% of adults met PA recommendations in 2011-12 [Australian Bureau of Statistics, 2013]) (Lee et al., 2012). Inactivity is also responsible for 6.0-10.0% of the burden of disease from health conditions like breast and colon cancer, type 2 diabetes and coronary heart disease (Lee et al., 2012). Life expectancy is likely to increase if people change from being physically inactive to physically active (Lee et al., 2012).

The direct and indirect health care costs associated with global inactivity-related deaths and disability reached \$INTL67.5 billion² in 2013 alone; in Australia, the cost of inactivity was \$AU805 million (Ding et al., 2016). The amount of money spent on health by Australian governments increases every year and remains close to the OECD average (Australian Institute of Health and Welfare, 2017c). Physical activity levels must be improved to increase life expectancy, quality of life and reduce inactivity-related health expenditure.

Sedentary behaviour and physical activity

The recent emergence of research specific to the detrimental effects that sedentary behaviour has on health necessitates an explanation of how it differs from physical inactivity. Sedentary behaviour is activity performed in a sitting or resting position that involves an energy expenditure typical of rest (≤ 1.5 metabolic equivalents [METs]) (Sedentary Behaviour Research Network, 2012). For example, sitting at a desk writing a thesis would constitute sedentary behaviour. This is different to being physically inactive, which involves not meeting the minimum recommended PA levels (e.g. doing less than 150 minutes of moderate intensity activity weekly) (Sedentary Behaviour Research Network, 2012). In 2011-12, Australians spent, on average, 39 hours per week sedentary (Australian Bureau of Statistics, 2015b). Most was accrued in leisure time (29 hours, mainly TV watching) and 10 hours was

2 An INTL dollar has the same purchasing power as the US dollar has in the United States and is used as a hypothetical currency to translate or compare costs across countries.

See World Health Organisation. (2017). *Purchasing power parity 2005*. Retrieved June 5, 2017, from <http://www.who.int/choice/costs/ppp/en/>

accrued at work (Australian Bureau of Statistics, 2015b). Sedentary time at work differed by occupation; professionals and clerical workers averaged 22-23 hours per week sitting, whereas labourers spent less than four hours (Australian Bureau of Statistics, 2015b).

Sedentary behaviour is associated with poor health. A review of forty-one studies identifying the associations between sedentary time and disease in adults reported that significant hazard ratio (HR) associations were found for all-cause mortality (HR = 1.24), incidence of cardiovascular disease (HR = 1.14), incidence of cancer (HR = 1.13), incidence of type 2 diabetes (HR = 1.91), death from cardiovascular disease (HR = 1.18) and death from cancer (HR = 1.17) (Biswas et al., 2015). A study of 200 Indian adults found those who were sedentary had greater odds of being overweight (3.0x), obese (2.4x), hypertensive (3.4x) or diabetic (7.4x) compared to physically active adults (Patil et al., 2017). The relationship between diabetes and sedentary behaviour was also identified in a study of 28 051 adults over 11 years where inactive adults with high sedentary time (sitting for ≥ 8 hours daily) had a 30.0% higher diabetes risk compared to those sitting for ≤ 4 hours daily (Asvold et al., 2017).

The detrimental effects of sedentary behaviour have been reported as being attenuated, or even eliminated, if high levels of PA are performed. Participating in moderate intensity PA can reduce mortality risk associated with sedentary behaviour, and the greater the amount of PA performed, the lower the mortality risk (Loprinzi et al., 2016). A meta-analysis including 1 005 791 adults reported that the mortality risk associated with sedentary behaviour (>8 hrs. sitting/day) was eliminated with high levels of PA (>35.5 MET hr./week or over 10.75 hours of brisk walking per week) (Ekelund et al., 2016). However, when considering TV viewing time separately to sedentary time, high levels of PA only attenuated,

rather than eliminated, mortality risk (Ekelund et al., 2016). A longitudinal analysis of 201 129 Australian adults found replacing sitting time (per hour) with low (HR = 0.86 [95%CI 0.81 – 0.90]) or moderate-to-vigorous (HR = 0.88 [95%CI 0.85 – 0.90]) intensity PA reduced mortality risk (Stamatakis et al., 2015). Therefore, either participating in large amounts of PA without changing sedentary time or replacing sedentary time with more active tasks can lower mortality risk associated with sedentary behaviour.

Being sedentary does not mean a person is also inactive (Burton et al., 2012); adults can be physically active and sedentary. Therefore, assuming that sedentary adults require help to become physically active, rather than to reduce their sedentary time, is ill-informed. Sedentary behaviour and physically active behaviours are different, and as such, require different interventions to change them. One must not assume an intervention designed to increase PA levels will reduce sedentary behaviours and vice versa (Biswas et al., 2016; Prince et al., 2014; Willoughby, 2016). This is because reducing sedentary behaviour involves stopping a behaviour, while increasing PA involves starting a behaviour (Burton et al., 2012; Michie et al., 2011). Thus, this thesis will focus specifically on the topic of behaviour change related to PA (more specifically, NTPA), and will not include sedentary behaviour change.

Non-treatment physical activity promotion in physiotherapy

*“We are not good at getting people physically active: a harsh reality that
we need to think about”*

(O’Keeffe et al., 2017, paragraph 6)

In the above quote, O’Keeffe et al. (2017) refers to the perceived inability of physiotherapists to increase patient PA levels. Non-treatment physical activity promotion interventions aim to increase patient PA levels without treating a condition, disease or specific impairment (Alexander et al., 2012). A physiotherapist can deliver this type of intervention at the same time as providing treatment specific to the condition. For example, a patient might present with elbow pain and receive the appropriate treatment for the condition causing that pain, however a component of the consultation will also be spent on promoting NTPA for general health purposes. Just over half (54.0%) of Australian physiotherapists reported that they promote NTPA to ten or more patients per month in 2010 (Shirley et al., 2010) and this increased marginally to 55.0% in 2017 (Freene et al., 2017).

Time-strapped health care professionals (e.g. general practitioners) are encouraged to refer patients to exercise professionals, such as physiotherapists and exercise physiologists, to help them to become physically active (McPhail & Schippers, 2012; Verhagen & Engbers, 2009). In the Netherlands, 68.5% of general practitioners referred patients to physiotherapists for PA counselling (Leemrijse et al., 2015) and oncology nurses were encouraged to refer patients to physiotherapists for PA advice (van Veen et al., 2017). Podiatrists and dieticians have reported that they are unsure if PA is their role and, thus, will refer patients to physiotherapists for assistance (Crisford et al., 2013; McKenna et al., 2004). The lack of

education, skills and training these other health professionals have in counselling and prescribing PA might encourage them to refer patients to physiotherapists for this purpose (Crisford et al., 2013; McKenna et al., 2004; Solmundson et al., 2016). Physiotherapists are considered suitably qualified and sufficiently skilled to improve patient PA levels (Shirley et al., 2010; Wittink et al., 2011).

Appropriate methods to improve patient PA in clinical practice have been documented. The Physical Activity on Prescription (PAP) program in Sweden (Professional Associations for Physical Activity, 2010) outlines the methods that health care professionals can use to efficaciously increase patient PA levels and health-related quality of life (Kallings et al., 2008; Lundqvist et al., 2017; Romé et al., 2014). A 4-month PAP intervention delivered in Sweden reduced the costs associated with inactivity by 22.0% (Romé et al., 2014). Thus, PA promotion by health professionals in clinical practice can be successful, however specifically designed interventions, like PAP, might be necessary.

High quality evidence suggests PA interventions delivered by a variety of health care professionals are efficacious, albeit only having small effects (Foster et al., 2005; Ma & Martin Ginis, 2018; Marley et al., 2017). Thus, better designed interventions are needed. Although guidelines exist (e.g. PAP) to guide PA promotion, it cannot be assumed that health care professionals use them. Instead, health care professionals might not promote PA at all or might use their own methods. It is unclear what methods physiotherapists currently use to promote NTPA. It is also unclear how often physiotherapists promote NTPA and if their promotion efforts are efficacious.

Ways to change behaviour

The promotion of NTPA involves changing a patient's behaviour from being physically inactive to being physically active, or at least increasing their activity levels. Compared to usual care and interventions not using theory, theory-based PA promotion interventions can increase the amount of PA performed by people with disabilities (Ma et al., 2018), the amount of walking performed after stroke (Stretton et al., 2017) and the overall amount of PA performed by 10.0-15.0% (The Swedish Council on Technology Assessment in Health Care, 2007). There are several theories (e.g. social cognitive theory, theory of planned behaviour and the health belief model etc. [Martin et al., 2010]) and approaches (e.g. health action process approach [Schwarzer, 2008]) to changing behaviour. This section will introduce three behaviour change methods that have received attention in physiotherapy and PA research in recent years.

Motivational interviewing

Motivational interviewing is a behaviour change method used by physiotherapists (Holden et al., 2015; McGrane et al., 2014) and other health care professionals (Greaves et al., 2011) to change behaviour. Motivational interviewing uses behaviour change techniques (BCTs) delivered in a specific way, or style, to develop appropriate rapport and context for effective behaviour change (McGrane et al., 2014). Motivational interviewing increases motivation for behaviour change by encouraging the patient to talk about the behaviour change and discuss and overcome their concerns about the change with their counsellor (McGrane et al., 2014).

Despite motivational interviewing interventions increasing PA levels small amounts (standardised mean difference = 0.19 [95%CI 0.06 – 0.32], $p = 0.004$) in adults with chronic health conditions compared to control conditions (O'Halloran et al., 2014), there is little evidence to suggest physiotherapist-led motivational interviewing interventions (Diamantoglou, 2014) and motivational interviewing interventions targeted towards non-clinical populations in primary care (Morton et al., 2015) can also achieve positive outcomes. One recent study reported an intervention delivered by physiotherapists that was based on motivational interviewing and the transtheoretical model of behaviour change increased PA levels of patients with chronic low back pain a small amount (between-group difference = 0.7 [95%CI 0.07 – 1.30], $p = 0.02$ favouring the intervention group at 12-month follow-up) (Ben-Ami et al., 2017). The use of motivational interviewing for PA promotion in primary care physiotherapy requires additional research to establish its efficacy.

Health coaching

Health coaching is a counselling method that incorporates motivational interviewing, self-efficacy and the transtheoretical model of behaviour change into a single method and has been used in behaviour change interventions specific to chronic disease management and prevention (Dufour et al., 2014; Huffman, 2007). A recent systematic review reported that health coaching had a small but significant effect on the PA levels of adults aged 60 years and older (Oliveira et al., 2017). Another systematic review could not determine the efficacy of health coaching interventions for patients with low back pain returning to usual activities due to the variability in intervention descriptions and the low quality of identified studies (Holden et al., 2014). The variability in intervention descriptions might limit the translation of

evidence into practice (Holden et al., 2014). Therefore, it is necessary to improve intervention descriptions in future studies.

Cognitive behavioural therapy

Cognitive behavioural therapy is another method that physiotherapists are encouraged to use to change behaviour (Herning et al., 2005; McGrane et al., 2014). Cognitive behavioural therapy aims to change behaviour by identifying and modifying maladaptive emotions and thought patterns (McGrane et al., 2014). Physiotherapists recognise cognitive behavioural therapy as a behaviour change tool and it involves using techniques physiotherapists are familiar with, like goal setting (Holden et al., 2015). However, techniques physiotherapists are less familiar with, like cognitive rehearsal, are also important components of cognitive behavioural therapy (Holden et al., 2015). Therefore, cognitive behavioural therapy might be a useful method for physiotherapists to use to promote PA. However, specific attention must be paid to ensuring the techniques that physiotherapists are not familiar with are used correctly.

Taking a different approach to NTPA promotion: Behaviour change techniques and their role in changing behaviour

A narrative analysis of seven studies concluded that physiotherapists can effectively change lifestyle behaviours (e.g. PA and nutrition) in the short term (Frerichs et al., 2012). Despite physiotherapists being perceived as ideally positioned to changing PA behaviours, promoting PA in the clinical setting and implementing behaviour change interventions can be difficult. Even though Australian physiotherapists feel confident promoting PA (Freene et al., 2017), current research suggests physiotherapists do not feel confident using psychology-

based behaviour change interventions that are often included in PA promotion interventions (Alexanders et al., 2015). It has been suggested that teaching counselling for health behaviour change as a clinical competency should occur in physiotherapy degrees (Dean et al., 2014). Taking this approach to higher education might fill current knowledge gaps and support the development of physiotherapists who face the challenge of increasing rates of inactivity and NCDs.

Health coaching, cognitive behavioural therapy and motivational interviewing interventions are often not well described in the literature, limiting their replication in clinical practice. Poor reporting, along with the perceived complexity of these behaviour change methods, suggests these psychology-based interventions might not be appropriate for the physiotherapy setting in their current form. Less than half of Australian physiotherapists are familiar with motivational interviewing (45.9%) and the majority only sometimes use intervention packages, like cognitive behavioural therapy and motivational interviewing (Holden et al., 2015). Therefore, learning about the individual BCTs that form the active components of these packages and how they can be used to change behaviour might be more useful to Australian physiotherapists wanting to promote NTPA.

Behaviour change techniques

A BCT is an observable, irreducible and replicable procedure used as an active ingredient in behaviour change interventions (Michie & Johnston, 2013). In other words, it is a replicable technique that can be utilised as part of a behaviour change intervention with the aim to produce behaviour change. An example of a BCT is *problem solving*, where the counsellor (or, for the purposes of this thesis, the physiotherapist) encourages the patient to

consider the barriers to changing the behaviour and discusses ways to successfully overcome those barriers with them (Michie, Richardson, et al., 2013).

The Behaviour Change Technique Taxonomy version 1.

The Behaviour Change Technique Taxonomy version 1 (BCTTv1) is a comprehensive list of 93 BCTs that can be used when designing and delivering behaviour change interventions (Michie, Richardson, et al., 2013). It builds on the Coventry, Aberdeen & London – Refined (CALO-RE) taxonomy of BCTs that has been used to design interventions aimed at improving PA and diet behaviours (Michie et al., 2011). The BCTTv1 aims to make reporting, designing and delivering behaviour change interventions easier by designing individual, replicable techniques that can be understood and used by intervention designers and implementers (Michie, Richardson, et al., 2013). The BCTTv1 was designed using a consensus process, where international experts reflected on various behaviour change theories to identify 93 BCTs that can accurately describe components of behaviour change interventions (Michie, Richardson, et al., 2013). The consensus process included reliability testing for 26 of the 93 BCTs, where 23 BCTs received a kappa of 0.6 or more (Michie, Richardson, et al., 2013).

The BCTTv1 can be used to identify the BCTs used in existing behaviour change interventions and to design new behaviour change interventions. The taxonomy is not specific to any one behaviour; it can be used to design interventions intended to change any behaviour (e.g. PA, eating vegetables, stopping smoking or gambling etc.). Although there are various behavioural theories that can be used to identify how physiotherapists behave in relation to NTPA promotion, using a taxonomy that reflects on several theories in its design

and provides a replicable way to present information allows for a more comprehensive examination of physiotherapist behaviour. Thus, the BCTTv1 taxonomy will be used extensively throughout this thesis to outline the techniques physiotherapists use to promote NTPA.

Behaviour change techniques and the relationship with models of behaviour change

Behaviour change techniques are used as individual components of behaviour change interventions, and behaviour change interventions can be based on several different models of behaviour change (e.g. motivational interviewing). The BCTs that make up motivational interviewing interventions have been identified. Hardcastle et al. (2017) reported that 16 of the BCTs used in motivational interviewing interventions were from the BCTTv1, while an additional 22 techniques were reported as not belonging to the BCTTv1. Identifying the individual components of behaviour change interventions might make it easier for physiotherapists to understand the content of the intervention and, thus, how to deliver it.

Physical activity promotion studies in physiotherapy have recently started reporting the BCTs used as part of interventions. A randomised controlled trial by O'Dwyer et al. (2017) used a behaviour change intervention to increase PA levels of patients with ankylosing spondylitis. Twenty-nine BCTs were used by the physiotherapist delivering the intervention (e.g. *goal setting* and *problem solving*) and were clearly outlined within the publication. The clear reporting of the techniques used to change the PA behaviours of the patients within this study is likely to make it easier for physiotherapists to replicate the behaviour change intervention in their own practice.

Behaviour change techniques and the Behaviour Change Wheel: designing new non-treatment physical activity interventions

Behaviour change interventions are often designed using well established behaviour change models and theories (e.g. cognitive behavioural therapy, theory of planned behaviour). A new method, called The Behaviour Change Wheel (BCW), was published in 2011 to make intervention design easier for clinicians and policy makers; those who are not trained in psychology (Michie, van Stralen, et al., 2011). This method aims to incorporate many different behaviour change frameworks into one comprehensive model, allowing the design of interventions that are not limited to the constructs of one theory or model (e.g. the theory of planned behaviour) but instead it uses principles from several theories and models (Michie, Atkins, et al., 2014; Michie, van Stralen, et al., 2011). The BCW gives clinicians the ability to identify the most appropriate BCTs to plan a suitable behaviour change intervention to change a patient's behaviour.

The aim of this thesis is not to design a new NTPA intervention. Instead, this thesis will report the BCTs physiotherapists currently use to support the design of new physiotherapist-led NTPA interventions. Thus, NTPA intervention design and the use of the BCW will not be discussed in detail in this thesis. However, a brief example of how to apply the BCW to designing an intervention to increase NTPA promotion by physiotherapists will be provided in Section 5.

The Determinants of Implementation Behavior Survey (DIBQ)

A determinant of behaviour is anything that influences or affects behaviour ("Behavior determinant," 2013). For example, there will be factors (e.g. beliefs about

capabilities) that determine if a physiotherapist will promote NTPA (promoting NTPA is the behaviour performed by the physiotherapist). It is important to identify these factors to explain why physiotherapists do, or do not, promote NTPA.

The factors associated with NTPA promotion by physiotherapists can be identified using observational tools (e.g. survey). The Determinants of Implementation Behavior Questionnaire (DIBQ) is an example of a valid and reliable questionnaire that has been used to identify the determinants of physiotherapists implementing PA interventions as part of experimental studies (Huijg, Gebhardt, et al., 2014). This tool was designed to measure a similar behaviour to NTPA promotion. The DIBQ measures factors associated with whether or not a physiotherapist would promote PA to their patients following guidelines. Thus, minor modifications will be made to the DIBQ to measure the factors associated with whether or not a physiotherapist will promote NTPA to their patients.

The DIBQ includes questions based on the Theoretical Domains Framework (TDF). The TDF has 12 different behavioural domains (e.g. Beliefs about Capabilities) that identify the reasons why an intervention might not be delivered and, hence, expose a potential determinant of intervention implementation (Michie et al., 2005). Therefore, the DIBQ uses the TDF to identify the factors that can influence behaviour. The DIBQ included six more domains to make the survey clinically useful, making an 18-domain questionnaire. The TDF will be used in this thesis to report the factors that influence NTPA promotion by physiotherapists.

The domains of the TDF can provide useful information when developing strategies to improve intervention delivery in clinical practice (Huijg, Dusseldorp, et al., 2014). The TDF forms an important part of the BCW briefly mentioned earlier, which can be used to

design a determinants-specific intervention to improve intervention delivery (e.g. an intervention to improve the physiotherapist's belief of their capability to promote NTPA). As previously mentioned, the purpose of this thesis is to inform intervention design and not to design an intervention, thus the TDF and BCW will not be discussed in detail. Instead, the TDF will be used to simply categorise the factors that influence NTPA promotion by physiotherapists.

The factors associated with physiotherapists' decision to deliver an experimental PA intervention with high fidelity have been established in 268 Dutch physiotherapists using the DIBQ (Huijg, Dusseldorp, et al., 2014). This cross-sectional study found that physiotherapists can deliver PA interventions with high fidelity (completeness and quality of delivery) and that the most important and significant factors associated with delivering the intervention completely and with good quality were Beliefs about Capabilities, Behavioural Regulation, Knowledge and Nature of the Behaviour (Huijg, Dusseldorp, et al., 2014). The physiotherapist's beliefs about their capability to deliver a PA intervention was the factor most associated with intervention fidelity. In other words, if a physiotherapist believed they were capable of delivering the intervention, they were more likely to do so with high fidelity.

Another cross-sectional study conducted in the Netherlands identified the predictors of physiotherapists and nurses promoting PA to patients (Sassen et al., 2011). The authors found that the behaviour of promoting PA was significantly correlated with barriers ($\beta = -0.239$, $p < 0.001$), intention ($\beta = 0.311$, $p < 0.001$) and habit ($\beta = 0.163$, $p < 0.01$) (Sassen et al., 2011). Therefore, having the intention to promote PA and being in the habit of doing so is a likely characteristic of health care professionals who promote PA; these health care professionals are also likely to face fewer barriers to promoting PA.

These previous studies show that the ability of a physiotherapist to deliver a PA intervention can be influenced by many factors. These factors need to be appropriately addressed and managed before asking a physiotherapist to deliver an intervention with high fidelity and, in turn, to ensure implementation success. It is important to identify the factors influencing NTPA promotion by Australian physiotherapists given the increased pressure for Australian physiotherapists to successfully promote NTPA.

Chapter 2: Objectives and Significance

The problem

- Physiotherapists treat patients with musculoskeletal conditions attending ambulatory (e.g. private practice and outpatient) clinics who are often inactive and have several NCD-related co-morbidities;
- Physiotherapists are encouraged to promote NTPA to patients to combat the increase in NCDs and their associated mortality risks;
- Existing research on physiotherapist-led physical activity (PLPA) interventions does not clearly and consistently differentiate between PA used to treat a condition and NTPA used to improve general health. This exposes an important research area;
- It is unclear how physiotherapists can efficaciously promote NTPA in private practice and outpatient physiotherapy clinics to patients with musculoskeletal conditions;
- The BCTs physiotherapists use to promote NTPA to patients with musculoskeletal conditions in private practice and outpatient settings are unclear; and
- The factors influencing NTPA promotion by physiotherapists treating patients with musculoskeletal conditions in private practice and outpatient settings are unclear.

It is important to solve the above problems to facilitate the design of NTPA promotion interventions that are compatible with everyday clinical practice and deliverable by physiotherapists trained in Australia.

Objectives

The main objectives of this PhD are to establish the: (i) efficacy of physiotherapist-led PA interventions; (ii) factors that influence NTPA promotion; and (iii) behaviour change techniques physiotherapists use to promote NTPA to patients with musculoskeletal conditions in private practice and outpatient settings (Table 1. 1). Findings from this PhD will provide information to support the design of new NTPA promotion interventions that consider the factors that influence Australian physiotherapists' choice to promote NTPA and include the BCTs physiotherapists currently use clinically.

Table 1. 1 The objectives for this PhD and the studies that address them

Objective number	Objective	Research question/s	Chapter	Title	Published or submitted manuscript ³
i	Establish the efficacy of PLPA interventions	Are PLPA interventions efficacious at increasing patient PA levels for those with, or at risk of, non-communicable disease?	3	Physiotherapist-led physical activity interventions are efficacious at increasing physical activity levels: A systematic review and meta-analysis	Published in the Clinical Journal of Sport Medicine
iii	Identify the BCTs physiotherapists use to promote PA	What BCTs do physiotherapists use in clinical practice? Do physiotherapists use different BCTs in experimental PLPA interventions?	4	Physiotherapists use a small number of behaviour change techniques when promoting physical activity: A systematic review comparing experimental and observational studies	Published in the Journal of Science and Medicine in Sport
ii	Establish the factors influencing NTPA promotion by Australian physiotherapists	What factors are associated with physiotherapists' decisions to promote NTPA to patients with musculoskeletal conditions?	6	The self-reported factors that influence Australian physiotherapists' choice to promote non-treatment physical activity to patients with musculoskeletal conditions	Submitted to the Journal of Science and Medicine in Sport

³ Note: All manuscripts in this thesis have been prepared for submission to peer-reviewed journals. Therefore, please expect repetition of text and concepts throughout.

iii	Identify the BCTs Australian physiotherapists use to promote NTPA	What BCTs do Australian physiotherapists use when promoting NTPA to patients with musculoskeletal conditions? What BCTs do Australian physiotherapists use to encourage patients with musculoskeletal conditions to adhere to rehabilitation exercises?	7	The behaviour change techniques used by Australian physiotherapists to promote non-treatment physical activity to patients with musculoskeletal conditions	Published (in-press) in the Journal of Science and Medicine in Sport
ii	Explore the experiences of Australian physiotherapists when promoting NTPA to patients with musculoskeletal conditions	What are the experiences of Australian physiotherapists promoting NTPA to patients with musculoskeletal conditions?	9	<i>“...like you’re pushing the snowball back up hill”</i> - The experiences of Australian physiotherapists promoting non-treatment physical activity: a qualitative study	Published open access in AIMS Medical Science (Special edition: Sedentary behaviour and musculoskeletal injury)

Significance of the research and contribution to existing literature

Australians are dying from the consequences of being physically inactive. Physical inactivity is responsible for more premature deaths in Australia (10.1%) than worldwide (9.0%) (Lee et al., 2012) and contributes to 6.0-10.0% of the global burden of disease from chronic health conditions (Lee et al., 2012). The direct health cost of physical inactivity to the Australian economy was \$AU805 million in 2013 alone (Ding et al., 2016). Those who have musculoskeletal conditions can have great difficulty increasing PA levels due to symptoms associated with their condition and are often classified as inactive (McPhail, Schippers, & Marshall, 2014; McPhail, Schippers, Marshall, et al., 2014), putting them at increased risk of being included in the 10.1% statistic. Yet physiotherapists rarely promote PA to their patients (Barrett et al., 2013); with only 55.0% of Australian physiotherapists promoting NTPA to ten or more patients per month (Freene et al., 2017). It is essential to identify why physiotherapists do not promote NTPA more often.

It is important to establish if PLPA interventions are efficacious to decide if these interventions need to be improved. It is also important to identify the BCTs that are currently used by physiotherapists to inform the design of future PLPA interventions. The first part of this thesis comprises two systematic reviews. The systematic reviews demonstrated the efficacy of PLPA interventions, as well as the techniques (BCTs) physiotherapists used when promoting PA. These reviews focused on PA promotion in general, as studies in this area do not consistently report if their intervention involves PA promotion or, more specifically, NTPA promotion.

The second part of this thesis comprises a national survey of 486 physiotherapists. Successful promotion of NTPA to patients with musculoskeletal conditions requires

physiotherapists to effectively support their patients to change their behaviour.

Physiotherapists must recognise that NTPA promotion and adoption requires behaviour change and use BCTs to support behaviour change (Dean, 2009). The BCTs physiotherapists currently use must be identified before designing interventions testing the efficacy of BCTs for promoting NTPA in physiotherapy practice, ensuring future interventions reflect clinical practice. The BCTs physiotherapists use to promote NTPA were identified using the national survey.

A reason for the gaps between evidence and clinical practice is the lack of research into the strategies required for successful implementation (Handley et al., 2016). Therefore, discovering the factors influencing physiotherapists' decision to promote NTPA or not is integral to identifying the strategies needed to support physiotherapists to successfully deliver NTPA interventions. The factors associated with physiotherapists' choice to promote NTPA were identified in the national survey using questions based on the DIBQ (Huijg, Gebhardt, et al., 2014) and were explored in greater detail in in-depth qualitative interviews conducted with 10 physiotherapists from across Australia.

This research is important because it will inform the design of better tailored NTPA promotion interventions and education programs. This will ultimately improve the ability of Australian physiotherapists to promote NTPA so they can be powerful, active partners in the vital task of combating chronic disease.

Section 2: Review of physical activity promotion by physiotherapists

This section comprises two systematic reviews reporting the efficacy of PLPA interventions and the BCTs physiotherapists use when promoting PA.

The background to this thesis outlined several unsolved problems. One of these problems was that it was unclear if physiotherapists can efficaciously increase patient PA levels. Additionally, the techniques physiotherapists use to promote PA was also unclear. Specifically, the BCTs physiotherapists use to change patient PA behaviour were unclear. Thus, two systematic reviews were completed to answer these questions.

The literature in the area of NTPA promotion by physiotherapists, and any health professional, is scarce. This is because PA is often considered more generally in the physiotherapy literature by including both treatment-focused PA and NTPA together. Thus, to ensure a sufficient search yield to conduct the reviews, the scope of the following reviews was expanded to include papers specific to PA and NTPA.

This section includes two published papers. The review in Chapter 3 was published in the Clinical Journal of Sport Medicine and the review in Chapter 4 was published in the Journal of Science and Medicine in Sport. A license was not required from either publisher to include the final papers in this thesis. Both publications are incorporated into this thesis as they are presented in the journal and include reference lists separate to the reference list at the end of the thesis. Therefore, replication of content will be found.

The following sections comprises two chapters:

Chapter 3: Physiotherapist-led physical activity interventions are efficacious at increasing physical activity levels: a systematic review and meta-analysis

Chapter 4: Physiotherapists use a small number of behaviour change techniques when promoting physical activity: A systematic review comparing experimental and observational studies

Chapter 3: Physiotherapist-led physical activity interventions are
efficacious at increasing physical activity levels: A systematic review
and meta-analysis (Published manuscript)

Chapter 3 has been removed at the author's request due to
copyright restrictions. The full text published article
referred to in chapter 3 can be found at:
<http://dx.doi.org/10.1097/JSM.0000000000000447>

Chapter 4: Physiotherapists use a small number of behaviour change techniques when promoting physical activity: A systematic review comparing experimental and observational studies (Published manuscript)

Chapter 4 has been removed at the author's request due to copyright restrictions. The full text published article referred to in chapter 4 can be found at:
<http://dx.doi.org/10.1016/j.jsams.2017.10.027>

Chapter 5: Survey methods

Objectives and research questions

The methods used to design, pilot and run the national survey are described in this chapter. Two different surveys were delivered together in one tool to address objectives (ii) and (iii) (Table 1. 1).

Research question one (RQ1): What factors are associated with physiotherapists' decisions to promote NTPA to patients with musculoskeletal conditions?

Research question two (RQ2): What BCTs do Australian physiotherapists use when encouraging adherence to rehabilitation exercises and promoting NTPA to patients with musculoskeletal conditions?

Sampling, recruitment and incentives

Physiotherapists were included if they were registered to practice in Australia, treated patients with musculoskeletal conditions weekly and worked in private practice or outpatient settings. Physiotherapists were excluded if they did not work primarily in a private practice or outpatient setting (e.g. they worked in inpatient services) and did not mostly treat patients with musculoskeletal conditions. It was important that the physiotherapist primarily treated patients presenting with musculoskeletal conditions so this patient presentation would be foremost in the physiotherapists' mind while completing the survey.

It was important to narrow the clinical settings and approach (e.g. individual consultation compared to group consultation) that physiotherapists used because intervention efficacy can differ based on the setting it is delivered in and the approach used (Downs et al., 2017; King et al., 2015; Murray et al., 2017). Ambulatory settings (e.g. private practice and outpatient) and adult patients with musculoskeletal conditions were chosen because it has

been previously reported that Australian adults attending ambulatory physiotherapy settings for treatment for a musculoskeletal condition are largely inactive (49.1%) and overweight (23.2%) or obese (42%) (McPhail, Schippers, & Marshall, 2014). Thus, physiotherapists in these settings have several opportunities to promote NTPA.

It was unclear how many physiotherapists met the inclusion criteria prior to the study commencing as the number of physiotherapists mainly treating musculoskeletal conditions is not reported. However, the total number of Australian physiotherapists practicing in all settings and disciplines is reported annually by the Physiotherapy Board of Australia. There were 26 901 practicing physiotherapists in Australia as of December 2015 (Physiotherapy Board of Australia, 2015). This number was used to conduct a sample size calculation using a population of 26 901, estimated true proportion of 0.5, confidence level of 0.95 and a precision of 0.05 to calculate an a priori sample size of 380.

Physiotherapists were recruited from across Australia using social media (Twitter and Facebook) and professional association email newsletters (Australian Physiotherapy Association and Sports Medicine Australia). Cabrini Health and Federation University Australia included advertisements on their social media pages and in newsletters. These approaches directed physiotherapists to an internet address to access the online survey. This approach saw 29 responses received over 2 months. After 2 months, the ‘find-a-physio’ search tool on the Australian Physiotherapy Association website (Australian Physiotherapy Association, 2017a) was used to begin cold-calling over 100 physiotherapy clinics to ask them if they would send the link to the survey to their physiotherapy staff. Although this provided another boost to completed surveys, still only 50 responses had been received by January, 2017.

All respondents were offered a chance to win one of ten \$200 gift cards when the survey was first opened (July 9, 2016) to incentivise participation. Further funding (Physiotherapy Research Foundation (PRF) Tagged Grant) provided the funds to change the incentive to an option of going into the draw to win a \$200 gift card or receiving a \$20 gift card. The additional incentive contributed to gaining 486 responses, 216 fully completed, by the time the study ceased in July, 2017.

Survey design

Surveys have been reported as being easier than qualitative methods (e.g. interviews) at identifying factors that influence behaviour (Phillips et al., 2015). Thus, a survey was chosen for this study. An online survey instead of a paper survey was chosen because an online version of the survey tool would be faster to distribute and complete. Using online survey designs could lead to low response rates as the link to the survey can be hidden within an email (Doehring et al., 2016). A paper survey, handed to a person, with a brief conversation could encourage survey completion. However, when comparing the two methods, it has been reported that internet-based and paper-and-pencil collection methods are equivalent in the data they collect (Weigold et al., 2013). Although having a relationship with each respondent might be useful to increase responses, it was offset by the time loss of personally distributing surveys and having to manually enter results into data management software.

In 2014-15, most Australian households who accessed the internet used a computer or laptop (94.0%), followed by a mobile or smart phone (86.0%) (Australian Bureau of Statistics, 2016). Thus, it was important that the tool could be completed using computers

and smart devices. The survey tool was designed using online survey software (Qualtrics, Provo, UT), which is compatible with computer and smart devices. The user interface included branding specific to the organisations involved in the study (Federation University Australia, Australian Centre for Research into Injury in Sport and its Prevention [ACRISP] and La Trobe University).

The final survey tool had three sections. The demographics section included 13 questions used to identify the characteristics of the physiotherapists participating in the study. This section was followed by 64 questions used to identify the factors influencing NTPA promotion (RQ1) (Appendix 3. 1), which was then followed by 100 questions used to identify the BCTs physiotherapists used to promote NTPA and encourage adherence to rehabilitation exercises (RQ2) (Appendix 3. 2)

Demographics section

Including demographics questions at the end of a survey might lead to respondents who do not complete the survey in full to only partially provide their demographic data (personal communication with Jason Holden, [Holden et al., 2015]). Therefore, the demographics section formed the first part of the survey tool.

A description of NTPA was provided at the beginning of the survey. The phrase ‘non-treatment physical activity’ is not a common term (Alexander et al., 2012). Other authors have used the phrase ‘health-enhancing physical activity’ (Wendel-Vos et al., 2003), ‘PA to improve general health’ or described PA as a method to reduce risk of developing lifestyle diseases (Dean, 2009). Non-treatment physical activity is a term that encouraged the physiotherapist to consider PA to improve general health as separate to PA used to treat a

musculoskeletal condition (enhance musculoskeletal health). Physical activity used to treat a condition could still be considered health enhancing as it can be used by physiotherapists to improve health by removing pain or other presenting signs and symptoms (Khan & Scott, 2009). However, health-enhancing in the context of this thesis refers to general health.

Rationale and justification for included questions.

Inclusion criteria.

Initial questions were used to establish if the physiotherapist met the inclusion criteria for the survey. They asked for the setting the physiotherapist worked in, if they were registered to practice in Australia, the number of patients they see each week and the proportion of their patients that had musculoskeletal complaints. If the physiotherapist did not meet the criteria, they received a message thanking them for their time, and the survey did not proceed any further. The questions that followed asked for the physiotherapists' age, gender, PA level, length of consultations, additional qualifications/education (three options: exercise science, psychology, health promotion), clinical experience and how often they promoted NTPA to their patients.

Physiotherapist PA level.

Physiotherapists who have the knowledge to implement PA interventions and are physically active themselves are considered well placed to promote PA (Huijg, Dusseldorp, et al., 2014; Huijg et al., 2015; Huijg, van der Zouwe, et al., 2014). A recent cross-sectional study identified that 80.8% of physiotherapists and physiotherapy students participate in regular exercise and 91.3% of the 672 respondents believed they should be a physically

active role-model (Black et al., 2012), suggesting the profession are physically active and value PA. However, a recent observational study in Rwanda found no significant association between a physiotherapist's PA levels and PA promoting practices (Frantz & Ngambare, 2013). Therefore, it was important to include a question about the respondent's PA level to establish if the frequency of NTPA promotion by Australian physiotherapists is related to their PA levels.

The single-item PA measure (print form) is considered a valid tool to determine if respondents are meeting recommended PA levels (Milton et al., 2013) and was used to measure physiotherapists' PA level. This measure has a moderate correlation with accelerometry (gold standard) for the number of days participating in more than thirty minutes of MVPA ($r=0.46$, $p<0.001$) (Milton et al., 2013). Using this measure in an online format meant maintaining the validity, sensitivity and specificity of the print measure was not possible. Furthermore, recall bias was a consideration when using this question, as the inability to remember PA events could have influenced the accuracy of the collected data.

Non-treatment physical activity promotion frequency.

Just over half of Australian physiotherapists have been reported to promote NTPA to ten or more patients per month (Freene et al., 2017; Shirley et al., 2010). Thus, it was necessary to determine the number of physiotherapists promoting NTPA in this survey to identify the factors associated with this low NTPA promotion frequency. The wording for the question was adapted from two resources (Holden et al., 2015; Shirley et al., 2010) and allowed for the identification of physiotherapists who promote NTPA.

Time as a barrier to NTPA promotion.

A commonly reported barrier to promoting PA to patients is lack of consultation time (Abaraogu et al., 2015; Aweto et al., 2013; Barrett et al., 2013; Holden et al., 2015; Johansson et al., 2010; Sheedy et al., 2000; Shirley et al., 2010). Thus, physiotherapists were asked how much time they spent with patients in the initial, second and final consultation to establish if consultation time was associated with NTPA promotion.

Training.

Lack of knowledge and training in using psychological techniques can act as a barrier for physiotherapists using these techniques (Driver et al., 2017). It has been identified that training in psychological techniques does not result in greater use of the techniques clinically (Alexanders et al., 2015; Holden et al., 2015). Physiotherapists were asked if they had additional qualifications in exercise science, psychology or health promotion beyond those obtained during their physiotherapy degree. This was to establish if additional education in techniques that can be used to promote NTPA, or change PA behaviours, was associated with greater NTPA promotion.

Personal factors.

Finally, the age, gender and clinical experience of the physiotherapist were collected to determine if any of these factors influenced NTPA promotion. A potential relationship between gender and NTPA promotion frequency might exist, hence gender was addressed. Physical activity promotion has recently gained more attention in physiotherapy education programs (Gates, 2016). Therefore, those who are younger or have less experience might

have had more exposure to NTPA promotion education. Thus, it was also important to assess if age and clinical experience was associated with NTPA promotion.

Influencing factors section

This section formed the second part of the survey and was based on the DIBQ outlined in Section 1. The DIBQ was used to develop an 18-domain section for this survey that was relevant to the Australian physiotherapy context and measured the factors influencing NTPA promotion using a 5-point Likert scale (strongly disagree to strongly agree). The TDF domains and question examples from each domain appear in Appendix 3. 3.

The survey tool in this thesis was not delivered as part of a longitudinal study. Therefore, the survey was not used to identify predictors or determinants of NTPA promotion like the DIBQ, but instead it was used to identify the factors associated with NTPA promotion cross-sectionally. Thus, the phrase ‘influencing factors’, rather than ‘determinants’ or ‘predictors’, is used to describe the results from this section of the survey.

Rationale and justification for included questions.

The DIBQ was specifically designed to identify the determinants of physiotherapists promoting PA when following the guidelines provided to them (Huijg, Gebhardt, et al., 2014). Therefore, several questions from the original questionnaire included the phrase ‘following the guidelines’ (*Figure 3. 1.*) (Huijg, Gebhardt, et al., 2014). The factors influencing the use of specific guidelines to promote NTPA was not the objective of the survey in this thesis. Instead, the objective was to identify the factors influencing

physiotherapists' decision to promote NTPA in any way, not necessarily in a way outlined by any guidelines. Thus, this phrase was removed from all questions.

The wording of the original questions was further changed to ensure they reflected the Australian clinical context. Conscious effort was made to ensure enough similarity between questions remained so they still reflected each TDF domain. The wording of some questions was modified to allow all questions to use the same Likert scale, thus reducing time needed to read the questions (*Figure 3. 1.*). Some questions were also changed to be negatively worded to enhance response trustworthiness (*Figure 3. 1.*).

<p><u>DIBQ original:</u> For me, performing the intake is (very difficult – very easy)</p> <p><u>Modified version:</u> For me, performing the initial assessment of physical activity levels is easy (strongly disagree – strongly agree)</p> <p><u>DIBQ original:</u> As a physiotherapist, it is my job to deliver [PA intervention] following the guidelines.</p> <p><u>Modified version:</u> When I consider using a non-treatment physical activity intervention in my practice: As a physiotherapist, it is NOT my job to deliver this intervention.</p>
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Figure 3. 1 Examples of question modifications made to survey questions appearing in the influencing factors section of the survey tool

All questions were included in a matrix-style layout to reduce the number of leading questions required and, thus, the amount of reading and page changes needed (*Figure 3. 2.*). Rows that repeated the Likert scale were used between each group of 5-10 questions to ensure the scale was always visible. The Likert scale and matrix-style layout was chosen despite the risk for acquisition bias, where respondents are more likely to agree with assertions, like choosing 'agree' on a Likert scale, to be agreeable and socially acceptable

(Vannette & Krosnick, 2014). It was considered more important to reduce the amount of time spent on the survey and to make it easier and more enjoyable to complete, potentially reducing rushing and non-differentiation (Barge & Gehlbach, 2012) and encouraging more physiotherapists to complete it.



When I consider using a non-treatment physical activity intervention in my practice, my workplace provides:

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Not applicable
All necessary resources to deliver this intervention.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Training to deliver this intervention.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sufficient intervention materials to support implementation and delivery.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Assistance with delivering this intervention.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Support meetings where I can get my questions answered about delivering this intervention.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 3. 2 An example of the matrix-style layout used to present questions in the influencing factors section of the survey tool

One group of questions included in the DIBQ was specific to the implementing organisation, or the organisation conducting the PA promotion research project (e.g. Does the [Implementing organisation] provide professionals with training to deliver the PA intervention?). An example of an implementing organisation might be a university research group. This group of questions formed the ‘Innovation Strategy’ domain. As this survey was

not focussed on obtaining information specific to implementing an intervention as part of a research project, the questions associated with this domain could have been removed.

However, they were changed from addressing the implementing organisation to addressing the workplace, allowing information to be collected that was specific to the physiotherapists' workplace and how the workplace influenced their decision to promote NTPA.

BCTs section

The objective of this section of the survey was to establish if physiotherapists used 50 different BCTs, as defined in the BCTTv1 (Michie, Richardson, et al., 2013), for promoting NTPA and encouraging adherence to rehabilitation exercises (see Appendix 3.4 for BCT definitions). Including questions about the BCTs used to encourage adherence to rehabilitation exercises was necessary to establish if physiotherapists use different BCTs for different behaviours. This was important as the BCTs identified in the systematic review (Chapter 4) were different to those used when prescribing rehabilitation exercises (Emilson et al., 2016).

A questionnaire was designed in 2014 to examine the BCTs used by physiotherapists when using cognitive behavioural therapy to treat clients with chronic low back pain (Harman et al., 2014). The authors used database searching and a BCT taxonomy to design their questionnaire and stated the need to discover additional techniques used by physiotherapists beyond those discoverable using their questionnaire (Harman et al., 2014). No other questionnaires or survey tools measuring BCT use using the BCTTv1 in health care professionals were found.

As outlined in Section 1, the BCTTv1 includes 93 BCTs that can be used in behaviour change interventions. The 50 BCTs chosen for the survey were chosen from the BCTs identified as used by physiotherapists in the systematic review in Chapter 4 and from literature outlining the BCTs used by health care professionals when delivering PA interventions (e.g. Olander et al. [2013]) and encouraging adherence to rehabilitation exercises (e.g. Peek et al. [2016]). All 93 BCTs were not used in the survey to ensure the BCTs used were relevant to physiotherapy and PA and to avoid burdening respondents.

This section was designed to have one BCT per online page (*Figure 3. 3*). For each BCT, two questions were required to ask if the physiotherapist used the BCT to: (i) promote NTPA; and (ii) encourage adherence to rehabilitation exercises. This resulted in 100 questions. Each dual question was preceded by the definition of the BCT and an example of its application to help the physiotherapist to understand the BCT prior to answering the question. Respondents were prompted to take a break after finishing the influencing factors section and before commencing this section as the survey was very large.



Goal setting (behaviour)

Definition

Set or agree on a goal defined in terms of the behaviour to be achieved.

Examples of a behaviour specific goal

For adherence to rehabilitation exercises: Complete strengthening exercises three times per day, three times per week.

For non-treatment physical activity: Walk for ten minutes, three times weekly.

Thinking about your practice in the last month, please rate how often you used this technique to encourage/support:

	Never	Rarely	Sometimes	Often	All of the Time
Adherence to rehabilitation exercises.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Non-treatment physical activity.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 3. 3 A question used to identify the use of the *goal setting (behaviour)* BCT in the first draft of the survey

Designing this section in the way shown in *Figure 3. 3* meant the section took 60-90 minutes to complete the 100 questions. This was due to the large amount of reading and the large number of page transitions necessary to have one BCT per online page. This was considered too long and was changed prior to piloting. A storytelling approach was adopted. The physiotherapists involved in the supervisory team worked with the candidate to design a story that reflected a typical clinical scenario that they commonly see when working with patients. The story was centred on a physiotherapist who was treating a patient, Brian, for elbow pain (*Figure 3. 4*) and was used as a clinical scenario to introduce BCTs to the respondent in a relatable way.

Brian is a 42-year-old lawyer who has presented to you with lateral elbow pain. You examine his elbow and suggest some exercises to help reduce his pain. As part of your regular assessment, you identify that Brian is not participating in regular physical activity and ask him why. He states that he doesn't think he needs to be physically active and has been too busy with work and family to exercise. You decide that your time with Brian should be spent addressing his elbow pain and supporting him to become more physically active to prevent the development of future musculoskeletal conditions and other non-communicable diseases. Brian is happy with this and is eager to hear how you can help him.

Figure 3. 4 The story of Brian, the patient in the case study used within the piloted survey

The scenario-style presentation was designed to make it simpler to present all 50 BCTs and their associated questions. Respondents were presented with five consultations from initial to final contact (see *Figure 3. 5* for an example of the initial contact). The number of BCTs used in each scenario ranged from six to 14. Each consultation was presented on one online page, reducing the number of pages from 50 to five. Each online page also included all the BCT questions for that scenario (see *Figure 3. 6* for an example of one of the BCT questions that followed the initial contact). Although the amount of reading was unchanged, the familiarity of the content for the typical physiotherapist would make reading and understanding the context of the question easier than only providing the definition of each BCT from the BCTTv1. The amount of time expected to complete this section was reduced from 60-90 minutes to 25-30 minutes with the adoption of the scenario approach.

Initial contact

You discuss with Brian the consequences of being inactive to better help him understand why it's important to become physically active. Brian is now aware that being physically active can reduce his risk of heart disease and stroke, can help improve his mood and can provide opportunities to spend more time with his children by going bike riding to the local park, and with his wife by joining her on her after-dinner walk.

You ask Brian what the pros and cons are of him becoming physically active and he states that he would like to be a good example to his children (which you encourage him to focus on), however he feels the additional activity, specifically bike riding, might "aggravate his sore elbow". You recommend Brian sees his doctor to get advice on suitable pain relief medications for his elbow before your next consultation and provide him with advice on elbow supports and some rehabilitation exercises to address the pain.

You encourage Brian to go for a walk after dinner with his wife once over the next week, to get a 'feel' for how a regular walking program could fit into his life, and to watch a short video called 23 and ½ hours by Dr Mike Evans to help him understand how beneficial physical activity is for a healthy life.

Figure 3. 5 The first of five contacts made between Brian and his physiotherapist



"Brian is now aware that being physically active can reduce his risk of heart disease and stroke..."

This is an example of **providing information about the health consequences** of being physically active. Consequences can be both positive and negative. Examples of a negative consequence are having an increased risk of heart disease if Brian remains inactive or continuing to feel elbow pain if he doesn't do his exercises.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete prescribed exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*Figure 3. 6 A survey question, which includes an example from the initial contact in the case study, asking the respondent if they use the BCT *Information about health consequences**

Ethics approval

Ethics approval was obtained from Federation University Australia Human Research Ethics Committee (B16-026) (Appendix 3. 5). The final ethics report can be found in Appendix 3. 6.

Pilot process

Several iterations of the survey were made prior to piloting to ensure that the shortest and most informative survey was piloted. The pilot process commenced in April, 2016 and ceased in July, 2016.

Fifteen pilot respondents were contacted using cold-calling and snowballing methods. Each respondent was provided with the link to the online survey and were asked to complete it within 1 week. The link to the survey included a link to the plain language information statement (Appendix 3. 7). Respondents were asked to complete the survey and provide comments on what they liked, what they did not like and how it could be improved. They were also asked to complete the survey again in 1 week to allow test-retest reliability analysis; however, no-one did this. Respondents were offered the chance to win a \$200 gift card as an incentive to participate.

Analysis methods

Data were downloaded from the online Qualtrics system and uploaded into SPSS 24. Data were cleaned and variables were labelled appropriately for analysis. Internal consistency (Cronbach's alpha [α] and corrected item-total correlations) was calculated for each of the 18 question domains included in the influencing factors section of the survey. It was important that questions within each domain correlated well as they were all meant to measure the same thing (e.g. Knowledge) and be used to identify the factors influencing NTPA promotion in the study. All written responses were read to identify respondent feedback.

Results

Fifteen respondents (100% response rate) partially or fully completed the pilot survey and provided feedback. The entire survey (all three sections) took approximately 35 minutes to complete. Most respondents were aged 25-34 ($n = 10$), not physically active ($n = 8$), female ($n = 10$), treated more than 15 patients per week ($n = 9$) and consultation times were mainly longer than 26 minutes (initial consultations $n = 14$, second consultations $n = 10$ and final consultations $n = 9$). More than half of the respondents had been practicing physiotherapy for

3-10 years ($n = 8$) and worked 1-3 days per week ($n = 9$). Most respondents did not have additional qualifications in psychology ($n = 10$) and promoted NTPA often or all of the time ($n = 7$). A greater percentage of males ($n = 3$, 60.0% of all males) than females ($n = 4$, 40.0% of all females) promoted NTPA often or all of the time

Internal consistency of the 18 domains.

The internal consistency reliability (Cronbach's alpha [α]) of each domain ranged from $\alpha = 0.012$ (Social Influences) to $\alpha = 0.905$ (Organisation) and 14 of the 18 domains had, at least, acceptable internal consistency ($\alpha > 0.70$) as per the criteria defined by L'insalata et al. (1997) (Appendix 3. 3). This is lower than the 17 domains with acceptable internal consistency identified by Huijg, Gebhardt, et al. (2014). However, Huijg, Gebhardt, et al. (2014) had 274 respondents in their study, suggesting that study had greater power to detect internal consistency compared to this pilot study. The four domains with unacceptable internal consistency (Goals, Innovation, Social Influences and Social/professional Role and Identity) were reviewed, along with respondent feedback.

Corrected item-total correlations can give a more accurate report of internal consistency for domains that have fewer than 10 items (Pallant, 2013), which was true for all of the 18 domains. It is desirable to have the corrected item-total correlations > 0.5 , but good scales can range between 0.30 and 0.70 (Ferketich, 1991). The range of corrected item-total correlations for all 18 domains was 0.17 to 0.94.

Feedback from respondents and associated changes to the final survey tool.

The main piece of feedback from the respondents was that the survey was too long. This annoyed and fatigued some respondents and encouraged them to not complete the survey. Therefore, the main changes made to the survey focused on reducing its length and making it simpler to complete.

General layout.

Comments specific to the general layout of the survey led to two changes being made to the final survey (Table 3. 1).

Table 3. 1 Actions undertaken in response to comments made by 15 pilot survey respondents on the general layout of the survey

Comment	Actions to improve survey tool
Respondents wanted the opportunity to provide more information on their use of BCTs than the questions allowed for.	A comment box was provided at the end of the survey to allow text entry.
Respondents did not know how far they were along in the survey.	A text percentage bar was added to clearly indicate survey progression.
Respondents liked being able to leave the survey and return.	This quality was maintained for the study.
Respondents could complete the survey easily on both computer and smart devices, but smart devices took longer.	Respondents in the study were advised at the start of the survey that completing the survey on a smart device would take longer.
The scenario approach to the BCTs section was liked by most. One respondent felt it provided too much information at once.	Including 50 BCTs in five scenarios can make these sections content-heavy. The number of scenarios was not increased to dilute the number of BCTs over the number of scenarios because this would add time to an already time-consuming survey. Thus, this comment was considered a potential limitation of the study but did not lead to change.

Demographics section.

Comments specific to the demographics section led to several changes to the final survey tool (Table 3. 2).

Table 3. 2 Actions undertaken in response to comments made by 15 pilot survey respondents on the demographics section of the survey

Comment	Actions to improve survey tool
Respondents were asked about the amount of cardiovascular activity they do each week but not the amount of strengthening activity they do. Both are important components of establishing if someone is physically active.	A question asking how often the respondent participates in strengthening activities each week was added. It read: “In the past week, on how many days (0-7) have you participated in muscle strengthening activities?”
Some respondents felt they had qualifications that taught them how to promote PA that were not included in the survey (only psychology was originally included).	Two questions asking if respondents have additional qualifications in health promotion and exercise science were added. For example: “Do you have any qualifications, aside from physiotherapy, in health promotion or have you attended at least 10 hours of educational classes with a health promotion focus? Topics might include physical activity promotion, smoking cessation, healthy eating, weight loss and alcohol consumption.”
Excluding physiotherapists working less than one day per week excludes those who work weekly but less than one day.	The reason to include physiotherapists who worked at least one day per week was to ensure they had recent memories of a variety of patient encounters to reflect on throughout the survey. The inclusion criteria were changed from needing to practice one day per week to needing to practice weekly to avoid excluding physiotherapists who still have weekly contact with patients.

Comment	Actions to improve survey tool
Physiotherapists who work in clinic-based community settings should be included.	Physiotherapists needed to work in private practice and outpatient settings to be included in this study. Physiotherapists working in clinic-based community settings work in almost identical settings to outpatient physiotherapists. Thus, the inclusion criteria was changed to include this setting.

Influencing factors section.

Comments specific to the influencing factors section were mainly about the questions being very similar to each other and being perceived as repetitive (Table 3. 3). This annoyed respondents and made them feel like the survey was longer than it needed to be.

Table 3. 3 Actions taken in response to comments made by 15 pilot survey respondents on the influencing factors section of the survey

Comment	Actions to improve survey tool
There were too many questions that were similar to others, causing confusion and frustration.	Winifred Gebhardt, who co-designed the DIBQ, was asked for suggestions on how to make the survey shorter. She suggested reducing the numbers of questions in all domains with an internal consistency >0.8 to at least three (Stevens, 1992). This advice was followed.
	Too many questions in a survey might increase the chance a respondent will rush. Some questions were reversed or phrased negatively to encourage respondents to read the question and to identify those who did not.
Some questions were not relevant to the clinical context, e.g. "When I deliver non-treatment physical activity interventions, I get financial reimbursement"	This question was from the DIBQ and was originally meant to ask respondents if they got paid to promote PA by the research team who asked them to promote it. This question

Comment	Actions to improve survey tool
	was not relevant to the objective of this study so it was deleted.
Some questions were not clear, e.g. “PA interventions cost little time to deliver.”	This question was re-worded. It read: “This intervention takes little time to deliver.”
The ‘Organisation’ domain of questions are not relevant to managers of a physiotherapy clinic (e.g. “I can count on support from the management of the organisation I work in, when things get tough”), yet responses to this question were required from all respondents.	Likert scales belonging to questions specific to employees, not managers, were changed to include a ‘not applicable’ option for managers to select.

The main change made to this section involved reducing the number of questions. This was done by identifying the question domains in Huijg, Gebhardt, et al. (2014) that had an internal consistency >0.8 (this was evident in 16 out of 18 domains) and reducing the number of questions included in those domains. Changes included removing some of the questions that pilot respondents said were confusing or contextually irrelevant. Questions that remained were considered necessary to address the objectives of the study. The questions in the Positive and Negative Emotions domains were reported as repetitive, so only two questions were kept per domain. Overall, 26 questions (Appendix 3. 8) were removed from this section of the survey, saving respondents approximately 5 minutes and leaving 64 questions remaining in this section.

BCT Section.

This section received positive comments and required little alteration prior to the study. The main changes involved additional clarification around the use of BCTs for the two behaviours (encouraging adherence to rehabilitation exercises and NTPA promotion) (Table

3. 4). The prompt to take a break prior to completing this section was removed as respondents reported forgetting to return to the survey. All piloted questions in this section remained for the study.

Table 3. 4 Actions taken in response to comments made by 15 pilot survey respondents on the BCTs section of the survey

Comment	Actions to improve survey tool
Some respondents were unclear on how to extrapolate the BCT example to both behaviours (encouraging adherence to rehabilitation exercises and NTPA promotion). Each BCT example usually only provided an example specific to encouraging adherence to rehabilitation exercises or NTPA promotion.	<p>More reminders about how adherence to rehabilitation exercises and NTPA differ, and how the BCTs used for each might be different, were added.</p> <p>The introduction section of the survey was modified to read: “Brian's physiotherapist will use BCTs to help him adhere to his exercises and become physically active to improve his overall health. You will be asked if you use any of the BCTs Brian's physiotherapist uses”.</p> <p>More examples of BCT use for both adherence to rehabilitation exercises and NTPA promotion for more BCTs were added throughout the survey tool.</p>
Using “muscle tears and scarring” to explain the use of the BCT <i>Salience of consequences</i> was “horrible”.	This was good feedback. This BCT is meant to be memorable, hence this graphic terminology was appropriate. No changes were made.

Data analysis – final study

Data were downloaded from Qualtrics once the full final survey was closed in July, 2017.

Analyses were chosen based on the research questions:

RQ1: What factors are associated with physiotherapists' decisions to promote NTPA to patients with musculoskeletal conditions?

RQ2: What BCTs do Australian physiotherapists use when encouraging adherence to rehabilitation exercises and promoting NTPA to patients with musculoskeletal conditions?

Analyses for RQ1

Analysis 1: Descriptive analysis of demographic and influencing factors data.

Analysis 2: Internal consistency of each of the 18 domains. This was necessary to demonstrate the reliability of the influencing factors section of the survey.

Analysis 3: Bivariable analyses to identify associations between demographic and influencing factors data.

Analysis 4: Multivariable analysis to identify if any of the 18 domains (influencing factors) were independently associated with NTPA promotion frequency.

Analyses for RQ2

Analysis 1: Descriptive analysis of demographic data completed as part of RQ1.

Analysis 2: Descriptive analysis of frequencies of BCT use for: (i) NTPA promotion; and (ii) encouraging adherence to rehabilitation exercises.

Data management

Data were entered into SPSS and coded as individual variables belonging to the demographics, influencing factors and BCT sections of the survey. Questions in the survey that were negatively phrased or had their order changed were reverse coded prior to analysis. Missing values were entered as -99 (ineligible respondent) or -100 (question not completed). The 'pairwise deletion' function in SPSS was used to remove these missing values. Pairwise deletion of data involves SPSS only deleting individual missing values. This was chosen instead of listwise deletion, which would delete all data from incomplete responses, reducing the amount data available for analysis.

Demographic variables.

Nominal demographic variables were used in crosstab analyses to establish associations between demographic variables and NTPA promotion frequency using the chi-square statistic. Several variables were dichotomised for this analysis because using the variables as originally entered resulted in more than 20.0% of cells having counts less than five. Groups were merged to ensure sample sizes were similar prior to use in regression analyses (e.g. the poorly populated 'unsure' category was merged with the 'no' category for qualifications variables). Ordinal demographic variables remained unchanged as they were used in Spearman's rho analyses where cell counts do not apply.

One demographic variable represented the frequency that respondents promoted NTPA to their patients (5-point Likert scale, never – all of the time). This variable was used as the dependent variable in the multivariable regression analysis. It was dichotomised

(always [all of the time] and irregularly [often + sometimes + rarely + never]) to ensure both groups within this variable had similar sample sizes.

Two new demographic variables were made from pre-existing data. One variable identified if the respondent was a clinic manager or not. This was done by counting the number of respondents who selected 'not applicable' to questions where they were instructed to select this option if they were a clinic manager. A variable that identified if the respondent was meeting PA guidelines was also made using data from both the amount of cardiovascular activity and strength training the respondent participated in.

Influencing factors variables.

Variables belonging to all 18 domains were coded on a 1 (strongly disagree) to 5 (strongly agree) ordinal scale. These variables were categorised into 'disagree/strongly disagree', 'neither agree nor disagree' and 'agree/strongly agree' options. This was done to simplify the presentation of frequencies in the manuscript.

Multivariable analysis was used to identify if any of the 18 domains were independently associated with NTPA promotion frequency. Each of the 18 domains comprised several variables (e.g. the Beliefs about Capability domain had six variables). One new variable (e.g. Beliefs about Capability) needed to be made from the individual variables (e.g. the six variables belonging to the Beliefs about Capability domain) for this analysis. Each new variable was made by entering all the component variables into the compute variable (mean) function in SPSS. This led to the production of 18 scale variables, representing 18 domains, which were used as independent variables in the multivariable analysis.

BCT variables.

Variables specific to BCT use were coded on a 1 (never) to 5 (always) ordinal scale. Data were further categorised into three categories (not used, used about half the time, used) where the 'not used' category consisted of 'never' and 'sometimes' options and the 'used' category consisted of 'always' and 'most of the time' options. 'Used about half the time' formed its own category. This format was used to clearly present the frequency of BCTs used for NTPA promotion and encouraging adherence to rehabilitation exercises in the manuscript.

Descriptive analysis (RQ1 and RQ2)

Frequencies of responses to all questions were identified using the descriptive statistics function in SPSS. All frequencies were reported as total number and valid percentage.

Internal consistency (RQ1)

The reliability of each domain was measured using Cronbach's alpha (α) and the corrected item-total correlation range, as was done with the pilot data. Internal consistency was considered excellent if $\alpha > 0.9$, good if $\alpha = 0.8-0.89$ and acceptable if $\alpha = 0.7-0.79$ (L'insalata et al., 1997). Item-total correlation values that were >0.5 were considered desirable and values ranging between 0.30 and 0.70 were considered good (Ferketich, 1991).

Bivariable analysis (RQ1)

The chi-square statistic was used to identify associations between demographic variables (nominal or ordinal) and the frequency of NTPA promotion (nominal). The demographic

variables included in these analyses were sex, qualifications (psychology, health promotion and exercise science), work setting, consultation length, the respondent's PA level and whether the respondent was a clinic manager or not.

Spearman's rho was used to identify associations between the remaining ordinal demographic variables and the frequency of NTPA promotion (nominal). Spearman's rho was used instead of chi-square because the chi square assumption specific to having fewer than 20.0% of cells with fewer than five counts was voided and merging cells was not appropriate. The demographic variables included in these analyses were age, number of patients treated weekly and clinical experience.

The significance levels were set at 0.05. Associations that had a significance level below 0.2 were included as independent variables in the first stage of the multivariable analysis.

Multivariable analysis (RQ1)

Binary logistic regression was used to identify the variables independently associated with NTPA promotion frequency. The significance level was set at 0.05.

Assumptions.

The sample sizes in each group within each variable were checked to ensure there were no large differences between the samples in each category. Groups were merged if large differences existed between groups. A correlation analysis including all variables was run and no variables had a Pearson correlation above 0.7 with any other variable, thus the variables were not highly correlated.

Process.

Twenty-three variables were entered into the model at step one. Backwards elimination was used to reach the final model, which was determined using three criteria that showed the model had: (i) the highest percentage of correct predictions compared to other stages of the elimination process, (ii) the smallest number of variables; and (iii) a non-significant Hosmer and Lemeshow Test. To do this, variables with the highest p-value in the SPSS “Variables in the Equation” table were removed step-wise because high p-values were interpreted to mean the variable was not significantly contributing to the model. During this process, the percentage of correct predictions and the p-value from the Hosmer and Lemeshow Test (must be ≥ 0.05) were monitored. Acceptable model fit was measured using the Hosmer and Lemeshow Test, where acceptable fit was indicated by $p \geq 0.05$.

Chapter 6: The self-reported factors that influence Australian
physiotherapists' choice to promote non-treatment physical activity to
patients with musculoskeletal conditions (Submitted manuscript)

Chapter 6 has been removed at the author's request due to
copyright restrictions. The full text published article
referred to in chapter 6 can be found at:
<http://dx.doi.org/10.1016/j.jsams.2018.08.006>

Chapter 7: The behaviour change techniques used by Australian
physiotherapists to promote non-treatment physical activity to patients
with musculoskeletal conditions (In-press manuscript)

Chapter 7 has been removed at the author's request due to
copyright restrictions. The full text published article
referred to in chapter 7 can be found at:
<http://dx.doi.org/10.1016/j.jsams.2018.06.002>

Chapter 8: Interview methods

Objective and research question

The methods used to design, pilot and run the interview study are described in this chapter. This study was used to address objective (ii) (Table 1. 1).

Research question: What are the experiences of Australian physiotherapists promoting NTPA to patients with musculoskeletal conditions?

Sampling, recruitment and incentives

Please refer to ‘Sampling, recruitment and incentives’ in Chapter 5 for inclusion criteria and funding.

Sample size

This study used interpretative phenomenological analysis (IPA) to guide the design and completion of the study. Initially, enough physiotherapists were going to be recruited to allow for data saturation (Braun & Clarke, 2013). However, the purpose of qualitative studies using IPA is to gain full and rich personal accounts to fully explore individual experiences (Hale et al., 2008; Smith et al., 2009). Individual experiences are unique to the individual and are unlikely to be saturated (Smith et al., 2009). Therefore, when considering the uniqueness and complexity of human experiences, and the need for detailed accounts to interpret these experiences, IPA studies benefit from using small samples (Braun & Clarke, 2013; Eatough et al., 2008; Smith et al., 2009). Thus, a small sample size was used. Between three and six interviewees have been recommended for honours level student projects (Smith et al., 2009). Up to ten physiotherapists were planned to be recruited for this study as this was a feasible number of interviews to complete and transcribe by the candidate.

Recruitment

Physiotherapists were purposefully sampled from across Australia using social media platforms (Twitter and Facebook) and snowballing from October, 2016 to February, 2017. No paid advertising was used. The social media post advertised the study along with the promise of a \$20 incentive to thank people for their time. Physiotherapists who were interested in participating would click on the link in the social media post and that would take them to an online eligibility survey. This survey was similar to the demographics section used for the studies in Section 3, with the addition of a section to provide contact details. Eligible interviewees were given the opportunity to read the plain language information statement (Appendix 4. 1) and provide their contact details if they chose to participate. All interviewees who provided contact details were emailed the plain language information statement and informed consent form (Appendix 4. 2) to be completed prior to participating in the study.

Interview design

An interview method was chosen for this study to ensure a wide, holistic and rich exploration of physiotherapists' experiences promoting NTPA. This complexity can be lost when using a survey (Braun et al., 2013). Interviews have been used in similar studies identifying the factors influencing implementation of PA interventions by physiotherapists in primary care (Huijg, van der Zouwe, et al., 2014) and PA promotion by Australian podiatrists (Crisford et al., 2013).

It was important to run a qualitative study to support triangulation of data. Triangulation refers to using two or more methods of data collection to explore the same phenomenon, allowing the researcher to achieve as much understanding regarding the

phenomenon as possible (Braun et al., 2013). In this thesis, the phenomenon is NTPA promotion by physiotherapists. Using triangulation can potentially contribute to the ecological validity of these findings, supporting their valid application to the 'real world' context (Braun et al., 2013).

Interpretative phenomenological analysis is used to explore the perceptions and experiences of people by using an in-depth qualitative analysis and a homogenous sample to examine how people perceive and understand what is happening to them (Smith & Osborne, 2008). Therefore, IPA is suited to studies that aim to explore interviewee experiences and understandings (Braun et al., 2013). This is opposed to a simple thematic analysis approach, which does not involve a specific focus on experiences during interviewing and involves a less detailed patterned analysis of data (Braun et al., 2013). Thus, IPA was the most appropriate method to use to explore physiotherapists' experiences of NTPA promotion in this study.

Face-to-face and telephone-based semi-structured interviews were used to collect data in this study. Using a semi-structured interview design provides structure to interviews by allowing the interviewer to ask some pre-determined questions while also allowing the interviewee the flexibility to talk more about some topics than others (Braun et al., 2013). This allows the interviewer and interviewee to converse freely and modify the direction of conversation (Braun et al., 2013). This style of interviewing is suited to IPA studies as it facilitates the exploration of interviewee experiences (Braun et al., 2013; Smith et al., 2008). Semi-structured interviews have been used previously by authors exploring the factors influencing the implementation of PA interventions by health care professionals in primary

care (Huijg, van der Zouwe, et al., 2014). Thus, semi-structured interviews were chosen for this study and were conducted by the candidate from November, 2016 to February, 2017.

Each interview was recorded using computer (Microsoft Voice Recorder) and iPhone (Voice Memos App) software. The clearest recording was kept for data analysis.

Interview questions

An interview guide was designed and included several questions that were informed by the survey pilot results (Chapter 5). For example, pilot respondents reported that they received little support from government, insurance companies and the workplace to promote NTPA. Thus, questions about receiving support to promote NTPA were included in the guide. Additionally, the pilot results suggested that physiotherapists plan to promote NTPA, but these plans can be difficult to implement when the patient is not motivated. Thus, plans to promote NTPA and the influence of patient motivation was also included in the guide.

The pilot survey also identified the BCTs respondents used to promote NTPA and encourage adherence to rehabilitation exercises. The BCTs that were identified as most and least used to promote NTPA formed a pool of 11 BCTs. This pool was used to randomly select five BCTs (Supplementary file 1, Chapter 9) to discuss in the interview.

Published literature also contributed to the decisions regarding interview guide content. The guide included questions about the amount of time and training needed to promote NTPA. Justifications for asking about time and training can be found in Chapter 5.

Physiotherapists have been reported as having low confidence levels when using psychology to change behaviours (Alexanders et al., 2015). This low confidence might be due to behaviour change (in general and specific to NTPA) not being perceived as a service

physiotherapists should deliver. Thus, the guide included questions about behaviour change being within the scope of practice of a physiotherapist and if behaviour change was compatible with their current practice.

Physiotherapists might be inclined to promote PA to those with more obvious risk factors for NCDs (e.g. overweight and obesity). Previously, few physiotherapists have reported being very likely to promote PA to healthy patients (25.0%), with more physiotherapists (77.0%) very likely to promote PA to overweight patients (Barrett et al., 2013). In a recent Australian survey, the majority (84.6%) of physiotherapists seeing overweight and obese clients provided PA advice for weight management purposes (Snodgrass et al., 2014). Therefore, the interview guide also included questions about the type of patients physiotherapists would promote NTPA to.

Each interview began by asking the question “Can you please tell me about your experiences promoting NTPA?” to encourage the interviewee to begin talking generally about their experiences promoting NTPA. This also facilitated close connection to the IPA method, which is governed by the need to keep close to the lived experience of the interviewee (Smith et al., 2008). Interviewees who gave detailed responses to this question were asked follow-up questions based on their original response. Those who did not give detailed responses were prompted by the candidate to discuss one of the seven topics included in the interview guide to get the conversation started (Supplementary file 1, Chapter 9). It was expected each interview would take approximately 60 minutes to complete if all topics were discussed.

Ethics approval

Ethics approval was obtained from Federation University Australia Human Research Ethics Committee (Appendix 4. 3). The final ethics report can be found in Appendix 4. 4.

Pilot process

The interview guide was reviewed by an expert in qualitative research⁵, as well as all supervisors, before piloting. The main feedback received was about structure, rather than content. The interview guide consisted of too many structured questions that reduced the flexibility usually allowed when using a semi-structured design. Also, the interview guide was not easy to read. The guide was meant to be referred to infrequently by the candidate when needed (e.g. when in the middle of an interview and the interviewee has nothing more to say) and should be structured in a way where questions are easily identifiable. Therefore, based on feedback, the number of questions were reduced and they were made easier to read and simpler to interpret. The original guide was kept as a reference (Supplementary file 1, Chapter 9) but the clearer, structured version was used as a running sheet in the interviews (Appendix 4. 5). The interview was piloted in November, 2016 with one formal interviewee face-to-face.

Analysis methods

The interviewee spoke very fast and this made transcription of the recording difficult. The use of Express Scribe allowed the interview to be slowed to 40.0% to make transcription easier. Overall, it took 10 hours to transcribe the 45 minute interview. Therefore, two days

⁵ The candidate would like to thank Penny Paliadelis, Executive Dean of the Faculty of Health at Federation University Australia, for her guidance.

were put aside for all future interviews (one day for the interview, another for the transcription).

The transcript was analysed by coding comments on a Microsoft Word document. These comments were collated to form overarching themes. Overarching themes consisted of frequently appearing comments that were similar to each other. For example, ‘confidence to promote NTPA’ and ‘having sufficient time to promote NTPA’ were categorised under the Facilitators theme.

Using Microsoft Word was time consuming and laboursome because it did not allow easy grouping of similar themes. Therefore, QSR NVivo software (QSR International Pty Ltd, Melbourne, Australia) was used to facilitate the organisation of data for coding and identifying themes in the study.

Results from the pilot interview with one interviewee

The summarised guide allowed for easy and quick access to prompting questions. The use of a broad opening question, as opposed to a list of narrow questions, was useful as it helped the interviewee to begin generally discussing NTPA promotion. Notes were made as the response to the initial question progressed. These notes presented several topics specific to NTPA that warranted discussion but did not appear in the interview guide. Thus, the notes were used to encourage the interviewee to discuss these topics at an appropriate time towards the end of the interview.

The interviewee was a 35-44 year old female who had been practicing physiotherapy for more than 10 years and saw patients with musculoskeletal conditions at least once weekly. The interviewee reported that the patient’s presentation and their symptoms

influenced how the interviewee promoted NTPA and if the patient would follow her advice. For example, the worse the patient's symptoms were, the less likely the patient would be willing to increase their activity levels. Becoming physically active was identified as a "journey" for the patient, one that they needed to be willing to take for NTPA promotion to be successful.

Lack of support from insurance companies and the workplace were considered barriers to NTPA promotion. The interviewee mentioned that they received little financial reimbursement from insurance companies to promote NTPA and that workplace-based professional development in this area was lacking. Thus, support to promote NTPA was lacking both financially and educationally.

Time was also considered a barrier to NTPA promotion. The interviewee felt a large amount of consultation time (e.g. 30-60 minutes) was needed to integrate NTPA promotion into her practice. Finally, having more clinical experience and good rapport with the patient made NTPA promotion and behaviour change easier. Therefore, although time limitations might have restricted NTPA promotion, having a good relationship with the patient helped overcome this barrier.

Data analysis - final study

Raw data were collected in the form of audio recordings and then transcribed into text. Recordings were transcribed verbatim using Express Scribe to slow, speed up, pause and rewind recordings to allow accurate transcription. Any audio that could not be transcribed (e.g. due to poor sound quality) was noted as such and not replaced with a guess of what the interviewee said. Recordings were listened to twice to ensure the transcripts did not contain

errors and so comments about the use of tone, pausing, and misunderstandings by the interviewee could be recorded.

Transcripts were produced using Microsoft Word and uploaded into NVivo for organisation prior to analysis. Each transcript was identified using a pseudonym comprising the interviewees' initials and the date the interview was completed. Transcripts were read and re-read to facilitate engagement with the data and support the interpretation of interviewees' subjective experiences. Note taking, commenting (descriptive, linguistic and conceptual) and pattern identification occurred during the reading stage to begin the interpretive process integral to IPA studies (Smith et al., 2009).

In line with recommendations when using the IPA approach (Smith et al., 2009), the interpretative process involved reading all transcripts and coding individual sections using codes that reflected what the interviewee said, or felt, about their experiences promoting NTPA. Each transcript was coded using terms such as 'frustration', 'barrier' and 'patient'. Pattern-based analysis, using NVivo features such as framework matrices and coding queries, was used to identify the codes that frequently appeared across transcripts (Braun et al., 2013). Similar and frequently emerging codes were pooled together to form emergent themes. Emergent themes that were similar were grouped together to form superordinate themes. Verbatim extracts (quotes) from interviewees were used to support all themes.

Analysis methods used to enhance trustworthiness

All themes, supporting extracts and interview content summaries (collected during the reading phase and before coding began) were provided to four study authors for checking. All authors discussed if the identified themes accurately reflected the summarised content of the

interviews. If necessary, changes were made after discussion with each author. Consensus was reached after making only minor changes in response to comments (e.g. increasing the emphasis of some emergent themes that were perceived as hidden within superordinate themes).

Member checking, where each interviewee checked their responses and the thematic interpretations made by the candidate, was used to give interviewees the opportunity to correct any misinterpretation of their experiences and ensure the authenticity of the identified themes (Braun et al., 2013). In August, 2017, each interviewee was emailed a detailed description of the themes that emerged from their experiences. Verbatim extracts were also provided. All interviewees responded within one week with comments and alterations. Only minor changes were requested (e.g. removing ‘you know’ from quotes) and were made. The analysis was deemed as reflecting the true experiences of all interviewees as much as possible after author and member checking.

Quality and rigor of the study was enhanced by using Yardley’s criteria to guide study design and completion. Good qualitative research must adhere to four criteria: (i) sensitivity to context; (ii) commitment and rigour; (iii) transparency and coherence; and (iv) impact and importance (Smith et al., 2009; Yardley, 2000). Examples of how this study adhered to these criteria are found in Supplementary file 2 for the published manuscript in Chapter 9.

Chapter 9: “...*like you’re pushing the snowball back up hill*” - The experiences of Australian physiotherapists promoting non-treatment physical activity: a qualitative study (Published manuscript)



AIMS Medical Science, 5(3): 224–237.

DOI: 10.3934/medsci.2018.3.224

Received: 13 February 2018

Accepted: 11 April 2018

Published: 17 May 2018

<http://www.aimspress.com/medicalScience>

Research article

“...like you’re pushing the snowball back up hill”—the experiences of Australian physiotherapists promoting non-treatment physical activity: A qualitative study

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Abstract: Participating in physical activity is important for maintaining general health. When physiotherapists promote physical activity for the purposes of maintaining or improving a patient’s general health, they are promoting non-treatment physical activity. Physiotherapists have a responsibility to promote non-treatment physical activity to their patients while also providing the patient with treatment for their presenting complaint. This qualitative study explored the experiences of Australian physiotherapists promoting non-treatment physical activity to patients with musculoskeletal conditions. Ten Australian physiotherapists treating patients with musculoskeletal conditions in private practice and outpatient settings were recruited using a social media campaign and snowballing. All interviewees received one \$AU20 gift card for participating. Sixty-minute semi-structured interviews were conducted and were transcribed verbatim. Interpretative phenomenological analysis was used to design the interview guide and analyse data. Transcripts were used to identify emergent and superordinate themes. Most interviewees were female, aged between 25–34 years, physically active and reported promoting NTPA. The superordinate themes that emerged from the transcripts included: Internal and external influences on NTPA promotion, approach taken by the physiotherapist towards NTPA promotion, challenges experienced when promoting NTPA, and skills and training. In conclusion, physiotherapists reported they were

well-placed to promote NTPA, but they face many challenges. The perceived inability to motivate patients to become physically active and the need to prioritise patient expectations of hands-on therapy made NTPA promotion difficult. Workplace specific factors, such as having an open-plan clinic environment and having other staff who promote NTPA, were perceived to make NTPA promotion easier. Using effective marketing strategies that portray the physiotherapy clinic as a physically active environment might see patients expect NTPA promotion, making NTPA promotion easier for Australian physiotherapists in the future.

Keywords: physical therapists; physiotherapy; health promotion; exercise; physical activity; motor activity; behaviour change

Abbreviations: BCT: Behaviour change technique; IPA: Interpretative phenomenological analysis; NTPA: Non-treatment physical activity; PA: Physical activity

1. Introduction

Physical inactivity is considered the greatest public health problem of the current century [1]. Adequate PA is defined as achieving 150–300 minutes of moderate intensity activity (e.g. gentle cycling or swimming) or 75–150 minutes of vigorous intensity activity (e.g. race cycling or spin class) weekly, as well as muscle strengthening for all major muscle groups twice weekly [2]. However, adults are not achieving sufficient levels of physical activity (PA) to support good health. Self-report data suggests 31.1% of adults worldwide are not meeting PA guidelines [3]. In 2014–2015, 44.5% of Australian adults did not achieve the minimum recommended PA levels [4].

Physiotherapists are healthcare practitioners who treat patients with musculoskeletal conditions and who also have a responsibility to promote PA [5]. Physiotherapists treat patients with a wide range of musculoskeletal conditions that can contribute to disability and form a large component of a physiotherapist's work. The global prevalence of musculoskeletal conditions, such as low back pain (9.2%) and other musculoskeletal disorders (8.1%), indicates these conditions are some of the most prevalent diseases in the world [6]. In 2014–2015, 30.0% of Australians reported having a musculoskeletal condition, with 23.0% also having another chronic comorbid condition, such as cardiovascular disease [7]. The presence of a musculoskeletal condition, and its associated symptoms (e.g. pain) and signs (e.g. poor physical condition), can act as a barrier to being physically active [8] and can increase the risk of developing comorbid conditions. Therefore, it is important that physiotherapists pay particular attention to supporting patients with musculoskeletal conditions to participate in PA. The type of PA that is specific to improving or maintaining general health, as opposed to being used to treat a musculoskeletal condition, is called non-treatment physical activity (NTPA) [9]. It is imperative that physiotherapists promote NTPA to improve the PA levels of Australian adults.

A recent systematic review reported that physiotherapists can successfully increase patient PA levels, but the PA improvements were small and not maintained [10]. It is important to be aware of how practicing physiotherapists experience NTPA promotion to understand how this might

influence the success of their promotion efforts. Understanding these experiences is important to be able to more effectively engage physiotherapists as active agents in improving the PA levels of Australians.

This qualitative study investigated the experiences of Australian physiotherapists promoting NTPA to patients with musculoskeletal conditions.

2. Materials and methods

2.1. Design

This was a cross-sectional qualitative study that used interpretative phenomenological analysis (IPA) as the methodological framework because IPA facilitates the exploration of interviewee experiences of a specific topic (e.g. NTPA promotion) [11]. Interpretative phenomenological analysis facilitates the exploration of the perceptions and experiences of people by using an in-depth qualitative analysis and a homogenous sample to examine how people perceive and understand what is happening to them [12].

2.2. Interviewees

Australian physiotherapists who treated patients with musculoskeletal conditions in private practice and/or outpatient settings were eligible to participate and were recruited using social media (Facebook, Twitter) and snowballing. All potential interviewees were provided with a plain language information statement and informed consent form outlining the study and were asked to return the signed consent form prior to participation. Thirteen interviewees were asked to participate in the study. Ten participated and received one \$AU20 gift card as an incentive.

2.3. Ethics

The Federation University Australia Human Research Ethics Committee approved this study (project number B16-131).

2.4. Data collection

The interview guide (Supplementary file 1) was designed based on the results of two systematic reviews [10,13] and previous relevant literature [14–16] specific to NTPA promotion in physiotherapy. The guide was piloted with one physiotherapist and reviewed by all co-authors prior to use. Yardley's criteria [17] was used to guide the design and completion of this study (Supplementary file 2).

Semi-structured interviews were conducted by the lead author face-to-face ($n = 6$), by telephone ($n = 2$) and online using a video service ($n = 2$). The reduced emphasis on structure in semi-structured interviews allows for flexible exploration of physiotherapists' experiences, making them the favoured data collection method for IPA-based qualitative studies [11,18].

Each interview was approximately 60-minutes in duration and was recorded. After rapport was established and the definition of NTPA was understood, all interviews commenced with the opening question "Can you please tell me about your experiences promoting non-treatment physical

activity?” The following topics were used to facilitate further discussion if the physiotherapist needed help choosing topics to discuss:

- The perceived barriers and facilitators to NTPA;
- Compatibility of NTPA promotion and physiotherapy;
- The support available to promote NTPA;
- The tools used to promote NTPA;
- Planning involved to promote NTPA;
- How patient presentation and expectations influence plans to promote NTPA; and
- The skills and training needed to promote NTPA and change patient behaviour.

2.5. Data analysis

Interviews were transcribed verbatim, read several times and summaries of each transcript were produced to foster familiarisation with the interviewees’ responses prior to entering data into NVivo 11 qualitative software (QSR International Pty Ltd, Melbourne, Australia). Codes were used to identify emergent and superordinate themes after repetitive interpretation and summarising [11]. Pseudonyms were used to identify quotes and de-identify interviewees. The Behaviour Change Technique Taxonomy was used to code the behaviour change techniques (BCTs) used to promote NTPA [19]. The written analysis and reasoning leading to the identification of emergent themes was reviewed by all interviewees prior to finalising superordinate themes. Consensus was reached with all interviewees, confirming accuracy of transcript interpretation, before additional evaluation by the authorship team. Emergent and superordinate themes were evaluated by two authors and, in the case of any discrepancies, final superordinate themes were decided by consensus with the research team.

3. Results

3.1. Interviewee characteristics

Ten interviewees were individually interviewed. The majority of interviewees worked in metropolitan private practices, saw more than 15 patients each week and had been practicing physiotherapy for longer than 5 years (Table 1). More than half of the interviewees were aged between 25–34 years, female and physically active. Most interviewees reported promoting NTPA.

3.2. Key themes

The themes identified from the interview transcripts were categorised into five emergent themes and four superordinate themes (Table 2).

Table 1. Demographic information of the 10 physiotherapists who participated in an interview on their experiences promoting non-treatment physical activity.

		n
Age	18–24	1
	25–34	7
	35–44	1
	45–54	1
Sex	Female	8
	Male	2
Work setting	Private practice	9
	Outpatients	1
Patients treated weekly	1–5	1
	6–15	1
	16–25	4
	26 +	4
Work location	Metropolitan	7
	Rural or regional	3
Years practicing physiotherapy	0–2 (graduate)	1
	3–5 (graduate)	3
	6–10 (experienced)	3
	11–15 (experienced)	1
	16 +(experienced)	2
Exercise science education*	Yes	4
	No	6
Health promotion education*	Yes	2
	No	8
Psychology education*	Yes	2
	No	8
PA level	Active [^]	6
	Half active [#]	3
	Inactive	1
Frequency of NTPA promotion	All of the time	2
	Often	5
	Sometimes	2
	Rarely	1
	Never	0

Notes: [^] Defined as meeting the minimum recommended physical activity level.

[#]Meeting recommended levels of cardiovascular OR strength activity.

* Having education in these areas was defined as having additional qualifications (e.g. diploma) or attending at least 10 hours of educational classes (e.g. professional development workshops).

‘Unsure’ results are not reported.

Table 2. The superordinate and emergent themes that arose from interviews with 10 physiotherapists about their experiences promoting non-treatment physical activity.

Superordinate themes	Emergent themes
Internal and external influences on NTPA promotion	Physiotherapist belief Patient expectations Workplace factors
Approach taken by the physiotherapist towards NTPA promotion	Use of behaviour change techniques Referral to other professionals
Challenges experienced when promoting NTPA	-
Skills and training	-

3.3. *Internal and external influences on NTPA promotion*

3.3.1. Physiotherapist belief

Most interviewees believed that they were well-placed to promote NTPA. Many interviewees thought each consultation should involve a discussion about healthy behaviours to ensure holistic care, with PA being considered a healthy behaviour that can also prevent subsequent injury.

“If they got a little bit fitter then probably their back pain would probably disappear or their knee pain would disappear or, actually, just their whole general mood would improve and, thus, most of their things would disappear” IB.

All interviewees perceived their role to include both treating musculoskeletal conditions and also promoting NTPA, despite them reporting that some patients and doctors think their primary role was to provide hands-on treatment.

“...physio is very much seen as hands-on here. And it’s expected by the doctors, it’s expected by the patients” FB.

3.3.2. Patient expectations

Patients were perceived by most interviewees as expecting hands-on treatment, not NTPA promotion. The patient was considered a customer who has paid for a service they have pre-determined. This saw interviewees prioritise providing hands-on treatment or rehabilitation exercises to treat the condition before NTPA promotion.

“...they’re paying for an appointment and they want you to not talk to them, they want you to put your hands on them” VR.

Many interviewees reported that patients were surprised when they introduced the topic of NTPA, particularly when the patient could not see how increasing PA levels was related to their presenting complaint. Some interviewees felt this surprise could damage their rapport with the patient. Several interviewees delayed promoting NTPA until they established good rapport (e.g. in later consultations where PA can be discussed in the context of injury prevention) or did not promote it at all to avoid damaging rapport. This problem was particularly evident in recent graduate physiotherapists (within 5 years of graduating physiotherapy) who felt patients trusted them less as they were less experienced.

“...if it comes from me, and they’ve come to me with a shoulder problem, and they kind of go ‘well how is this even relevant?’ and often they get quite defensive and that’s, quite, (they’re) sort of almost confrontational about the whole thing, which is challenging” IB.

3.3.3. Workplace factors

Several interviewees reported that having a multidisciplinary clinic with an open-plan layout facilitated NTPA promotion by allowing access to other professionals who can help to facilitate PA participation (e.g. exercise physiologists running exercise classes) and for patients to see others exercising. Some interviewees found the open-plan design prompted patients to ask the physiotherapist why others were exercising and if they should do it too, providing an opportunity to discuss NTPA.

Some interviewees reported that including PA messages in newsletters and on social media, as well as having staff actively commuting to work, was one way the clinic itself promoted NTPA to current and potential patients. Having management staff who promoted NTPA to their patients, valued health promotion and encouraged staff to learn how to promote NTPA made some interviewees feel NTPA promotion was their job.

“The partner who is driving this wellness and health promotion (program) is fantastic, he works tirelessly, we have new styles of classes being added, a high-intensity post-natal exercise class, that’s in the last 12 months” FB.

Most interviewees thought short consultation times (especially when patients present with multiple concerns), tight appointment schedules, uncertainty regarding insurance funding for NTPA promotion, and the expectation to only deliver services that patients expect contributed to less NTPA promotion.

Some workplaces had policies encouraging physiotherapists to refer patients to exercise physiologists for NTPA promotion. This made some interviewees feel their role was being restricted to treatment only, however others liked being able to refer the patient to another skilled professional.

“Our exercise physiolog(ists) get all our general physical activity ones, specifically physical activity. I’ll often get people who will be sent to me because they might have a large falls risk and they can’t do activity because they’re such a big falls risk or because they’ve got knee pain and they can’t do their other things” IB.

3.4. Approach taken by the physiotherapist towards NTPA promotion

Interviewees reported that patients responded better to NTPA advice if it considered their preferences (e.g. NTPA advice included active commuting if the patient enjoyed bike riding) and their symptoms. Tailoring PA advice often involved adding additional support (e.g. providing a referral to an exercise physiologist) or not prescribing the levels of PA outlined in the guidelines (e.g. 150–300 minutes of walking). Some interviewees felt prescribing enough walking to meet the guidelines was too much for someone who was currently inactive, potentially deterring the patient from doing any activity.

“For someone who’s done nothing, for you to tell them that they need to do 30 to 60 minutes of physical activity most days, at least 5 days a week, that’s going to be a bit overwhelming” BK.

3.4.1. Use of BCTs

Interviewees reported using *goal setting (behaviour)*, *action planning*, *graded tasks*, *problem solving*, *self-monitoring of behaviour* and *social support (unspecified)* to promote NTPA.

Self-monitoring devices (e.g. pedometers) were used by some interviewees to help patients monitor their activity levels. Interviewees reported that electronic devices and apps were more trustworthy and easier to use compared to conventional methods (e.g. paper-based exercise diary).

“She could actually see what she was achieving and she could see fluctuations and then she could correlate the number of steps with how well she was sleeping and how she was feeling” DB.

Some interviewees avoided using incentive and reward BCTs. Techniques to incentivise or reward a patient for being active were considered short-lasting and not conducive to long-term change.

“...have you actually kind of addressed why it was a problem or have you just kinda given them some sort of carrot, which in the short term is OK, but in the long term is that going to be very sustainable?” IB.

Social comparison was used by some interviewees who felt comparing inactive patients to active patients could motivate them to improve. In contrast, those who did not use it felt this BCT had the potential to demotivate patients if they felt they could not achieve the same amount of PA.

“I guess that can go either way, so like sometimes the patient is like ‘oh everyone is so much better than me, I’m never going to be that good’ and sometimes they’re like ‘oh yeah, that looks really interesting, that kind of looks fine’” KM.

3.4.2. Referral to other professionals

Most interviewees reported referring patients to trusted professionals for guidance to increase PA levels once the patient’s symptoms had improved. Interviewees considered experience, education and open communication as determinants of trust.

Most interviewees were unlikely to refer patients to professionals who lacked experience with injured patients. Having high-level skills and education in exercise prescription and injury prevention was considered necessary to avoid symptom aggravation and subsequent injury. High-level skills were considered those learnt during a university degree, meaning interviewees often referred patients to exercise physiologists before personal trainers.

“You have to have done your time (study), um because yeah, because I do get a lot of clients out of it (personal training) and because they go into it too hard too quick with patients and they get injured” BK.

Exercise physiologists were considered specialists in NTPA promotion for certain conditions (e.g. chronic disease) by many interviewees. Several interviewees would begin the discussion about increasing PA levels with patients and then refer them to an exercise physiologist for ongoing guidance.

“I think I have a base level of skill and I think they (exercise physiologists) do it better as an ongoing thing. I think they have more skill in it, yeah I think we get a very baseline level at uni, I think you pick up skills as you go depending on who you work with” IB.

3.5. Challenges experienced when promoting NTPA

Patients who were hesitant to increase their PA levels or had little motivation to become physically active made NTPA promotion difficult for most interviewees. Several interviewees felt the patient needed to be “*ready to change*” (KM) before they could help them.

“I’ll say, you know, ‘if you, if you change your mind, if you’re interested, I’m here, you can book an appointment any time and just come in and we’ll just start talking through your goals, but I can see that you’re not ready yet’. So, I mean, you know, you need to be ready and you need to want to do it. I can’t, I can’t force you there basically” FB.

Some interviewees felt frustrated when patients resisted their advice to become physically active, making them feel powerless, which impacted their job satisfaction.

“I kind of feel worthless. Like, what are we doing here? Is it worth you continuing or...if you’re not gunna listen to anything or do anything?” KM.

Consistent with this, FB commented:

“...makes me wanna quit physio some days. Some days you just feel like you’re pushing the snowball back up hill, you know, but, you gotta, you gotta enjoy your wins, as few and far between as they are” (The wins were interpreted as when a patient improves their PA levels in some way).

Some interviewees reported that they were not confident promoting NTPA, making them less likely to do it themselves and instead they would refer the patient to an exercise physiologist. One interviewee recited feeling uncomfortable when presented with a patient who only wanted NTPA promotion. This interviewee was not used to only promoting health within consultations.

“Yeah it made me quite on edge...trying to ask them and lead them to me maybe having a look at their neck to see if there’s any stiffness there, you know, treat them for something!” VR.

3.6. Skills and training

Many interviewees felt that any confidence they had to promote NTPA came from having health promotion skills and clinical experience. Several interviewees reported the NTPA promotion and behaviour change skills they possess came from clinical and personal experience (e.g. using techniques that have worked for themselves, or were suggested by patients or peers).

“I haven’t learnt anything about behaviour change techniques or motivational interviewing. If you asked me to give you the definition of motivational interviewing I wouldn’t have a clue” SB.

Most interviewees wanted more training in NTPA promotion and behaviour change. Specifically, they wanted to learn techniques to help unmotivated patients to increase their PA levels.

“Motivation’s really hard. Um, that’s probably the thing I struggle with most because if they don’t want to do it then they won’t do it” KM.

Graduate and experienced (graduated from physiotherapy more than 5 years ago) interviewees felt learning about NTPA promotion needed to occur in the professional development setting, as opposed to university, as an appreciation for health promotion was considered to increase with experience. Face-to-face (e.g. lectures, conferences) and online (e.g. online courses, journals and social media) methods were used by interviewees for professional development on various topics, with online methods considered better if no task practice was required. Several interviewees suggested a professional development workshop run by their workplace or professional association and facilitated by a behaviour change expert would help them to learn how to promote NTPA.

However, the cost and travel necessary to attend a workshop for rural and regional physiotherapists made their attendance unlikely.

“...by the time you get flights...there’s half my PD budget gone...getting to Sydney or Melbourne is probably 400 bucks at a minimum” FB, split quote.

4. Discussion

Physiotherapists believed that NTPA promotion is part of their role. However, it can be difficult to do. Physiotherapists reported tailoring their promotion approaches to the patient and using BCTs that they have learnt clinically, rather than at university. Workplaces that had staff who promoted NTPA and had an open-plan and multidisciplinary environment made NTPA promotion easier for physiotherapists. Physiotherapists often faced resistance from patients who attended physiotherapy sessions not expecting NTPA promotion but instead only expecting treatments for their presenting condition (e.g. hands-on therapy and exercises). Barriers like these, as well as low patient motivation and physiotherapist confidence in changing behaviours, resulted in many physiotherapists feeling frustrated and promoting NTPA less, or referring the patient to exercise physiologists. Most physiotherapists wanted additional training in changing behaviours of unmotivated patients and saw behaviour change experts as integral to this.

Physiotherapists in this study felt it was part of their role to promote NTPA, despite some patients and doctors seeing their role mainly in treatment. This finding is supported by a recent Australian survey that reported 98.8% of physiotherapists agreed it was their role to promote PA [20]. Results from a small Australian study of physiotherapy patients suggest that patients feel it is the role of the physiotherapist to promote NTPA. The Health Promoting Pilot Program run in Victoria, Australia over 2014–2015 surveyed 59 physiotherapy patients and found that 94.5% believed it is the role of the physiotherapist to promote NTPA [21]. Patients accepted that they would receive NTPA promotion from their physiotherapist because it was their role to do this [21]. Therefore, physiotherapists’ perceptions that patients expect hands-on therapy more than NTPA promotion might not be accurate in all cases.

Physiotherapists found their workplace could influence how easy NTPA promotion was by valuing health and PA promotion, providing an exercise-promoting environment and using advertising that includes PA messages. These findings are similar to those in a recent qualitative study that reported organisations facilitate PA promotion when they have values in-line with PA promotion, leaders committed to delivering promotion programs and appropriate facilities to support exercise [22]. Therefore, there are likely to be several factors external to the physiotherapist that influence NTPA promotion.

The clinic environment and the advertising used by the clinic can frame patients’ expectations of the service they will receive at that clinic [23]. Patient expectations are not met when advertising is not consistent with the services delivered; this can lead to patient dissatisfaction [23]. For example, having an image of someone getting a massage on the clinic window advertises a hands-on service, thus patient expectations might not be met when the physiotherapist promotes NTPA instead of providing massage. Not meeting the expectations of patients acted as a barrier to many interviewees promoting NTPA in this study. This finding is supported by a recent study that reported patients expecting passive therapy was a barrier for chiropractors prescribing exercise for low back pain management [24]. Additionally, not being able to promote NTPA, albeit clinically

indicated, due to the need to meet patient expectations (e.g. for massage) was expressed with frustration by several physiotherapists in this study, suggesting difficulty promoting NTPA might induce job-specific frustration. This type of conflict-induced frustration can contribute towards employee dissatisfaction [23]. Changes to the services advertised by a clinic (e.g. using people who are exercising in advertising) might make NTPA promotion easier for physiotherapists.

Musculoskeletal physiotherapists might not feel confident using psychology-based behaviour change interventions [25]. Physiotherapists in this study who were not confident promoting NTPA thought it was because they lacked the behaviour change skills necessary to do it. Australian podiatrists (another profession that has a role in PA promotion) have also reported that they lack behaviour change skills, limiting PA promotion [26]. Lack of PA counselling skills has been reported to reduce the odds (OR = 0.165, 95%CI 0.038 to 0.710) a physiotherapist will promote PA [20]. This might suggest additional training is needed, as training might improve confidence in delivering behaviour change interventions [27]. However, receiving training in how to deliver behaviour change interventions does not always mean that such interventions are delivered more often [28,29]. Thus, training in NTPA promotion alone is unlikely to lead to NTPA being promoted more often.

Physiotherapists stated that the behaviour change skills necessary for NTPA promotion came from clinical and life experience, as opposed to more formal (university or professional development) learning environments. A recent phenomenological study also found that life, learning and clinical experiences all influenced physiotherapists' practice [30]. Therefore, training and support for NTPA promotion might be best delivered within the clinical environment as opposed to a formal learning environment. Having PA champions has been suggested by health care professionals as useful to support them to promote exercise to patients with breast cancer [31] and are considered facilitators to health and PA promotion by primary care professionals [32] and stakeholders [16]. Having current staff who are PA champions who can provide formal (e.g. internal workshop) and informal (e.g. lunchroom discussion) support for NTPA promotion can provide the information physiotherapists seek while also avoiding any travel related barriers associated with formal education.

There are some potential limitations to this study. Social desirability bias might have been present between the interviewees and interviewer who were all physiotherapists. This might have seen interviewees change their responses to questions to please the interviewer or avoid ridicule. The use of telephone interviews in place of face-to-face interviews could be considered an inferior method of data collection due to the lack of non-verbal communication and increased reliance on verbal acknowledgements [33]. However, telephone interviews have been used successfully before for qualitative data collection and are considered a valuable alternative for when interviewees cannot attend in person [34]. Using telephone interviews allowed for more physiotherapists to participate in this study, particularly those who lived in rural and regional areas or did not have access to internet. Finally, following Yardley's criteria when designing and conducting this study provided the framework necessary for a high-quality study and ensured transparency when reporting findings.

5. Conclusion

Physiotherapists felt they were well placed to promote NTPA but faced several challenges. The apparent need to meet patient expectations and the modest perceived ability to change the behaviour

of unmotivated patients made NTPA promotion difficult for physiotherapists. Nevertheless, physiotherapists often tailored their PA advice to the patient, used BCTs to support PA adoption and referred patients to exercise physiologists for additional guidance. Physiotherapists felt NTPA promotion was facilitated by several workplace specific factors, notably having an open-plan environment and senior staff who valued NTPA promotion. Creating exercise-promoting clinical environments, which allow the physical features of the clinic to promote NTPA, could make NTPA promotion easier and less frustrating for physiotherapists.

Acknowledgements

This work was conducted by the first author as part of her PhD studies and was supervised by co-authors Professor Cook, Professor Finch, Doctor Kemp and Doctor O'Halloran. This research was partially funded by the Physiotherapy Research Foundation (Grant ID T16-BS001). Aspects of this research are related to the work of the Australian Centre for Research into Injury in Sport and its Prevention (ACRISP), which is one of the IOC centres of research excellence for the prevention of injuries and promotion of health in athletes. Ms Kunstler was supported by an Australian Government Research Training Program (RTP) Stipend and RTP Fee-Offset Scholarship through Federation University Australia, Dr Kemp is supported by an NHMRC Early Career Fellowship (ID 1119971) and Professor Cook is an NHMRC Practitioner Fellow (ID 1058493). The authors would like to thank Professor Penny Paliadelis for her guidance in designing this study.

Conflicts of interest

All authors declare no conflicts of interest in this paper.

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Supplementary files associated with Chapter 9**Supplementary file 1: The interview guide that was used to guide the questions asked and their order when conducting the 10 interviews during the interview study****Introductions**

Welcome the participant and thank them for participating.

Introduce myself.

Explain I will be taking brief notes to ensure I keep track of what we have and have not discussed.

Provide consent form and PLIS. Give the interviewee the chance to read through and ask questions if they need to.

The aim of this interview

The purpose of this interview is to determine the factors that impact your decision to encourage patients to become more physically active. The interview will begin by exploring your experiences promoting non-treatment physical activity and use behaviour change techniques. This will be followed by a discussion regarding your exposure to these concepts at university. We will then discuss if and when you use these techniques clinically and finish with determining your thoughts regarding the role of physiotherapists promoting non-treatment physical activity and using behaviour change techniques.

There are no right or wrong answers. I am interested in your views, opinions and beliefs. You are always going to be the expert on those.

The reason I am collecting this information is to learn how we can assist physiotherapists to encourage healthy practices, like physical activity, within their usual

clinical practice. Also, the findings from this study have the potential to inform the development of interventions testing the effectiveness of physiotherapist's efforts when promoting physical activity to their patients.

Your name and any other personal information will not be used to identify you during analysis of your answers or publishing the results. Responses to these questions will remain between you and me. I will be recording your responses on this device (BK to show participant recording device) and I will use the recording only to analyse your responses for the purpose of producing study results. The recording will not be shared with anyone.

Do you have any questions about any of that?

Ask the participant:

If they consent to participating in this study and to sign the consent form.

To turn off their phone, or put it on silent, and that I am turning on the recorders.

To introduce themselves for the recording.

Part 1: What influences the physiotherapist's decision to promote NTPA?

Provide the interviewee with the definition of NTPA

Provide interviewee opportunity to clarify the definition.

QUESTIONS START

Topic: Compatibility

Q1 “Some physiotherapists are unsure if NTPA promotion is compatible, or fits well, with regular daily practice. They also say that primary health care is more focused on treatment rather than disease prevention. Can you please tell me about your experiences promoting NTPA in a normal day and comment on how compatible this is with your daily practice?”

Prompts

1. How regularly do you promote NTPA to your patients?
2. Is promoting NTPA something you are interested in doing?
 - a. Do you want to promote non-treatment physical activity to patients with musculoskeletal injury?
 - b. Should physiotherapists be responsible for promoting non-treatment physical activity to patients?
 - i. Why/why not?
 - c. Do you refer patients to other professionals if they need help becoming physically active?
 - d. Is there another profession that should have more responsibility than physiotherapists for promoting non-treatment physical activity?
 - i. E.g.: psychologists, exercise physiologists, general practitioners and personal trainers.
 - e. If not interested in NTPA promotion, what about behaviour change more generally?

Topic: Time as a barrier

Q2 “Some physiotherapists have said that they don’t have enough time to promote NTPA in a typical consultation. Is time also a barrier for you, and do you have any other barriers?”

Prompts

1. How much time would it take you to promote NTPA to a patient?
 - a. What percentage of the consultation is spent promoting NTPA?
2. Is this amount of time too much or too little?
3. What type of information do you use to assist prioritising your patient’s problems?
4. Do you screen physical activity levels?
 - a. If yes: if your patient has low activity levels, how would you prioritise the need to increase activity levels?

Topic: Training/Skills/Knowledge

Q3 “Some physiotherapists have reported they are not trained to promote NTPA to patients. Can you please tell me if you feel you have the training to deliver this intervention (and why?)”

Prompts

1. Can you please rate from 1 to 10 how confident you feel promoting NTPA to your patients?
 - a. Can you please explain why you chose that score?
2. Have you learnt about NTPA at university?
3. What about at professional development seminars or courses?
4. Have you practiced promoting NTPA in any of these environments?
 - a. What skills do you think are required to promote NTPA effectively?

5. Have you done anything to try and maintain or improve your skills promoting NTPA?

Topic: Planning

Q4 “Some physiotherapists plan to promote NTPA, but these plans can be hard to follow when patients aren’t motivated. Have you tried to promote NTPA to a patient with low motivation?”

Prompts

1. How did you do this?
2. Do you think it worked?
3. Did you use any particular techniques?
4. Was it easy or hard? Why?

Topic: Support

Q5 “Some physiotherapists feel they get little support from government, health insurance companies and the workplace to promote non-treatment physical activity. Can you please tell me about the support you have received, or you feel you could benefit from, when promoting non-treatment physical activity?”

Prompts

1. What makes it easier to promote non-treatment physical activity to your patients?
2. What makes it more difficult?
3. What type of support would you find useful to help you promote NTPA to patients?
 - a. What can be changed to ensure you have the appropriate support to promote NTPA to your patients?
 - b. From government/insurance/workplace/other

Topic: Patient presentation

Q6 “Some physiotherapists have said they would be more inclined to promote NTPA to some patients more than others. I would like to know if your decision to promote NTPA depends on patient presentation. Can you please tell me if there are any patient-specific things that would make you more or less likely to promote NTPA?”

Prompts

1. Gender/weight/age/attitude of patient
2. Would your decision to (or not to) promote NTPA change if these patients were undergoing treatment for breast cancer?
 - a. Would NTPA promotion become a higher/lower/same priority given this information?
 - b. Does this mean you would be more/less/same inclined to promote NTPA to this patient?
3. What if, instead of being treated for cancer, this patient had a heart condition that was being managed by their doctor?
 - a. Would NTPA promotion become a higher/lower/same priority given this information?
 - b. Does this mean you would be more/less/same inclined to promote NTPA to this patient?

Part 2: What influences the physiotherapist’s decision to use BCTs when promoting NTPA?**Topic: Infrequent use of BCTs**

Provide the interviewee the list of BCTs and definitions found at the end of this guide.

Q7 “Is it within the physiotherapist’s scope of practice to change behaviour?”

Prompts

1. If yes, why?
2. If no, why not?

Provide interviewee with the definition of BCTs

Provide interviewee opportunity to clarify the definition.

Q8 “Some physiotherapists have reported they don’t use behaviour change techniques very often. Can you please look at these four BCTs and tell me if you HAVE used any of these?”

Prompts

1. What type of patient have you used this technique with?
2. When you used this technique, what were you trying to get your patient to do? For example, adhere to rehabilitation exercises.

Topic: Frequency of BCT use differs based on the behaviour being changed

Q9 “Some physiotherapists use BCTs more when encouraging patients to adhere to their exercises than when encouraging them to be physically active. What influences your choice whether or not to use BCTs?”

Prompts

1. Does your use of BCTs depend on anything?
 - a. E.g.: Evidence for efficacy, familiarity, social comparison, subjective norm, knowledge, skill, confidence, time, patient education level, patient presentation, treatment being delivered etc.
2. Is there a BCT on the sheet provided that you would not use?
3. What makes it easy to use BCTs?

4. What makes it hard?

Q10 “What type of support would you find useful to help you use behaviour change techniques?”

Prompts

1. Who should provide this support?
2. Is it important that physiotherapy students learn how to use behaviour change techniques?
3. Is it important that practicing physiotherapists learn how to use behaviour change techniques?
4. Have you learnt how to use BCTs at university or during any professional development sessions?

Topics end here Additional questions would ideally be covered, time permitting.

Q11 “Do you support patients change other behaviours? For example: smoking cessation, responsible alcohol consumption and weight loss.”

Prompts

1. Is it within the physiotherapist’s scope of practice to support these changes?

QUESTIONS END

This is the end of the interview. Would you like to add any final thoughts regarding the content we have explored today? Or do you have any questions for me?

I am going to turn the audio recording device off now. Anything you say once this has happened will not be used in the study.

Thank you for participating.

Behaviour Change Techniques*1. Identification of self as a role model*

Inform your patient that if they are physically active, that may be a good example for their children or partner.

2. Self-reward

Encourage your patient to reward themselves with material (e.g., new clothes) or other valued objects if, and only if, they have adhered to their exercise prescription.

3. Reward approximation

Arrange a reward (verbal or material) for any increase in physical activity, gradually requiring the daily physical activity level to become closer to the desired level.

4. Social support (practical)

Encourage the patient to ask their partner to place their walking shoes at the front door so that the patient remembers to go for a walk. Alternatively, you can ask the patient's partner directly to provide any practical assistance that they think will help the patient to remember to go for a walk.

5. Social comparison

Mention to the patient how well other patients with this condition are able to adhere to their exercise prescription. Compare the amount of exercise your patient does to the amount of exercise another patient in a similar situation does.

Supplementary file 2: Examples of how the interview study design met each of Yardley's criteria

Criterion	Example
Sensitivity to context	<p>Explained unexpected or contrasting findings.</p> <p>Explored the use of language.</p> <p>Related findings to context and previous literature.</p>
Commitment and rigour	<p>Followed an appropriate qualitative method (IPA).</p> <p>Used an appropriate sample that had a lot in common.</p> <p>Based the interview on comprehensive guide.</p>
Transparency and coherence	<p>Provided interviewee quotes to support analysis.</p> <p>Reflexivity – reported the values and position of interviewer.</p>
Impact and importance	<p>Results were discussed with relevance to current literature and the physiotherapy context.</p> <p>Impact on future research directions were discussed.</p>

Notes:

For an in-depth description of the above criteria, see Yardley, L. (2000). Dilemmas in qualitative health research. *Psychol. Health*, 15(2), 215-228.

doi:10.1080/08870440008400302

Section 5: Discussion and conclusions

This section draws this thesis together with a discussion of results and final conclusions.

List of abbreviations

BCT = Behaviour Change Technique

NTPA = Non-treatment physical activity

BCCTv1 = Behaviour Change Technique Taxonomy (version 1)

PA = Physical activity

DIBQ = Determinants of Implementation Behavior Questionnaire

PLPA = Physiotherapist-led physical activity

IPA = Interpretative Phenomenological Analysis

TDF = Theoretical Domains Framework

Summary

This thesis comprises several published and unpublished works that comprehensively examined the techniques physiotherapists use to promote NTPA and the factors that influence physiotherapists' decision to promote NTPA. The published works in this thesis include two systematic reviews, one national survey of 486 physiotherapists and one interview study including 10 physiotherapists (Table 5. 1). The work presented in this thesis has also been presented at six conferences and formed the basis of two articles written for two Australian Physiotherapy Association national newsletters (Appendix 1. 1 and Appendix 1. 2).

Main findings

The findings from the studies included in this thesis provide an insight into the methods physiotherapists used to promote NTPA, how efficacious their efforts were and the factors that influenced NTPA promotion frequency and, potentially, efficacy. The review in Chapter 3 found that physiotherapist-led PA promotion interventions doubled the odds of patients meeting PA guidelines, but PA improvements were not maintained. The review in Chapter 4 found that physiotherapists used more BCTs when delivering a PA promotion intervention as part of an experimental study compared to when they promoted PA clinically. The national survey in Chapter 7 found that physiotherapists used similar BCTs to promote NTPA as they did to encourage patients to adhere to their rehabilitation exercises. The survey (Chapter 6) also found that prioritising NTPA promotion over other treatments, knowing how to promote NTPA and using a promotion method conducive to regular clinical practice were all independently associated with NTPA promotion. Finally, the interview study in Chapter 9 found physiotherapists feel NTPA promotion was part of their role, but promoting NTPA

could be difficult to do. These main findings are outlined in Table 5. 1 and elaborated on throughout this chapter.

Table 5. 1 A summary of the findings from two systematic reviews, one national survey and one national interview study included in this thesis

	Objective	Chapter	Research question/s	Main findings	Practical implications
Systematic reviews	Establish the efficacy of PLPA interventions	3	Are PLPA interventions efficacious at increasing patient PA levels for those with, or at risk of, non-communicable disease?	PLPA interventions doubled the odds of patients meeting PA guidelines; and Small increases in total PA were seen in the short term (<1 year) only.	Physiotherapists can successfully increase patient PA levels.
	Identify the BCTs physiotherapists use to promote PA	4	What BCTs do physiotherapists use in clinical practice?	Physiotherapists use seven BCTs clinically, mainly <i>social support (practical)</i> and <i>social support (unspecified)</i> .	Physiotherapists use a small number of BCTs clinically. A small amount of research contributed to this finding.
			Do physiotherapists use different BCTs in experimental PLPA interventions?	Yes. Physiotherapists use 30 BCTs experimentally, mainly <i>goal setting (behaviour)</i> and <i>social support (unspecified)</i> .	Experimental PA interventions use different BCTs than the BCTs used by physiotherapists clinically. Thus, PA promotion might be performed differently clinically compared to experimentally.

	Objective	Chapter	Research question/s	Main findings	Practical implications
Survey	Establish the factors influencing NTPA promotion by Australian physiotherapists	6	What factors are associated with physiotherapists' decisions to promote NTPA to patients with musculoskeletal conditions?	<p>Factors that are bivariately associated with NTPA promotion include:</p> <ol style="list-style-type: none"> 1. Physiotherapists' PA level; and 2. Having exercise science qualifications. <p>Factors that are multivariately associated with NTPA promotion include:</p> <ol style="list-style-type: none"> 1. Knowing how to promote NTPA; 2. Prioritising NTPA promotion over other treatments; and 3. NTPA promotion is compatible with clinical practice. 	<p>Researchers and educators now know the factors that can influence physiotherapists' decision to promote NTPA. Considering these factors when designing new physiotherapist-led NTPA interventions and education programs is important to enhance intervention efficacy and support clinical integration of NTPA promotion.</p>
	Identify the BCTs Australian physiotherapists use to promote NTPA	7	What BCTs do Australian physiotherapists use when promoting NTPA to patients with musculoskeletal conditions?	Physiotherapists' mostly used <i>graded tasks</i> , <i>social reward</i> and <i>reward approximation</i> to promote NTPA.	Physiotherapists use similar BCTs to promote NTPA and encourage adherence to rehabilitation exercises. Future physiotherapist-led NTPA interventions can include BCTs physiotherapists use to encourage adherence to

	Objective	Chapter	Research question/s	Main findings	Practical implications
			What BCTs do Australian physiotherapists use to encourage patients with musculoskeletal conditions to adhere to rehabilitation exercises?	Physiotherapists' mostly used <i>graded tasks</i> , <i>social reward</i> , <i>reward approximation</i> and <i>body changes</i> to encourage adherence to rehabilitation exercises.	rehabilitation exercises. This will ensure the intervention is not entirely new to the physiotherapist charged with delivering it.
Interview study	Explore the experiences of Australian physiotherapists when promoting NTPA to patients with musculoskeletal conditions	9	What are the experiences of Australian physiotherapists promoting NTPA to patients with musculoskeletal conditions?	Superordinate themes included: <ol style="list-style-type: none"> 1. Internal and external influences on NTPA promotion; 2. Approach taken by the physiotherapist towards NTPA promotion; 3. Challenges experienced when promoting NTPA; and 4. Skills and training. 	The advertising and services used in the workplace made NTPA promotion easier for many physiotherapists (e.g. having a public social media page with PA-specific posts). Thus, integrating PA inspired advertising and services into the clinical setting might make NTPA promotion interventions more effective. Clinic management and marketing staff should be involved in experimental physiotherapist-led NTPA intervention design to ensure it fits well into the clinical environment.

The systematic reviews presented in Chapters 3 and 4 established the efficacy of PLPA interventions and also reported the BCTs physiotherapists used to promote PA. The first review (Chapter 3) used a meta-analysis to establish that PLPA interventions are efficacious at increasing patient PA levels but only in the short term (<1 year). Additionally, the odds of patients meeting the minimum recommended PA levels were doubled after receiving a PLPA intervention. A narrative analysis also demonstrated that PLPA interventions can increase the amount of PA patients performed at all intensities. Therefore, PLPA interventions can successfully increase PA levels; however, the increases are small and not maintained long term.

The second review (Chapter 4) established that physiotherapists use fewer BCTs to promote NTPA in observational studies compared to experimental studies. This suggests that physiotherapists use fewer BCTs when promoting PA clinically compared to when they promote NTPA as part of an intervention in an experimental study. Physiotherapists most commonly used *social support (unspecified)* in both observational and experimental studies. The BCTs used in efficacious interventions were compared to inefficacious interventions in a narrative analysis. The functions the BCTs gave the intervention were also compared. Overall, more BCTs were used in efficacious interventions compared to inefficacious interventions and the BCTs in the efficacious interventions also had a larger number of functions. Additionally, most interventions functioned to *enable* PA behaviour change. This suggests that the more BCTs and functions an intervention has, the more efficacious it is.

The national survey comprised two studies (Chapters 6 and 7). The survey tool was designed by the candidate and used a modified version of the DIBQ (Huijg, Gebhardt, et al., 2014) to measure factors influencing physiotherapists' decision to promote NTPA or not. The

tool also used the BCTTv1 (Michie, Richardson, et al., 2013) to display BCTs to respondents and ask which BCTs they do and do not use to promote NTPA and encourage patients to adhere to their rehabilitation exercises. The tool has now been published in a peer-reviewed journal article (Chapter 7), which demonstrates the value of the survey as meeting the aims of the study to the international community.

The first study (Chapter 6) identified the factors that influence physiotherapists' choice to promote NTPA. There were several factors that influenced NTPA promotion. The physiotherapists' own PA level, as well as having qualifications or education in exercise science, were bivariately associated with NTPA promotion frequency. Multivariable analysis demonstrated that three TDF behavioural domains were independently and significantly associated with NTPA promotion: Goals, Innovation and Knowledge. This suggests that the odds of promoting NTPA decrease if other treatments are considered more important (Domain: Goals). Additionally, the odds of promoting NTPA increase with greater knowledge of how to promote NTPA (Domain: Knowledge) and if the NTPA promotion intervention is compatible with regular clinical practice (Domain: Innovation). These findings suggest that both intrinsic (e.g. knowledge of how to promote NTPA) and extrinsic (e.g. compatibility of NTPA promotion with clinical practice) factors can influence the choice to promote NTPA.

The second study (Chapter 7) identified the BCTs Australian physiotherapists use to promote NTPA and encourage adherence to rehabilitation exercises. Physiotherapists used just over half of the BCTs included in the survey to promote NTPA and to encourage adherence to rehabilitation exercises. Physiotherapists mostly used the same BCTs for both NTPA promotion and encouraging adherence to rehabilitation exercises, with *graded tasks* being used the most. Physiotherapists also reported the BCTs they did not use, and these were

the same for both NTPA promotion and encouraging adherence to rehabilitation exercises. However, four BCTs were used more for one behaviour compared to the other. *Behavioural substitution* was mainly used to promote NTPA, whereas *adding objects to the environment*, *social comparison* and *discrepancy between current behaviour and goal* were mainly used to encourage adherence to rehabilitation exercises. Therefore, physiotherapists used similar BCTs for both NTPA promotion and encouraging adherence to rehabilitation exercises.

The interview study (Chapter 9) collected in-depth data on physiotherapists' experiences promoting NTPA. Overall, physiotherapists felt NTPA promotion was part of their role but they also found it challenging, leading to several physiotherapists either promoting NTPA less, or only promoting it strategically (e.g. only promoting NTPA after they had developed rapport with the patient). Physiotherapists reported NTPA promotion was dictated by patient expectations; if the patient expected hands-on treatment, but not NTPA promotion, then the physiotherapist was inclined to provide only hands-on treatment. Several physiotherapists felt workplace factors, such as having managers who encouraged staff to promote NTPA and having an open-plan clinic design, made NTPA promotion easier. Most physiotherapists reported not having sufficient skills to promote NTPA, particularly to unmotivated patients, and this was one reason to refer the patient to another suitable professional (e.g. exercise physiologists). Finally, physiotherapists mentioned using few BCTs and felt their knowledge of how to use them came from personal experience rather than formal education.

The factors influencing NTPA promotion by physiotherapists

The factors influencing NTPA promotion were identified from both the national survey (Chapter 6) and the face-to-face interviews (Chapter 9). The behavioural domains independently associated with NTPA promotion were identified using logistic regression and were discussed in the survey manuscript in Chapter 6. However, the bivariate associations between behavioural domains and NTPA promotion were minimally discussed in the manuscript. Both multivariate and bivariate results will be discussed here.

All behavioural domains, except two, were bivariately associated with NTPA promotion (Appendix 3. 12). This suggests there is a relationship between the factors that influence how physiotherapists behave (the TDF behavioural domains) and how often they will promote NTPA.

Goals and Negative Emotions were negatively associated with NTPA promotion. The negative association between Goals and NTPA promotion suggests that physiotherapists who irregularly promote NTPA prioritise other treatments over NTPA promotion. The Negative Emotions domain was also identified as independently and significantly associated with NTPA promotion. The negative association between Negative Emotions and NTPA promotion suggests that physiotherapists who promoted NTPA less felt negative while promoting it (e.g. they felt nervous). Thus, supporting physiotherapists to promote NTPA should involve strategies to prioritise NTPA promotion and overcome any negative emotions experienced when promoting NTPA.

Intention was positively associated with NTPA promotion. This suggests that having the intention to promote NTPA was associated with promoting NTPA more often. A positive correlation between intending to promote PA and promoting PA has been previously reported

in a study examining 278 physiotherapist and nurses (Sassen et al., 2011). The authors of this longitudinal study concluded that having high intentions to promote PA predicted PA promotion, suggesting intention predicts behaviour. However, only 39.7% of the respondents in this study who had high intentions to promote PA actually promoted it (Sassen et al., 2011). Thus, it is necessary to find efficacious ways to narrow the gap between having the intention to promote NTPA and actually promoting NTPA.

The Beliefs about Capability, Behavioural Regulation, Beliefs about Consequences, Positive Emotions, Skills and Nature of the Behaviour domains were all positively associated with NTPA promotion. This suggests that Australian physiotherapists who promoted NTPA more often scored higher for these behavioural domains. These domains have also been identified as associated with Dutch physiotherapists' intervention fidelity when delivering PA interventions (Huijg, Dusseldorp, et al., 2014). However, this cross-sectional study reported these domains as predictors of PA intervention fidelity, suggesting these domains have strong, independent associations with PA intervention fidelity. These domains were not independently associated with NTPA promotion in the national survey contained in this thesis, possibly because the study was not sufficiently powered to observe such associations.

The results of the multivariate analysis produced a model that included nine variables (Table 3. 7). This model correctly predicted NTPA promotion frequency 70.2% of the time. Therefore, the variables in this model can be used together to identify the chance a physiotherapist will promote NTPA or not. This finding is important, as using nine variables (comprised of 25 questions) in a survey will take less time to complete, and will be more practical for clinicians and researchers to use, compared to completing the 65 questions used in the survey in this thesis. The greatest contributors to the regression model were the

behavioural domains Goals, Innovation and Knowledge. This suggests that these sections of a short-form of this survey can be used to indicate if the physiotherapist will promote NTPA.

The finding that Goals, Innovation and Knowledge each independently influenced NTPA promotion is similar to the findings of the study by Huijg, Dusseldorp, et al. (2014). Huijg, Dusseldorp, et al. (2014) identified the predictors of completeness and quality of experimental PA intervention delivery by 268 physiotherapists in the Netherlands. The authors found that Knowledge was one of the most important predictors of completeness (C) and quality (Q) of PA intervention delivery (C: $b = 0.20$ [95%CI 0.11 – 0.30], Q: $b = 0.30$ [95%CI 0.19 – 0.40]) (Huijg, Dusseldorp, et al., 2014). Goals (C: $b = 0.09$ [95%CI 0.02 – 0.16], Q: $b = 0.08$ [95%CI 0.00 – 0.16]) and Innovation (C: $b = 0.14$ [95%CI 0.04 – 0.24], Q: $b = 0.24$ [95%CI 0.13 – 0.35]) were also significantly associated with completeness and quality of intervention delivery. Thus, these three domains may be associated with not only the frequency of NTPA promotion (as seen in Chapter 6) but also the quality and completeness of PA intervention delivery. However, it must be noted that both studies that contributed to this conclusion were completed in different countries (Australia and the Netherlands), potentially limiting the generalisability of this conclusion to Australian physiotherapists.

Chapter 6 reported NTPA promotion frequency as a dichotomous variable (irregularly/always). The percentage of physiotherapists who irregularly (never, rarely, sometimes, often) promoted NTPA was 56.6% and the percentage of those who always (all of the time) promoted NTPA was 43.4% (85.1% of physiotherapists promoted NTPA often or all of the time). This is fewer than the 77.9% of Irish primary care physiotherapists who always promoted PA (163/209) (O'Donoghue et al., 2014) and the 99.0% of the 110 Dutch

physiotherapists who always or regularly promoted PA to patients with rheumatoid arthritis (Hurkmans et al., 2011). It is unclear if the latter study examined NTPA promotion or a broader definition of PA that includes its use as a treatment. The former study reviewed risk factors for NCDs, which suggests PA for general health (NTPA) was the topic. Narrowing the breadth of PA (e.g. NTPA rather than PA more generally) could potentially reduce the number of physiotherapists reporting that they promote PA. This would support the observation that fewer physiotherapists promoted PA in the national survey in this thesis and in O'Donoghue et al. (2014), compared to Hurkmans et al. (2011). Contextual differences (e.g. education) between Australia and European countries might also explain the differences between promotion rates, and these will be discussed later in this section.

The interview study found physiotherapists often referred patients to exercise physiologists for PA guidance, even if they felt it was their role to promote NTPA. This suggests that the promotion efforts of physiotherapists might only include introducing the topic of increasing PA levels and providing a referral to an exercise physiologist. An Australian qualitative study that explored the attitudes and beliefs of podiatrists towards PA promotion also found some podiatrists feel it is their role to promote PA (Crisford et al., 2013). However, they would regularly refer patients to physiotherapists, general practitioners and exercise physiologists for PA guidance (Crisford et al., 2013). Dieticians in the UK have also reported referring patients to other professionals for PA guidance, despite feeling PA promotion was part of their role (McKenna et al., 2004). Therefore, several health professionals tend to refer patients out of the clinic for help with PA, despite cost-effectiveness of exercise referral programs being marginal (Ewald et al., 2018) and efficacy being small (Williams et al., 2007) or unclear (Pavey et al., 2011). Referral adds more

expense for the patient, which might act a barrier to seeking the care they need (Corscadden et al., 2017). It is important to empower physiotherapists to promote NTPA themselves to reduce patient burden and potentially enhance patient PA outcomes.

Physiotherapists are taught to set specific, measurable, achievable, realistic, timely and self-determined (SMARTS) goals with patients to help them achieve their goals (Pescatello & American College of Sports Medicine, 2014). However, the interview study in Chapter 9 demonstrated that physiotherapists might not apply this approach in practice. Physiotherapists reported setting goals with patients in an unstructured way (i.e. not by using SMARTS goals) and did not encourage them to achieve the targets outlined in the PA guidelines, but to instead to do what they could. A similar general approach to PA promotion was also reported in a recent UK qualitative study of 12 physiotherapists (Lowe, Littlewood & McLean, 2018). Physiotherapists in the interview study also reported the goals they set with the patient were tailored to the patient and took into account the patient's symptoms and preferences. Podiatrists have also reported promoting NTPA a similar way (Crisford et al., 2013). This general approach could be more successful than setting SMARTS goals, as rigid and structured goals can be perceived as too challenging by the patient, potentially resulting in the patient doing nothing at all (Swann & Rosenbaum, in press)¹.

The majority of physiotherapists felt that patients who only expect treatment, such as hands-on therapy, as opposed to advice on disease prevention (e.g. NTPA promotion) acted a barrier to them promoting NTPA. This barrier has also been reported by podiatrists (Crisford et al., 2013) and in a recent review of the use of psychological interventions by

¹ The concepts discussed in this paragraph have been discussed in greater detail in a newsletter publication written by the candidate. See Appendix 1. 2.

physiotherapists (Driver et al., 2017). When asked to discuss lifestyle behaviour change interventions, 40-74 year old patients at risk of vascular disease and eligible for a government funded health check have reported feeling their health is determined by fate or they are too old to see any worthwhile effects of health behaviour change (Elwell et al., 2013). Therefore, NTPA promotion might not be a priority for a patient, and might appear unsuited to a physiotherapy consultation.

A recent observational study reported the expectations Australian adult patients have when attending private practice physiotherapy clinics (McRae & Hancock, 2017). The majority of the 500 patients surveyed reported improved function (93.0%), injury prevention (90.0%) and pain relief (89.0%) were important reasons to see a physiotherapist (McRae et al., 2017). It can be deduced from this that physiotherapists are expected to improve the patient's function (e.g. performing work-specific activities), prevent injury (e.g. prevent knee pain returning) and relieve pain during consultations. Therefore, physiotherapists' beliefs about patients specifically expecting hands-on therapy, as opposed to other treatments like NTPA promotion, might be unfounded. However, it must be noted that the above study only surveyed patients from ten clinics in Sydney, Australia, reducing generalisability to other Australian metropolitan, rural and regional clinics.

Physiotherapists should be made aware of the above evidence-based patient expectations during their training and integrate their NTPA promotion efforts into consultations that aim to meet those expectations. Promotion of NTPA can be integrated into consultations by ensuring the patient perceives NTPA promotion as relevant. For example, a physiotherapist might promote NTPA to an obese patient presenting with osteoarthritic knee pain. The physiotherapist can explain to the patient that increasing PA can assist in weight

loss, which can reduce knee pain symptoms (Messier et al., 2013). Thus, the patient is being encouraged to increase their PA for general health reasons (e.g. lose weight). In addition, PA is also being used to treat the knee pain and as a strategy to prevent the pain returning (which, as a result, can also facilitate the patient's performance of work-specific activities).

The BCTs used by physiotherapists

The systematic review in Chapter 4 reported the BCTs used the most in efficacious physiotherapist-led PA interventions. As Chapter 7 showed, physiotherapists used all but two of these BCTs (*social support [unspecified]* and *credible source*) (Table 5. 2). In Chapter 9, several interviewees reported using *social support (unspecified)* by encouraging the patient to attend exercise groups or go walking with family or friends. However, some interviewees also reported not using *social support (unspecified)* because using external supports (e.g. family or friends) might foster an external locus of control in the patient, where the patient adopts external reasons to participate in PA. Adopting an internal locus of control for PA, where the patient relies on themselves rather than others, was considered important for PA success by many physiotherapists. The example of *social support (unspecified)* used in the survey in Chapter 7 involved Brian's wife providing Brian with opportunities to exercise. Survey respondents might have interpreted this situation as the physiotherapist encouraging Brian to adopt an external locus of control, where Brian's PA participation becomes his wife's responsibility. Therefore, it is unlikely that most physiotherapists do not use *social support (unspecified)*, but instead they might use it in a different way than that presented in the survey.

Using a *credible source*, for example a video about the benefits of PA filmed by a health care professional, to advise overweight and obese adults to lose weight can triple the odds of adults adopting weight loss behaviours like PA (Loprinzi & Davis, 2017). Interviewees rarely mentioned using *credible source* when describing how they promote NTPA. When interviewees did mention using *credible source*, the source was usually themselves, another health care professional or a reference to evidence on the benefits of PA. The survey tool presented in this thesis included an example of using *credible source* whereby a physiotherapist encouraged Brian to watch an online video made by a doctor. It might not be regular practice for physiotherapists to use external *credible sources* to promote NTPA (e.g. online videos), suggesting they would rather rely on their own credibility or that of a colleague.

The systematic review contained in Chapter 4 reported that physiotherapists used seven BCTs to promote NTPA clinically. Australian physiotherapists reported using four of these BCTs in the national survey (Table 5. 2). *Social support (unspecified)* and *social support (practical)* were used by physiotherapists in the review but not in the survey. As mentioned previously, this might be due to physiotherapists perceiving this BCT as fostering an external locus of control for PA. *Identification of self as a role model* was also identified in the review but was not used by the majority of survey respondents. Most interviewees in the interview study also reported they did not use *identification of self as a role model*, with one interviewee considering it a form of “manipulation”. Interviewees felt using this BCT would make the patient feel like they currently were not a good role model (e.g. for their children), and this could damage rapport. Therefore, physiotherapists might avoid using this BCT as it might damage their relationship with the patient.

The number of physiotherapists who reported that they used *adding objects to the environment, commitment, discrepancy between current behaviour and goal, restructuring the physical environment* and *restructuring the social environment* in the survey was almost equal to the number of physiotherapists who reported that they did not use them (Table 5. 2). This suggests that BCT choice can be individual and influenced by many factors, such as knowing that the technique exists. Not knowing the techniques that can be used to promote PA has been identified as a barrier for Australian podiatrists (Crisford et al., 2013). The physiotherapists who did not use the BCTs might not know they exist, rather than decide not to use them for any specific reason. Therefore, NTPA promotion interventions to be delivered by physiotherapists should not be static and assume that most physiotherapists will be familiar with, and use, the same BCTs. Instead, a dynamic approach that allows the physiotherapist the autonomy to choose the BCTs they use to suit their, and their patient's, situation is important.

Physiotherapists who are unfamiliar with, or do not use, a BCT included in a NTPA intervention might intentionally avoid using it. Avoiding using a component of an intervention might have a negative effect on intervention fidelity, and potentially efficacy, as the intervention is not being delivered as intended or designed. To avoid this, NTPA promotion intervention design should focus less on the component BCTs and instead focus on the functions the BCT gives the intervention (the BCT's 'intervention function'). Intervention functions were introduced in Chapter 1 and applied in Chapter 7. For example, a NTPA promotion intervention might function to *coerce* people into becoming more active (Intervention function: Coercion). *Punishment* and *anticipated regret* both have the *coercion* function (Michie et al., 2014). Instead of asking physiotherapists to use *punishment* or

anticipated regret when promoting PA, which most physiotherapists do not use (Table 5. 2), they could be asked to choose a related BCT that also acts to *coerce* but is one they have used before and is appropriate to their situation. The physiotherapist could use *feedback on behaviour* instead, which is a BCT most physiotherapists use and has the *coercion* function. This dynamic or flexible approach provides the physiotherapist with a ‘buffet’ of BCTs they can choose from, while ensuring their NTPA promotion efforts are tailored to the patient and the situation (Table 5. 3, 5.4 and 5. 5).

Table 5. 2 The BCTs used by physiotherapists who promote NTPA: a comparison between previous research and national survey results

BCTs	Systematic review		Survey	
	Number of experimental studies with this BCT (9 studies)	Number of observational studies with this BCT (3 studies)	Number (%) of Australian physiotherapists who used this BCT to promote NTPA	Number (%) of Australian physiotherapists who did not use this BCT to promote NTPA
Action planning	4	-	108 (46.8) <i>n</i> = 231	71 (30.7) <i>n</i> = 231
Adding objects to the environment	1	-	87 (39.4) <i>n</i> = 221	89 (40.3) <i>n</i> = 221
Anticipated regret	-	-	29 (13.6) <i>n</i> = 224	149 (69.6) <i>n</i> = 224
Behaviour substitution	-	-	99 (46.1) <i>n</i> = 231	76 (35.4) <i>n</i> = 231
Behavioural contract	1	-	25 (10.8) <i>n</i> = 231	198 (85.7) <i>n</i> = 231
Behavioural practice and rehearsal	2	-	138 (58.0) <i>n</i> = 238	56 (23.5) <i>n</i> = 238
Biofeedback	-	-	46 (21.5) <i>n</i> = 214	137 (64.0) <i>n</i> = 214
Body changes	1	-	152 (63.9) <i>n</i> = 238	53 (22.3) <i>n</i> = 238
Commitment	1	-	93 (40.3) <i>n</i> = 231	85 (36.8) <i>n</i> = 231

BCTs	Systematic review		Survey	
	Number of experimental studies with this BCT (9 studies)	Number of observational studies with this BCT (3 studies)	Number (%) of Australian physiotherapists who used this BCT to promote NTPA	Number (%) of Australian physiotherapists who did not use this BCT to promote NTPA
Comparative imagining of future outcomes	-	-	56 (26.1) <i>n</i> = 215	122 (56.7) <i>n</i> = 215
Credible source	4	-	51 (21.4) <i>n</i> = 238	155 (65.1) <i>n</i> = 238
Demonstration of the behaviour	-	-	102 (44.2) <i>n</i> = 231	92 (39.8) <i>n</i> = 231
Discrepancy between current behaviour and goal	-	-	77 (35.8) <i>n</i> = 215	84 (39.1) <i>n</i> = 215
Exposure	1	-	N/A	N/A
Feedback on behaviour	2	-	146 (66.1) <i>n</i> = 221	45 (20.4) <i>n</i> = 221
Feedback on outcome(s) of behaviour	1	-	125 (56.6) <i>n</i> = 221	52 (23.5) <i>n</i> = 221
Focus on past success	-	-	116 (52.5) <i>n</i> = 221	67 (30.3) <i>n</i> = 221
Framing/reframing	-	-	91 (42.3) <i>n</i> = 215	80 (37.2) <i>n</i> = 215
Goal setting (behaviour)	6	-	127 (55.0) <i>n</i> = 231	57 (24.7) <i>n</i> = 231
Goal setting (outcome)	2	-	108 (46.8) <i>n</i> = 231	78 (33.8) <i>n</i> = 231

BCTs	Systematic review		Survey	
	Number of experimental studies with this BCT (9 studies)	Number of observational studies with this BCT (3 studies)	Number (%) of Australian physiotherapists who used this BCT to promote NTPA	Number (%) of Australian physiotherapists who did not use this BCT to promote NTPA
Graded tasks	1	-	173 (74.9) <i>n</i> = 231	29 (12.6) <i>n</i> = 231
Identification of self as a role model	-	1	58 (24.4) <i>n</i> = 238	146 (61.3) <i>n</i> = 238
Identity associated with changed behaviour	1	-	N/A	N/A
Information about emotional consequences	-	1	129 (54.2) <i>n</i> = 238	60 (25.2) <i>n</i> = 238
Information about health consequences	1	1	133 (55.9) <i>n</i> = 238	63 (26.5) <i>n</i> = 238
Information about social and environmental consequences	4	1	99 (41.6) <i>n</i> = 238	91 (38.2) <i>n</i> = 238
Instruction on how to perform the behaviour	5	1	123 (53.3) <i>n</i> = 231	68 (29.4) <i>n</i> = 231
Material reward (behaviour)	-	-	26 (12.1) <i>n</i> = 215	173 (80.5) <i>n</i> = 215
Monitoring of outcome(s) of behaviour by others without feedback	1	-	35 (16.4) <i>n</i> = 214	150 (70.1) <i>n</i> = 214
Non-specific reward	1	-	N/A	N/A

BCTs	Systematic review		Survey	
	Number of experimental studies with this BCT (9 studies)	Number of observational studies with this BCT (3 studies)	Number (%) of Australian physiotherapists who used this BCT to promote NTPA	Number (%) of Australian physiotherapists who did not use this BCT to promote NTPA
Pharmacological support	-	-	64 (26.9) <i>n</i> = 238	136 (57.1) <i>n</i> = 238
Problem solving	5	-	128 (55.4) <i>n</i> = 231	67 (29.0) <i>n</i> = 231
Prompts/cues	-	-	107 (48.4) <i>n</i> = 221	63 (28.5) <i>n</i> = 221
Pros and cons	2	-	58 (24.4) <i>n</i> = 238	134 (56.3) <i>n</i> = 238
Punishment	-	-	11 (5.1) <i>n</i> = 214	194 (90.7) <i>n</i> = 214
Reducing negative emotions	1	-	102 (47.4) <i>n</i> = 215	70 (32.6) <i>n</i> = 215
Restructuring the physical environment	1	-	91 (41.2) <i>n</i> = 221	90 (40.7) <i>n</i> = 221
Restructuring the social environment	-	-	90 (40.7) <i>n</i> = 221	94 (42.5) <i>n</i> = 221
Review behaviour goals	2	-	108 (48.9) <i>n</i> = 221	73 (33.0) <i>n</i> = 221
Review outcome goal(s)	2	-	109 (49.3) <i>n</i> = 221	62 (28.1) <i>n</i> = 221
Reward approximation	-	-	160 (72.4) <i>n</i> = 221	32 (14.5) <i>n</i> = 221

BCTs	Systematic review		Survey	
	Number of experimental studies with this BCT (9 studies)	Number of observational studies with this BCT (3 studies)	Number (%) of Australian physiotherapists who used this BCT to promote NTPA	Number (%) of Australian physiotherapists who did not use this BCT to promote NTPA
Salience of consequences	-	-	31 (14.5) <i>n</i> = 214	159 (74.3) <i>n</i> = 214
Self-incentive	-	-	51 (23.7) <i>n</i> = 215	137 (63.7) <i>n</i> = 215
Self-monitoring of behaviour	2	-	45 (19.5) <i>n</i> = 231	151 (65.4) <i>n</i> = 231
Self-monitoring of outcome(s) of behaviour	2	-	46 (19.9) <i>n</i> = 231	151 (65.4) <i>n</i> = 231
Self-reward	-	-	38 (17.7) <i>n</i> = 215	157 (73.0) <i>n</i> = 215
Self-talk	-	-	76 (35.4) <i>n</i> = 215	103 (47.9) <i>n</i> = 215
Social comparison	-	-	79 (36.9) <i>n</i> = 214	96 (44.9) <i>n</i> = 214
Social reward	2	-	163 (73.8) <i>n</i> = 221	27 (12.2) <i>n</i> = 221
Social support (practical)	3	2	74 (33.5) <i>n</i> = 221	104 (47.1) <i>n</i> = 221
Social support (unspecified)	6	2	80 (36.2) <i>n</i> = 221	92 (41.6) <i>n</i> = 221
Verbal persuasion about capability	-	-	123 (55.7) <i>n</i> = 221	51 (23.1) <i>n</i> = 221

BCTs	Systematic review		Survey	
	Number of experimental studies with this BCT (9 studies)	Number of observational studies with this BCT (3 studies)	Number (%) of Australian physiotherapists who used this BCT to promote NTPA	Number (%) of Australian physiotherapists who did not use this BCT to promote NTPA
Vicarious consequences	-	-	43 (20.0) <i>n</i> = 215	144 (67.0) <i>n</i> = 215

Notes:

Majority responses are **bolded**

The percentages of used and not-used responses for each BCT will not add to 100.0% as the category ‘about half the time’ has been removed from the table

Used and not-used percentages are considered similar if they are within 5.0% of each other. Both response categories are **bolded** in this case.

N/A: The BCT was not included in the survey tool

Eleven of the BCTs physiotherapists used for both promoting NTPA and encouraging adherence to rehabilitation exercises were reported as used more for encouraging adherence to rehabilitation exercises (*Figure 5. 1*). In contrast, no BCTs included in the survey were used more to promote NTPA. The BCTs might be used more for encouraging adherence to rehabilitation exercises because Australian physiotherapists are likely to spend more time encouraging adherence to rehabilitation exercises than promoting NTPA, hence they had more experiences to reflect on while completing the survey.

Action planning, information about health consequences and prompts/cues have been used within an efficacious physiotherapist-led program targeted at improving exercise adherence by 93 patients with chronic low back pain (Friedrich et al., 1998). Furthermore, a recent systematic review reported *goal setting (behaviour)*, *goal setting (outcome)* and *instruction on how to perform the behaviour* can help patients to adhere to self-management strategies (Peek et al., 2016). Thus, several of the BCTs outlined in *Figure 5. 1* as used by physiotherapists primarily to encourage adherence to rehabilitation exercises are established evidence-based techniques. It is important to note that Peek et al. (2016) also identified that using *self-monitoring of behaviour* could also assist adherence, yet this BCT was not used by the majority of physiotherapists who responded to the survey.

Action planning
Body changes
Demonstration of the behaviour
Feedback on outcomes of behaviour
Goal setting (behaviour)
Goal setting (outcome)
Information about health consequences
Instruction on how to perform the behaviour
Prompts/cues
Review behaviour goals
Review outcome goals

Figure 5. 1 The BCTs used by physiotherapists to encourage adherence to rehabilitation exercises more than to promote NTPA

Note:

The difference between the percentage of physiotherapists who used these BCTs to encourage adherence to rehabilitation exercises compared to promoting NTPA was more than 15.0%

Four BCTs were either used more to promote NTPA or to encourage adherence to rehabilitation exercises. *Behaviour substitution* was used more to promote NTPA. *Adding objects to the environment*, *social comparison* and *discrepancy between current behaviour and goal* were used more to encourage adherence to rehabilitation exercises. A recent Irish RCT including 40 patients with ankylosing spondylosis reported a physiotherapist-led PA intervention successfully increased PA levels by 58 minutes per week at 6 months (O'Dwyer et al., 2017). The intervention included many BCTs, including *behaviour substitution*, *social comparison* and *discrepancy between current behaviour and goal*. Thus, the intervention was successful, despite including BCTs that Australian physiotherapists rarely use to promote NTPA.

Through personal communication with the lead author, the candidate established that Dr O'Dwyer was the only person who delivered the intervention. He is an Irish physiotherapist and has training in motivational interviewing, health promotion and psychology, and has a degree in communication studies. Health promotion and psychology was integrated into the physiotherapy degree Dr O'Dwyer completed in Ireland. Dr O'Dwyer stated that delivering the BCTs as part of the intervention was easy due to his extensive training. It is uncertain if Australian physiotherapists would have the same degree of success when promoting NTPA without having these additional specialisations.

The results from the interview study (Chapter 9) demonstrated that some physiotherapists were unsure of how to use motivational interviewing and the results from the national survey (Chapter 6) indicated most physiotherapists did not have extra-curricular qualifications in health promotion or psychology. Only 46.2% of accredited Australian physiotherapy programs include health promotion in the curriculum (Bodner et al., 2013), suggesting health promotion skills are not frequently taught at the university level in Australia. Thus, it should not be expected that the PA improvements reported in the O'Dwyer, Monaghan, et al., (2017) study could be replicated in the Australian context due to Irish physiotherapists having additional skills compared to Australian physiotherapists. Interventions tailored to the Australian clinical environment are urgently needed.

Future educational and clinical actions

Having sufficient knowledge to promote NTPA, as well as having qualifications or education in exercise science, were associated with greater NTPA promotion. Integrating NTPA promotion educational materials into university programs might lead to more

physiotherapists having the knowledge to make “every contact count” (Gates et al., 2017, p. 768) and promote NTPA to every patient. A small pilot study reviewed the acceptability and perceived benefit of integrating PA promotion resources into the Bachelor of Physiotherapy degree at the University of Canberra (Freene, 2017). Students received the resources positively but those with exercise science qualifications did not gain additional knowledge (Freene, 2017). This suggests physiotherapy degrees that incorporate exercise science qualifications (e.g. Bachelor of Exercise Science Master of Physiotherapy double degrees) might provide more guidance on NTPA promotion compared to the conventional Bachelor of Physiotherapy degree. Thus, university programs in Australia that do not have an exercise component might benefit from additional exercise science content to improve NTPA promotion knowledge.

This thesis primarily focused on the physiotherapist improving patient PA levels. However, increasing physiotherapists’ own PA level might be one way to support them to promote NTPA. Physiotherapists and physicians who are physically active themselves, or value PA and living a healthy lifestyle are more inclined to promote PA (Abramson et al., 2000; Aweto et al., 2013; Huijg et al., 2015; Lobelo & de Quevedo, 2016; Shirley et al., 2010). A 4-year pilot intervention to improve medical student health delivered over the length of their degree resulted in 56.0% greater odds of students providing exercise counselling to patients at the end of their degree, and more students maintaining baseline PA levels compared to the control group (Frank et al., 2007). Therefore, focussing on supporting physiotherapy students during their degree to adopt healthy behaviours themselves might facilitate NTPA promotion upon graduation.

New physiotherapist-led NTPA interventions must fit well, or be compatible with, Australian physiotherapists' current practice. This means new interventions must integrate easily into current practice. One way of doing this is to reduce the number of new skills a physiotherapist needs to learn to deliver the intervention. This can be done by ensuring the components of the new intervention are familiar to the physiotherapist and have been used before. Therefore, integrating the BCTs that physiotherapists use to promote NTPA and encourage adherence to rehabilitation exercises (e.g. *graded tasks*) into new interventions could make the intervention easier to deliver, improving the fit of the intervention with the clinical context.

Interventions might be easier to deliver if clinical practices identify as PA-promoting clinics. Physiotherapists are likely to feel more comfortable promoting NTPA if it is in-line with the values of the clinic and is expected by patients (Zeithaml et al., 2009). Therefore, clinic management and staff might need to review their workplace values and integrate NTPA or health promotion. Patient expectations also need to be managed to make NTPA easier for physiotherapists. Marketing can influence patient expectations by advertising a particular service offered by a clinic (Zeithaml et al., 2009). For example, if a clinic has an image of someone receiving a massage on the front window, patients will expect a massage at that clinic. Thus, as part of identifying as a PA-promoting clinic, the clinic could change this image to one of someone walking with friends. This could see patients expect that their time with the physiotherapist will involve some discussion around active pursuits, rather than only hands-on or passive therapy. Future NTPA interventions need to test how incorporating PA-specific marketing changes into the clinical setting influences NTPA promotion frequency and ease, as well as patient expectations for NTPA and their PA outcomes.

It is important to identify the most efficacious way to support physiotherapists to prioritise NTPA promotion. Chapter 9 showed Australian physiotherapists perceive patients as expecting hands-on treatment, not NTPA promotion, when they present to a physiotherapist. Therefore, integrating NTPA promotion into patient care might be considered unacceptable to patients and burdensome to physiotherapists by adding additional tasks to an already busy consultation (Taukobong et al., 2014; Verhagen et al., 2009). Manipulating patient expectations using the marketing strategies mentioned above might also help physiotherapists prioritise NTPA promotion higher and, thus, promote it more often.

Future research needs

Despite the majority of physiotherapists in the national survey (Chapter 7) reporting that they promote NTPA often or all of the time, it is likely that a proportion of this NTPA promotion involves referring the patient to another health care professional for PA guidance. Thus, physiotherapists might not be involved in the patient's care during the entire behaviour change process that occurs from them being physically inactive to becoming physically active. It is important to identify the most efficacious way for Australian physiotherapists to promote NTPA within the local clinical context without needing to refer the patient to another professional and while maintaining a person-centred focus. This is important to reduce the number of health care professionals patients need to work with, the number of consultations they need to attend and, consequentially, the cost associated with becoming more physically active. New interventions must account for the psychosocial and environmental factors that influence patients' decision to participate in PA, physiotherapists' decision to promote NTPA

and aim to overcome these before expecting physiotherapists to deliver NTPA interventions to completion.

The findings of this thesis lead to several avenues for future research. Future physiotherapist-led NTPA interventions should be designed with the following in mind:

1. Physiotherapists understand it is part of their role to promote NTPA, but they find it complex and often refer patients to other professionals because it is easier;
2. There are several factors associated with a physiotherapist's decision to promote NTPA or not. These factors must be addressed to increase the number of physiotherapists promoting NTPA instead of referring patients elsewhere;
3. There are techniques physiotherapists currently use to promote NTPA. These techniques should be integrated into new NTPA promotion interventions and tested to see if they are efficacious at increasing patient PA levels; and
4. Physiotherapists are open to learning how to use BCTs more often for NTPA promotion. Learning from peers and behaviour change experts in the clinical environment might be more acceptable and successful than using more formal training programs (e.g. university).

Behaviour change interventions are often designed using well-established behaviour change models and theories (e.g. cognitive behavioural therapy, the theory of planned behaviour). The Behaviour Change Wheel (BCW) (*Figure 5. 2*), which was outlined in the Introduction, can be used to design interventions to increase the amount of NTPA promotion performed by physiotherapists (Michie et al., 2011).

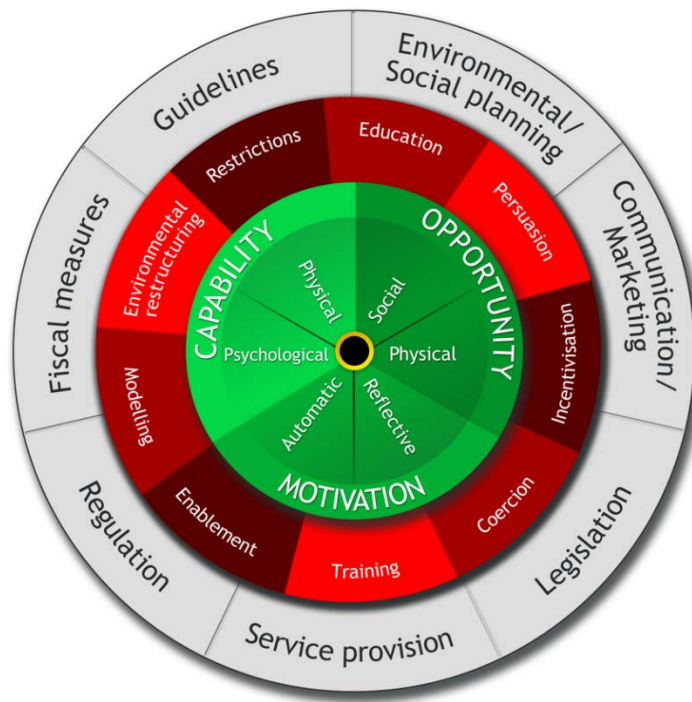


Figure 5. 2 The Behaviour Change Wheel (Michie et al., 2011, p. 7, open access)

Any intervention aimed at improving the ability of the physiotherapist to promote NTPA will be a behaviour change intervention. The behaviour change is specific to changing the physiotherapist's behaviour from not promoting NTPA to promoting NTPA. This thesis reported three domains within the TDF that influence NTPA promotion: Goals, Knowledge and Innovation (Environmental context and resources). The BCW uses the TDF to identify what needs to be improved for behaviour change to occur. For example, physiotherapists' knowledge must be improved for physiotherapists to promote NTPA more often. The BCW allows for the identification of the BCTs that can be used to improve the physiotherapist's knowledge, prioritising of NTPA promotion and the compatibility of NTPA promotion to the clinic environment. Examples of this application can be found in tables 5. 3, 5.4 and 5. 5.

Table 5. 3 An example of how the BCW can be used to address innovation (compatibility) barriers to NTPA promotion for Australian physiotherapists

Factor influencing NTPA promotion (TDF Domain)	Definition	BCTs that can change the influencing factor (Michie et al., 2014)^	Suggested BCTs to include in intervention	Example of how the BCT can be used (Michie, Richardson, et al., 2013)
Innovation (Environmental context and resources)	Any characteristics of the NTPA promotion intervention that facilitates or blocks its use.	Avoidance/changing exposure to cues for the behaviour	Avoidance/changing exposure to cues for the behaviour	Use people exercising on advertising materials instead of someone receiving a massage.
	E.g. NTPA promotion is not compatible with clinical practice.			This will remove references to hands-on treatments, enhancing the compatibility between the clinic and NTPA promotion.
		Restructuring the social environment	Restructuring the social environment	Train a staff member to become a 'PA champion' who supports others to promote NTPA.
				This will help NTPA promotion to appear compatible with the clinical environment.

Factor influencing NTPA promotion (TDF Domain)	Definition	BCTs that can change the influencing factor (Michie et al., 2014)^	Suggested BCTs to include in intervention	Example of how the BCT can be used (Michie, Richardson, et al., 2013)
		Prompts/cues	Prompts/cues	Have the physiotherapist put a poster on the wall outlining the benefits of PA for musculoskeletal conditions to remind them to promote NTPA.
				This will act in a similar way to using active people in advertising.
		Discriminative (learned) cue	-	-
		Restructuring the physical environment	-	-

Notes:

When designing the DIBQ, Huijg, Gebhardt, et al. (2014) made some changes to the TDF domains to improve clinical applicability.

This meant that the domain ‘Environmental context and resources’ from the original TDF was modified to form the ‘Innovation’ domain. Thus, for the purposes of Table 5. 3 and identifying the BCTs needed to increase NTPA promotion, both the original and modified domains are shown.

^This list of BCTs forms a ‘buffet’ of BCTs the physiotherapist and intervention designers can choose from

Table 5. 4 An example of how the BCW can be used to address knowledge barriers to NTPA promotion for Australian physiotherapists

Factor influencing NTPA promotion (TDF Domain)	Definition	BCTs that can change the influencing factor (Michie et al., 2014)^	Suggested BCTs to include in intervention	Example of how the BCT can be used (Michie, Richardson, et al., 2013)
Knowledge	An awareness of the existence of something. E.g. Having an awareness of NTPA promotion and how to do it.	Feedback on behaviour	Feedback on behaviour	Tell the physiotherapist how well they have promoted NTPA over the past month. If their ability to promote NTPA has improved, knowledge might have been gained.
		Antecedents (group of BCTs)*	Adding objects to the environment [#]	Give physiotherapists online access to a PA monitoring app that they can use to monitor patient PA levels via the patient's smartphone.
				This is a tool that can be used by the physiotherapist, increasing their knowledge of ways to promote NTPA.
		Biofeedback	-	-
		Health consequences	-	-

Notes:

*includes the BCTs restructuring the physical environment, restructuring the social environment, avoidance/reducing, exposure to cues for the behaviour, distraction, adding objects to the environment and body changes.

#A BCT belonging to the Antecedents group.

^This list of BCTs forms a 'buffet' of BCTs the physiotherapist and intervention designers can choose from.

Table 5. 5 An example of how the BCW can be used to address priority (goal) barriers to NTPA promotion for Australian physiotherapists

Factor influencing NTPA promotion (TDF Domain)	Definition	BCTs that can change the influencing factor (Michie et al., 2014)^	Suggested BCTs to include in intervention	Example of how the BCT can be used (Michie, Richardson, et al., 2013)
Goals	Mental representations of outcomes or end states that an individual wants to achieve. E.g. Prioritising NTPA promotion over other patient problems.	Goal setting (behaviour)	Goal setting (behaviour)	Have the physiotherapist set a goal to promote NTPA to one patient per day for three weeks.
		Action planning	Action planning	Encourage the physiotherapist to add detail to their goal (e.g. the patient must have an upper limb condition and be inactive). Setting an action plan is part of developing a plan to prioritise NTPA.
		Review of behaviour goal(s)	Review of behaviour goal(s)	Review the physiotherapist's ability to achieve the above goal at three weeks and change the goal to be easier or harder depending on their progress.

Factor influencing NTPA promotion (TDF Domain)	Definition	BCTs that can change the influencing factor (Michie et al., 2014)^	Suggested BCTs to include in intervention	Example of how the BCT can be used (Michie, Richardson, et al., 2013)
				Reviewing goals tells the physiotherapist how well their plan is progressing.
		Goal setting (outcome)	-	-
		Review of outcome goal(s)	-	-

Notes:

^This list of BCTs forms a 'buffet' of BCTs the physiotherapist and intervention designers can choose from.

Limitations

The findings included in this thesis can be applied to Australian physiotherapists treating patients with musculoskeletal conditions in private practice and outpatient settings. The potential limitations seen in the studies included in this thesis primarily emerge from the survey. Pairwise deletion was used to manage missing data, which assumes that all missing data were missing completely at random and were unrelated to other variables. The study was also potentially underpowered due to fewer than 380 physiotherapists completing the survey. Finally, the survey used a tool that was not validated and did not include all of the possible BCTs (50 of a possible 93 BCTs were included). As the reliability of the BCCTv1 is currently only deemed acceptable ($\kappa > 0.6$), which is only based on reliability testing of 26 of the 93 BCTs (Michie, Richardson, et al., 2013), additional reliability testing of the BCTs included in the survey is warranted.

The survey was very long (it took 25-30 minutes to complete). The use of a gift card draw incentive (where the respondents had a chance to win a \$200 gift card) was chosen to increase responses. However, this incentive was insufficient as few physiotherapists responded in the first 6 months the survey was open. This setback extended the time needed for data collection. Adding the incentive of a \$20 gift card for completion greatly increased responses in the final few months; however, this might have encouraged some respondents to rush their responses and participate only to receive the incentive. Receiving a guaranteed, small incentive (i.e. the \$20 gift card) might be more attractive to physiotherapists than only having a chance to receive a larger incentive. This might not be because they require the money, but instead they might like the idea of a guaranteed reward for taking the time to complete

the survey. Thus, future studies might find it easier to recruit participants if they provide a small but guaranteed incentive rather than a large but not guaranteed incentive.

Ideally, the survey should have been open for longer to gain additional responses to power the study. However, the survey was closed to allow sufficient time for write-up prior to thesis submission. In the future, the survey tool should be shortened to increase responses. This could be done by shortening the influencing factors part of the survey (Chapter 6) to include only the nine variables included in the logistic regression model (Table 3. 7). Additionally, if funding is available, incentives that include a guaranteed reward (e.g. \$20 gift) should be used to increase response rate.

The survey tool was not validated prior to its use, but it did undergo piloting. A main finding from the pilot process was that the survey took too long to complete, meaning that not all questions could be included. A question asking respondents if they ask their patients how much PA they perform could add detail to the existing question that asks how often the respondent promotes NTPA. This question could be included if the tool was to be shortened or the two parts were delivered separately, for example: (i) a part identifying the factors influencing physiotherapists' decision to promote NTPA; or (ii) another part identifying the BCTs physiotherapists use when promoting NTPA and encouraging adherence to rehabilitation exercises.

The DIBQ has been validated for use in primary care and to identify the factors associated with PA intervention fidelity (Huijg, Gebhardt, et al., 2014). The DIBQ was modified for this survey to suit the Australian context and address the factors influencing NTPA promotion. Therefore, validity of the tool might not have been retained. Recent literature, rather than a validated survey tool, was used to inform the design of the questions

addressing BCT use by physiotherapists. These limitations were accepted when the tool was chosen because no other validated tools were found that measured the factors influencing NTPA promotion by physiotherapists and the BCTs that they use. The survey should be validated prior to any future use, especially if it is modified, as the internal consistency, and thus the reliability, might be lost. Finally, although the TDF has been used previously to identify factors influencing behaviour in the DIBQ (Huijg, Gebhardt, et al., 2014), using these findings to inform intervention design is still an under researched area.

The interview study (Chapter 9) also had limitations. In line with adhering to the IPA method, data analysis involved a double hermeneutic approach; the transcripts outlined the lived experience of the interviewees and were then interpreted, or analysed, by the candidate. In this thesis, the interviewees were physiotherapists and so was the interviewer and data analyst (the candidate). The candidate could have, inadvertently, interpreted the interviewees experience in light of her own experiences, comparing the two and using that comparison to inform final findings. The candidate was aware of the potential for this to occur and tried to minimise it by using member checking and having co-authors review findings against the transcript summaries.

Face-to-face interviews were primarily used for the interview study. Telephone interviews were used when interviewees could not attend in person and did not have access to Skype. Telephone interviews can be successfully used for data collection in studies exploring PA promotion in physiotherapy (Lowe, Littlewood, et al., 2018) and have been considered a valuable alternative for when interviewees cannot attend the interview in person (Sweet, 2002). However, other authors have considered their use to be a limitation due to the lack of non-verbal communication (Irvine et al., 2013). The use of telephone interviews in this study

was considered a valuable alternative because that allowed for the recruitment of physiotherapists from across Australia, including physiotherapists practising in regional and rural locations.

There was a risk of social desirability bias, where interviewees might have felt inclined to provide desirable answers to avoid ridicule. This is possible because interviewees could have known the interviewer was a physiotherapist. The interviewees would have likely known the interviewer was passionate about physiotherapists promoting NTPA, which could have also led to them providing desirable answers. In the future, external interviewers could be used to complete the interviews. However, a strength of the study was that the interviewer could understand the jargon the physiotherapists used and could relate to their experiences. This strength will be lost if the interviewer is detached from the research topic.

Conclusions

The objectives of this thesis were to identify the: (i) efficacy of physiotherapist-led PA interventions, (ii) factors that influence NTPA promotion; and (iii) behaviour change techniques physiotherapists use to promote NTPA to patients with musculoskeletal conditions in private practice and outpatient settings. Objective (i) was addressed by using a systematic review that found that PLPA interventions are efficacious in the short term only and doubled the odds of patients with, or at risk of, NCDs meeting the recommended PA guidelines. Objective (ii) was addressed in both a national survey and interview study. The survey found that Goals, Knowledge and Innovation were the behavioural domains significantly and independently associated with NTPA promotion. This suggests that prioritising NTPA over other treatments, knowing how to promote NTPA and using NTPA promotion interventions that fit well with the clinical environment increases the odds that physiotherapists will promote NTPA. The interview study found that physiotherapists felt it was their role to promote NTPA, but external factors like patient expectations made NTPA difficult. Feeling insufficiently skilled or confident to promote NTPA contributed to physiotherapists referring patients to exercise physiologists for PA guidance. Objective (iii) was addressed using a systematic review that found that physiotherapists used 32 different BCTs to promote PA. Fewer BCTs were used by physiotherapists in observational studies compared to experimental studies, suggesting BCTs are used less commonly in clinical settings compared to experimental settings. *Social support (unspecified)* was identified the most across all studies, suggesting this BCT was used the most by physiotherapists in this review. The national survey also contributed to addressing objective (iii) by reporting that Australian physiotherapists used 29 BCTs to either promote NTPA or encourage adherence to

rehabilitation exercises, with 25 BCTs used for both. *Graded tasks* was used the most, with *punishment* used the least, for both NTPA promotion and encouraging adherence to rehabilitation exercises. *Social support (practical and unspecified)* were not used by the majority of physiotherapists, despite being observed as used by physiotherapists in the review. The findings from these studies provide clinicians and researchers with an understanding of the multiple factors that must be considered before designing new NTPA interventions and asking physiotherapists to promote NTPA using BCTs in Australian private practice and outpatient settings.

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Appendices

RESEARCH

Moving towards more physical activity

PHYSIOTHERAPY RESEARCH FOUNDATION Breanne Kunstler, APAM, recipient of a PRF 2016 Tagged Grant, discusses her research project into the promotion of physical activity by physiotherapists.

Project overview

Physical inactivity is the fourth-leading risk factor for global mortality, placing it as a significant contributor to early death, alongside smoking and obesity (WHO 2010). Globally, 31 per cent of adults do not meet the minimum recommended physical activity levels (Hallal et al 2012). In 2008, nine per cent of deaths around the world were caused by complications arising from inactivity (Lee et al 2012) and in 2013 alone, the direct and indirect health costs associated with inactivity totalled INTL\$67.5 billion (Ding et al 2016). The picture is much worse in Australia where 44.5 per cent of Australian adults are not meeting the minimum recommended physical activity levels (ABS 2015), which contributed to 10 per cent of deaths in 2008 (Lee et al 2012) and cost the Australian economy \$805 million in 2013 alone (Ding et al 2016).

Physiotherapists encourage their patients to be physically active to treat the symptoms of musculoskeletal conditions. People presenting to Australian ambulatory clinics with musculoskeletal conditions are often inactive, overweight or obese and have comorbidities such as diabetes. It is the role of the physiotherapist to not only promote physical activity to treat the patient's presenting condition but also to prevent and improve poor health. Physical activity promotion for the purposes of improving or enhancing general health and preventing non-communicable disease is an example of non-treatment physical activity (NTPA)

promotion. My work focuses on NTPA promotion by physiotherapists.

The APA released an influential video as part of its 2014 Australia's Biggest Killer campaign, which encouraged physiotherapists to promote physical activity to their patients to help reduce the number of adults at risk of, and suffering from, non-communicable disease. This campaign also encouraged consumers to see a physiotherapist for help to become physically active.

Little is known about the promotion of NTPA by Australian physiotherapists, despite it being an important part of physiotherapy practice now and into the future. It is important to know how Australian physiotherapists currently promote NTPA, and what factors influence their choice to promote it, to support future research into successful ways to promote NTPA.

Interventions to increase patients' physical activity levels use behaviour change techniques (BCTs) (eg, goal setting); interventions that use many BCTs can be more successful than those that use fewer. Only a small amount of research has explored the techniques

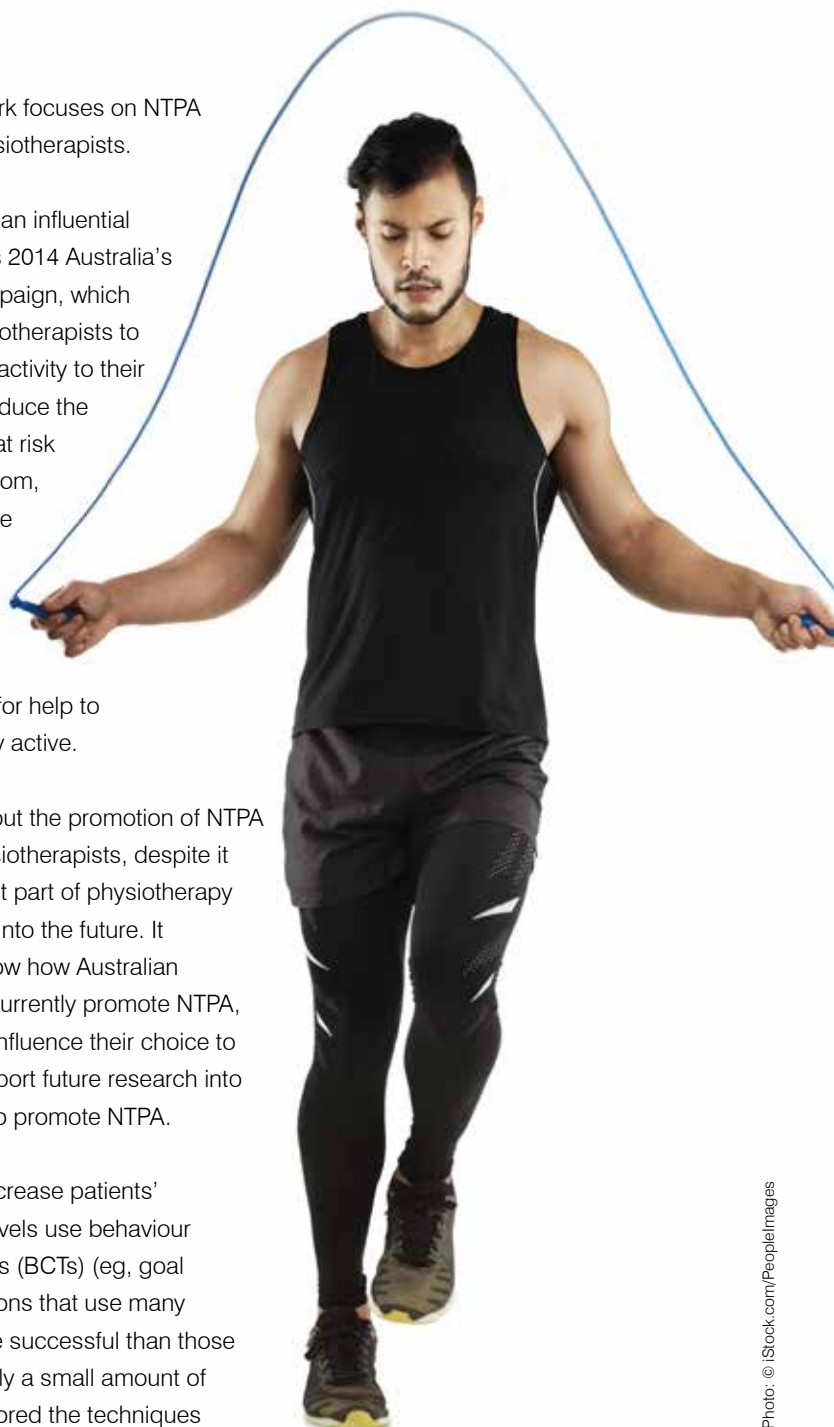


Photo: © iStock.com/PeopleImages

physiotherapists use to promote physical activity and none of this work is specific to BCTs, NTPA and Australian physiotherapists. My project will identify the BCTs Australian physiotherapists use to improve the NTPA levels of their patients.

Many factors can influence a physiotherapist's decision to promote NTPA to their patients. Researchers in the Netherlands asked physiotherapists what helped them promote physical activity and found that having sufficient knowledge and capability was necessary to promote physical activity well.

This suggests physiotherapists need sufficient knowledge and capability to successfully promote physical activity. It is important to do similar research in Australia and make this specific to NTPA. This project will identify the factors that determine if a physiotherapist will promote NTPA.

Knowing the determinants of NTPA promotion and the BCTs Australian physiotherapists use will allow researchers to design new NTPA interventions specifically for the Australian physiotherapy context that take into consideration the difficulties physiotherapists face when promoting NTPA.

This approach to intervention design will ensure the intervention is clinically relevant for the Australian physiotherapy context, potentially making NTPA promotion easier and more common in Australian physiotherapy practice.

Identifying the determinants of NTPA

promotion will assist the APA and other education providers to understand the difficulties faced by Australian physiotherapists when promoting NTPA. This will hopefully lead to improvements in existing education and professional development programs.

The PRF Tagged Grant will support two projects. Both projects will identify the determinants of NTPA promotion and the BCTs physiotherapists use to promote NTPA. These projects will form part of my PhD, which is supported by the Australian Collaboration for Research into Injury in Sport and its Prevention (ACRISP) at Federation University Australia.

Methods

The participants recruited for these projects were Australian physiotherapists treating patients with musculoskeletal conditions in private practice and outpatient clinics. Participants were recruited using social media and advertisements in APA and Sports Medicine Australia news emails.

The first project was an online survey that was piloted prior to the study commencing. A total of 486 Australian physiotherapists attempted the survey and it took an average of 25 minutes to complete.

The second project was an interview study. Ten physiotherapists from around Australia participated in a 60-minute interview that involved discussing how they promote NTPA to their patients and what makes it easy or hard to do. Interviews were conducted face-to-face, over the phone and over Skype. Data collection is complete

A 2016 PRF Tagged Grant is supporting Breanne Kunstler's current research. The PRF is calling for applications for 2017 Project Grants (formerly Tagged Grants) and the Beryl Haynes Memorial Grant. See page 11 for more details.



for both studies and analysis of the data has begun.

Findings

Early results suggest that physiotherapists feel responsible for promoting NTPA to their patients and see it as part of their role, but patient expectations and workplace-specific factors can influence how they do it and how often they do it. Physiotherapists use many different BCTs to promote NTPA, often without realising it.

Additionally, physiotherapists want more training resources to improve their skills in BCT use and NTPA promotion and see the APA as the main provider of these. Final project results are expected by the end of 2017.

Email info@physiotherapy.asn.au for references.



PROMOTING PHYSICAL ACTIVITY: YOUR PATIENT HAS THE ANSWERS

AUSTRALIAN ADULTS ARE NOT MEETING THE RECOMMENDED LEVELS OF WEEKLY PHYSICAL ACTIVITY. PHD CANDIDATE **BREANNE KUNSTLER**, APAM, DISCUSSES PATIENT EXPECTATIONS AND PHYSIOTHERAPISTS' KEY ROLE IN PROMOTING PA.

Australian adults are not meeting the recommended levels of weekly physical activity (PA). The Australian Physical Activity & Sedentary Behaviour Guidelines for Adults state that adults must participate in 75–150 minutes of vigorous intensity PA (eg, running) or 150–300 minutes of moderate intensity PA (eg, brisk walking), as well as muscle-strengthening activities on at least two days each week to be considered physically active (Commonwealth of Australia 2014). In 2014–15, 44.5 per cent of Australian adults did not achieve the minimum recommended PA levels (Commonwealth of Australia 2015). Those with musculoskeletal conditions report lower PA levels (McPhail et al 2014a), potentially due to their condition acting as a barrier (McPhail et al 2014b). As many as 10.1 per cent of Australian deaths in 2008 were directly attributed to physical inactivity (Lee et al 2012). Physical inactivity is therefore a major contributor to early death.

Physiotherapists have a role to play in PA promotion and have a responsibility to improve the PA levels of their patients (World Confederation for Physical Therapy 2012). But the real question is:

Are we any good at increasing our patients' PA levels?

I have almost completed a PhD exploring PA promotion by Australian physiotherapists. One of my PhD projects found that physiotherapists can increase their patients' PA levels, but only by a small amount (eg, 17.9 minutes daily) and improvements were not maintained beyond one year (Kunstler et al 2017). So, what is the problem? Why are PA improvements small and not maintained? How can we improve the way we promote PA?

The Australian Physical Activity & Sedentary Behaviour Guidelines for Adults provide physiotherapists with a recipe for how frequently and intensely adults should exercise to be considered physically active and reap the associated health benefits (Commonwealth of Australia 2014). The guidelines also provide guidance on the amount of time adults should exercise and gives some examples of types of activity to do (Commonwealth of Australia 2014). However, what they do

not do is encourage the physiotherapist to adopt a tailored approach to physical activity prescription. In other words, the guidelines can be used by some as a stock-standard recipe for PA promotion, but the result may be PA prescriptions that are not tailored to the patient.

Physiotherapists often tailor their treatment to their patients. Is that weight too heavy? Let's reduce it. Is that exercise causing excessive pain? Let's modify it. Does the patient balance a busy life of work and family? Suggest suitable times to squeeze in exercises. We should treat PA promotion the same way. Physical activity prescriptions should be tailored to the patient. If this is done, we might see greater improvements.

Physiotherapists in Australia and globally have scored poorly on their knowledge of the PA guidelines (Shirley et al 2010, Mohan et al 2012, Lowe et al 2017), which might suggest that physiotherapists are not following the guidelines and prescribing PA incorrectly to their patients. Having a general understanding of how much PA people should do to maintain health is an important prerequisite to prescribing PA.

However, I suggest that physiotherapists who do not strictly adhere to the black-and-white, hard-and-fast 'you must do 150–300 minutes of brisk walking per week' part of the guidelines have an excellent approach to PA prescription. This is because they stop thinking about how much PA their patient needs to do to be considered physically active, and instead they focus on the lesser mentioned part of the guidelines that suggest that doing any amount of physical activity is better than doing none (Commonwealth of Australia 2014). Thus, these physiotherapists tailor their PA prescription to suit the patient, rather than trying to make the patient suit the prescription.

Physical activity interventions, just like any other intervention, need to be tailored to the patient to be successful (Noar et al 2007, Dohrn et al 2016). You might think that if physiotherapists do not prescribe PA following the guidelines then they are not prescribing enough PA for their patient to achieve any health benefits. Do not think that.

Recent research has clearly demonstrated that doing a small amount of PA (eg, 15 min per day) is sufficient to achieve health benefits (Wen et al 2011). Regularly participating in PA of any intensity, and even at low levels, in leisure time can protect against developing depression in the future (Harvey et al 2017). Therefore, prescribing a small amount of PA can be enough to achieve some benefit and might be the perfect amount for some patients, if this is all they can achieve.

Let's use an example. Brian is a 45-year-old banker who presents to you with right shoulder pain. You notice he is overweight, possibly obese. He casually mentions to you that he avoids exercise 'like the plague' but tries to do at least 10 minutes of walking per day. You convince Brian that becoming physically active can help improve his overall health and that he should be doing more.

Question: what PA prescription do you give Brian?

- 150–300 minutes of brisk walking per week
- 75 minutes of running per week
- 12 minutes of walking this week with the aim to increase to 14 minutes next week

Answer: all of these PA prescriptions follow the guidelines, however, the third option gives Brian an achievable small goal and considers his activity preferences and abilities. Because of this, the third option gives Brian a better chance at engaging in PA and maintaining it over time.

Why are goals important?

Setting goals gives the physiotherapist and patient a target to aim for. We often ask patients what they want to achieve during their time in physiotherapy. Physiotherapists are encouraged to frame patient goals using the SMARTS (specific, measurable, achievable, realistic, timely and self-determined) acronym (American College of Sports Medicine 2013).

However, a recent editorial in the *British Journal of Sports Medicine* argues that specific goals might be less effective than simple, vague goals (eg, just encouraging Brian to walk a little more next week) (Swann & Rosenbaum 2017). Swann and Rosenbaum (2017) make the very valid point that specific, often challenging, goals might see people participate in less PA, contradicting our aim. Aiming to be physically active (eg, walking 150 minutes per week) might be too challenging for someone who is currently inactive (Swann & Rosenbaum 2017).

Put yourself in Brian's shoes for a moment: how successful do you think you will be at achieving your PA goal if your physiotherapist just told you to run for 75 minutes per week? Tailoring your PA prescription to the patient is important for success.

What can I do to help patients maintain PA?

Physical activity maintenance is hard. The PA improvements seen in patients who receive a PA prescription from their physiotherapist are only maintained up to one year (Kunstler et al 2017) and up to 15 months in young and middle-aged adults (Murray et al 2017). Initiating PA and maintaining it over time requires effort from the patient and the physiotherapist.

Maintenance of PA requires contact with the physiotherapist over an extended period and the use of follow-up prompts, self-monitoring, goal-setting and action-planning (Swedish Council on Technology Assessment in Health Care 2007, Fjeldsoe et al 2011, Dombrowski et al 2012, Olander et al 2013, Murray et al 2017). This means that

PA maintenance requires ongoing contact with the physiotherapist beyond the usual treatment timelines. As part of this extended contact, it is necessary to contact the patient while they are away from the clinic to see how they are going with their current plan (this is an example of using follow-up prompts).

Self-monitoring is also a useful tool to support maintenance and involves the patient using devices (eg, a smartphone app or exercise diary) that measure the amount of PA they do. This information can be automatically uploaded online for the physiotherapist to use when establishing if goals need reassessing or a new plan is needed.

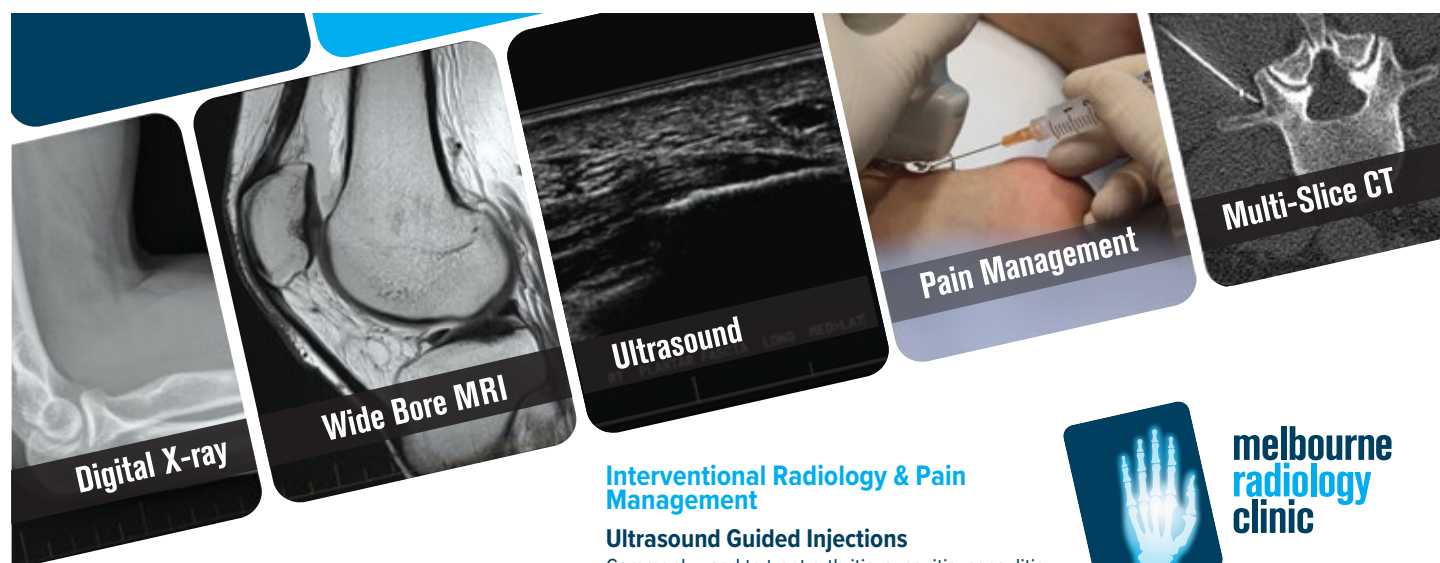
Promoting PA is complex and has several challenges. Overall, it is important to remember that every patient is different and will respond to your advice differently. Therefore, be sure to prescribe an amount of PA that suits your patient, even if you think it is not enough. Physical activity levels can be progressed over time; some people will take longer to become physically active and some might never reach that level of activity. Use the resources available to you (eg, use reasonable goal-

setting, set plans, monitor progress) and keep in contact with your patients. Checking in occasionally might be the one thing they need to keep on track.

For references, email ngeditor@physiotherapy.asn.au

Breanne Kunstler is a final-year PhD scholar at the Australian Centre for Research into Injury in Sport and its Prevention (ACRISP) at Federation University Australia. She graduated as a physiotherapist in 2013 from La Trobe University. Breanne's research is in physical activity promotion by physiotherapists, which is financially supported by a 2016 Physiotherapy Research Foundation (PRF) Tagged Grant. You can follow her on Twitter @BreanneKunstler and @Physios4PA.

Breanne would like to thank Joanne Kemp, APA Sports Physiotherapist (NHMRC Early Career Research Fellow, La Trobe Sport and Exercise Medicine Research Centre), for collaborating on this piece. She would also like to thank the PRF for funding her research.



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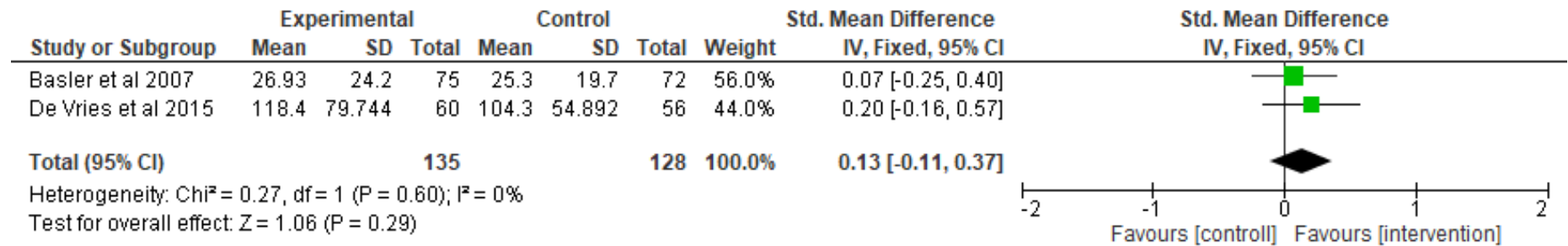
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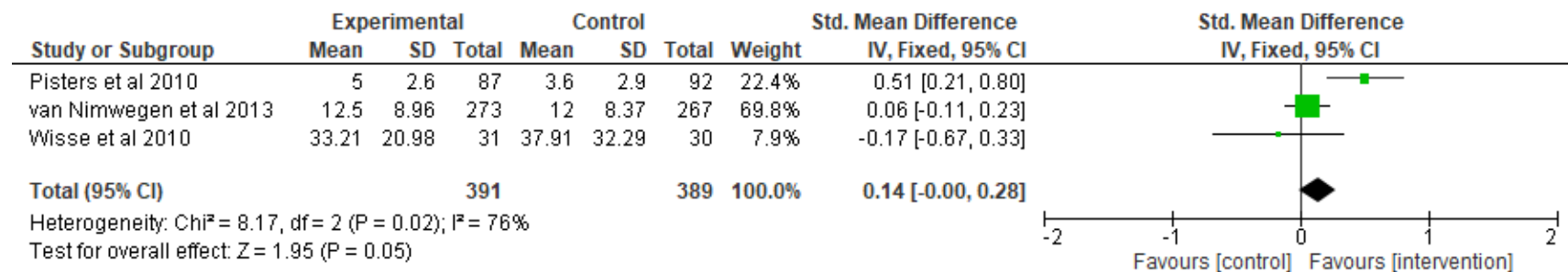
clinic update

Appendix 2. 1 Additional meta-analyses completed as part of the review but were not published

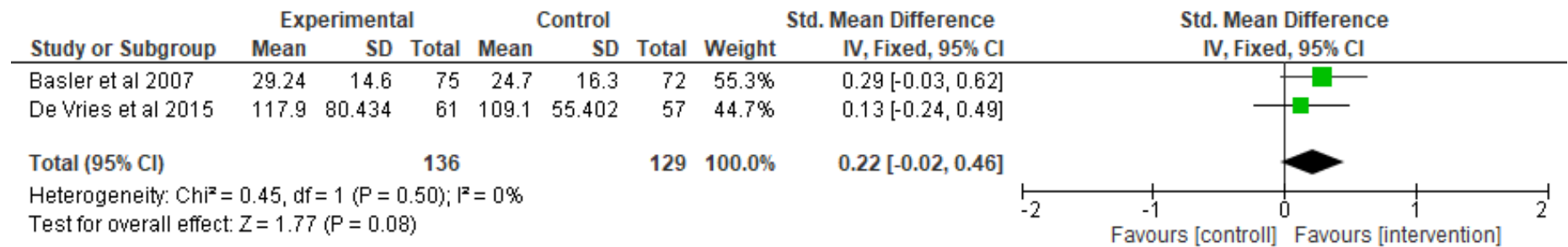
The total amount of PA performed by adults after receiving a short (<1 year) PLPA intervention. Measured at final follow up.



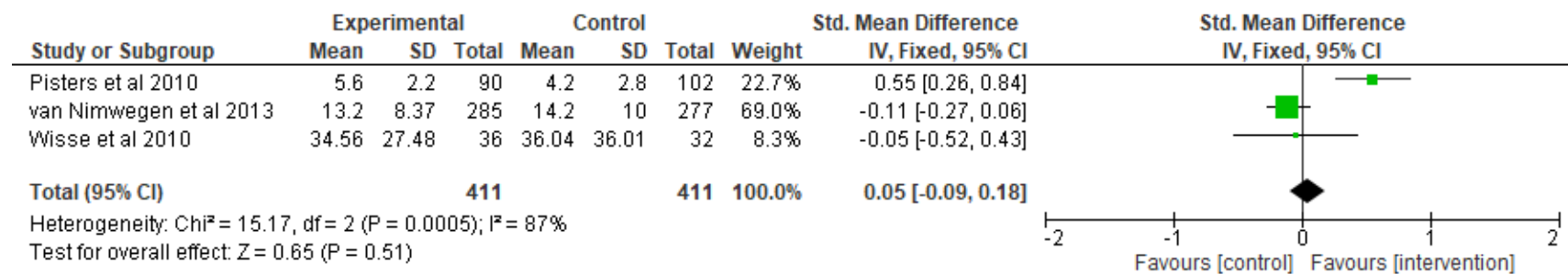
The total amount of PA performed by adults after receiving a long (≥ 1 year) PLPA intervention. Measured at final follow up.



The total amount of PA performed by adults after receiving a short (<1 year) PLPA intervention. Measured at first follow up.



The total amount of PA performed by adults after receiving a long (≥ 1 year) PLPA intervention.



Determinants of NTPA promotion survey

Welcome

This questionnaire will be used to identify the factors that influence your decision to promote non-treatment physical activity (NTPA) to patients with musculoskeletal conditions.

Non-treatment physical activity is physical activity that is used to improve a patient's general health, as opposed to rehabilitating an ailment. Please keep this definition in mind as you progress through the questionnaire.

The questionnaire is expected to take approximately 10-15 minutes. Upon successful completion of the questionnaire, you will be asked to provide your name, email and postal address so you can be sent a thank you gift of a \$20 gift card OR be placed in a draw to win one of several \$200 gift cards (the choice is yours!).

Please read the plain language statement before beginning the questionnaire. Beginning the questionnaire is taken as consent to participate in this study.

Thank you very much for taking the time to complete our questionnaire. By doing so, you are making an important contribution to improving the ability of physiotherapists to help patients become physically active.

Ethics approval number: B16-026 (Federation University Australia)



Tell us about you

Q1 How old were you on your last birthday?

- ☐ Under 18
- ☐ 18 - 24
- ☐ 25 - 34
- ☐ 35 - 44
- ☐ 45 - 54
- ☐ 55 - 64
- ☐ 65 - 74
- ☐ 75 - 84
- ☐ 85 or older
- ☐ Prefer not to answer

Q2 What is your gender?

- ☐ Male, or identifying as male
- ☐ Female, or identifying as female
- ☐ Prefer not to answer

Q3 How many years have you been practicing physiotherapy in Australia?

- ☐ 0-2
- ☐ 3-5
- ☐ 6-10
- ☐ 11-15
- ☐ 16+
- ☐ I am not registered to practice as a physiotherapist in Australia

Q4 How many patients do you see each week?

- ☐ 0
- ☐ 1-5
- ☐ 6-15
- ☐ 16-25
- ☐ 26+

Q5 Of the number of patients you see per week, how many have musculoskeletal complaints?

- ☐ Less than half
- ☐ Half
- ☐ More than half

Q6 How long would a typical consultation take with a patient with a musculoskeletal condition?

	5-10 minutes	11-15 minutes	16-25 minutes	26 minutes or longer
Initial consultation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Second consultation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Final consultation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q7 Do you have any qualifications, aside from physiotherapy, in psychology or have you attended at least 10 hours of educational classes with a psychology focus? Topics might include motivational interviewing, health coaching, cognitive behavioural therapy or pain management.

- ☐ Yes
- ☐ No
- ☐ Unsure

Q8 Do you have any qualifications, aside from physiotherapy, in health promotion or have you attended at least 10 hours of educational classes with a health promotion focus? Topics might include physical activity promotion, smoking cessation, healthy eating, weight loss and alcohol consumption.

- ☐ Yes
- ☐ No
- ☐ Unsure

Q9 Do you have any qualifications, aside from physiotherapy, in exercise science or have you attended at least 10 hours of educational classes with an exercise science focus? Topics might include exercise physiology and exercise science.

- ☐ Yes
- ☐ No
- ☐ Unsure

Q10 In the past week, on **how many days** have you done a total of 30 min or more of physical activity, which was enough to raise your breathing rate? This may include sport, exercise and brisk walking or cycling for recreation or to get to and from places, but should not include housework or physical activity that may be part of your job.

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

Q11 In the past week, on **how many days** have you participated in muscle strengthening activities?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

Q12 Thinking about your clinical practice in the last month, how often did you encourage your patients to have a more physically active lifestyle specifically for general health purposes?

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Often
- ☐ All of the time

Q13 Of these clinical settings, which do you work in **the most** in an average week?

- ☐ Inpatient
- ☐ Community - Home based
- ☐ Community - Clinic based
- ☐ Private practice
- ☐ Outpatient
- ☐ Other (please write)

The next page includes questions about your experiences promoting NTPA.

When I consider using a non-treatment physical activity intervention in my practice:

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I know how to deliver this intervention.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Objectives of this intervention and my role in this are clearly defined for me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I DO NOT know what my responsibilities are.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know exactly what is expected from me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Delivering this intervention is part of my work as a physiotherapist.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
As a physiotherapist, it is NOT my job to deliver this intervention.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is my responsibility as a physiotherapist to deliver this intervention.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For me, delivering the content of the intervention is easy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For me, performing the initial assessment of physical activity levels is easy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



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For me, giving attention to my patients' maintenance of physical activity behaviour outside the clinic is easy.

☐ ☐ ☐ ☐ ☐

I intend to deliver this intervention in the next three months.

☐ ☐ ☐ ☐ ☐

My intention to deliver this intervention in the next three months is strong.

☐ ☐ ☐ ☐ ☐

I will definitely deliver this intervention in the next three months.

☐ ☐ ☐ ☐ ☐

It is possible for me to tailor this intervention to my patients' needs.

☐ ☐ ☐ ☐ ☐

This intervention takes little time to deliver.

☐ ☐ ☐ ☐ ☐

This intervention is well-suited to daily practice.

☐ ☐ ☐ ☐ ☐

This intervention is simple to deliver.

☐ ☐ ☐ ☐ ☐

Government and local authorities provide sufficient support to deliver interventions like this.

☐ ☐ ☐ ☐ ☐


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Insurance companies provide sufficient support to deliver interventions like this.

☐ ☐ ☐ ☐ ☐

Primary health care is sufficiently oriented towards disease prevention.

☐ ☐ ☐ ☐ ☐

Most people who are important to me think that I should deliver this intervention.

☐ ☐ ☐ ☐ ☐

I have been trained in delivering this intervention.

☐ ☐ ☐ ☐ ☐

I DO NOT have the skills to deliver this intervention.

☐ ☐ ☐ ☐ ☐

I have experience delivering this intervention.

☐ ☐ ☐ ☐ ☐

Note: If you hold a managerial role or own your practice, some of these questions might not apply to you. In this instance, please choose 'Not applicable'

Strongly disagree

Somewhat disagree

Neither agree nor disagree

Somewhat agree

Strongly agree

Not applicable

I can count on support from the management of my workplace when things get tough.

☐ ☐ ☐ ☐ ☐ ☐

The management of my workplace is willing to listen to my problems with delivering this intervention.

☐ ☐ ☐ ☐ ☐ ☐


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The management of my workplace is helpful when delivering this intervention.

☐ ☐ ☐ ☐ ☐ ☐

Professionals with whom I work are willing to listen to my problems with delivering this intervention.

☐ ☐ ☐ ☐ ☐ ☐

Professionals with whom I work are helpful with delivering this intervention.

☐ ☐ ☐ ☐ ☐ ☐

When I consider using a non-treatment physical activity intervention in my practice, my workplace provides:

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Not applicable
All necessary resources to deliver this intervention.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Training to deliver this intervention.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sufficient intervention materials to support implementation and delivery.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Assistance with delivering this intervention.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Support meetings where I can get my questions answered about delivering this intervention.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

When I consider using a non-treatment physical activity intervention in my practice, I am confident that I can:

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Deliver this intervention.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Deliver this intervention even when there is little time.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Deliver this intervention even when patients are not motivated.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

When I consider using a non-treatment physical activity intervention in my practice, addressing other patient problems:

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Are a higher priority than delivering this intervention.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Are more urgent than delivering this intervention.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Patients receiving non-treatment physical activity interventions from me:

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Are motivated to do it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Are NOT positive about the intervention.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

When considering non-treatment physical activity interventions, I have a clear plan:

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
How I will deliver this intervention.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Under what circumstances I will deliver this intervention.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How to deliver this intervention when patients are not motivated.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How to deliver this intervention when there is little time.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In my work as a physiotherapist:

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
In uncertain times, I usually expect the best.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am never optimistic about the future.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overall, I expect more good things to happen than bad.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If I deliver a non-treatment physical activity intervention:

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
It will be effective.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My patients will be appreciative.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It will NOT help patients become more physically active.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

For me, delivering a non-treatment physical activity intervention:



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	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Is worthwhile.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

When I deliver a non-treatment physical activity intervention, I feel:

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Optimistic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nervous	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cheerful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comfortable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pessimistic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Uncomfortable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

When I deliver a non-treatment physical activity intervention:

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I get recognition from the work context.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Delivering a non-treatment physical activity intervention is something:

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I do automatically.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do without having to consciously remember.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do without thinking.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often forget.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Additional comments

Do you have anything else to add? Please feel free to provide any comments or additional information you would like to share on the topic of promotion of non-treatment physical activity.

Thank you for participating in this study.



Appendix 3. 2 The survey tool used to identify the BCTs Australian physiotherapists use when promoting NTPA and encouraging adherence to rehabilitation exercises

The behaviour change techniques used by physiotherapists

Welcome

This questionnaire will be used to identify the behaviour change techniques (BCTs) you use to promote exercise adherence AND/OR non-treatment physical activity (NTPA), which is physical activity that is used to improve a patient's general health, as opposed to rehabilitating an ailment. A BCT is a technique used by health care professionals to help people change their behaviour. Please keep these definitions in mind as you progress through the questionnaire.

The questionnaire is expected to take approximately 15-20 minutes. Upon successful completion of the questionnaire, you will be asked to provide your name, email and postal address so you can be sent a thank you gift of **a \$20 gift card OR be placed in a draw to win one of several \$200 gift cards** (the choice is yours!).

Please read the plain language statement before beginning the questionnaire. Beginning the questionnaire is taken as consent to participate in this study.

Thank you very much for taking the time to complete our questionnaire. By doing so, you are making an important contribution to improving the ability of physiotherapists to help patients become physically active.

Ethics approval number: B16-026 (Federation University Australia)

Tell us about you

Q1 How old were you on your last birthday?

- ☐ Under 18 - 24
- ☐ 25 - 34
- ☐ 35 - 44
- ☐ 45 - 54
- ☐ 55 - 64
- ☐ 65 - 74
- ☐ 75 - 84
- ☐ 85 or older
- ☐ Prefer not to answer

Q2 What is your gender?

- ☐ Male, or identifying as male
- ☐ Female, or identifying as female
- ☐ Prefer not to answer

Q3 How many years have you been practicing physiotherapy in Australia?

- ☐ 0-2
- ☐ 3-5
- ☐ 6-10
- ☐ 11-15
- ☐ 16+
- ☐ I am not registered to practice as a physiotherapist in Australia

Note: The demographics section is repeated here as the whole survey has been split in two to be used in future research projects that address either the factors influencing NTPA promotion or BCT use. The survey used in this thesis included both of these surveys delivered together, so the demographics section was presented only once at the start.

Q4 How many patients do you see each week?

- ☐ 0
- ☐ 1-5
- ☐ 6-15
- ☐ 16-25
- ☐ 26+

Q5 Of the number of patients you see per week, how many have musculoskeletal complaints?

- ☐ Less than half
- ☐ Half
- ☐ More than half

Q6 How long would a typical consultation take with a patient with a musculoskeletal condition?

	5-10 minutes	11-15 minutes	16-25 minutes	26 minutes or longer
Initial consultation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Second consultation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Final consultation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q7 Do you have any qualifications, aside from physiotherapy, in psychology or have you attended at least 10 hours of educational classes with a psychology focus? Topics might include motivational interviewing, health coaching, cognitive behavioural therapy or pain management.

- ☐ Yes
- ☐ No
- ☐ Unsure

Q8 Do you have any qualifications, aside from physiotherapy, in health promotion or have you attended at least 10 hours of educational classes with a health promotion focus? Topics might include physical activity promotion, smoking cessation, healthy eating, weight loss and alcohol consumption.

- ☐ Yes
- ☐ No
- ☐ Unsure

Q9 Do you have any qualifications, aside from physiotherapy, in exercise science or have you attended at least 10 hours of educational classes with an exercise science focus? Topics might include exercise physiology and exercise science.

- ☐ Yes
- ☐ No
- ☐ Unsure

Q10 In the past week, on **how many days** have you done a total of 30 min or more of physical activity, which was enough to raise your breathing rate? This may include sport, exercise and brisk walking or cycling for recreation or to get to and from places, but should not include housework or physical activity that may be part of your job.

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

Q11 In the past week, on **how many days** have you participated in muscle strengthening activities?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

Q12 Thinking about your clinical practice in the last month, how often did you encourage your patients to have a more physically active lifestyle specifically for general health purposes?

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Often
- ☐ All of the time

Q13 Of these clinical settings, which do you work in **the most** in an average week?

- ☐ Inpatient
- ☐ Community - Home based
- ☐ Community - Clinic based
- ☐ Private practice
- ☐ Outpatient
- ☐ Other (please write)

The next page includes questions about the behaviour change techniques you use.

The questions will ask you what behaviour change techniques (BCTs) you use clinically, if at all. Questions related to rehabilitation exercises will be specific to lateral elbow pain, however you can think about other musculoskeletal ailments if you like. Questions specific to physical activity will address non-treatment physical activity. If you are unsure whether you use any of the BCTs, please provide your best guess.

This section will use a case study that provides you with descriptions of Brian's consultations with his physiotherapist. Brian's physiotherapist will use BCTs to help him adhere to his exercises and become physically active to improve his overall health. You will be asked if you use any of the BCTs Brian's physiotherapist uses. Each BCT will appear in bold text. Please respond to all questions from your own perspective and based on your clinical experiences.

Who is Brian?

Brian is a 42 year old lawyer who has presented to you with lateral elbow pain. You examine his elbow and suggest some exercises to help reduce his pain. As part of your regular assessment, you identify that Brian is not participating in regular physical activity and ask him why. He states that he doesn't think he needs to be physically active and has been too busy with work and family to exercise. You decide that your time with Brian should be spent addressing his elbow pain and supporting him to become more physically active to prevent development of future musculoskeletal conditions and other non-communicable diseases. Brian is happy with this and is eager to hear how you can help him.

Initial contact

You discuss with Brian the consequences of being inactive to better help him understand why it's important to become physically active. Brian is now aware that being physically active can reduce his risk of heart disease and stroke, can help improve his mood and can provide opportunities to spend more time with his children by going bike riding to the local park, and with his wife by joining her on her after-dinner walk.

You ask Brian what the pros and cons are of him becoming physically active and he states that he would like to be a good example to his children (which you encourage him to focus on), however he feels the additional activity, specifically bike riding, might "aggravate his sore elbow". You recommend Brian sees his doctor to get advice on suitable pain relief medications for his elbow before your next consultation and provide him with advice on elbow supports and some rehabilitation exercises to address the pain.

You encourage Brian to go for a walk after dinner with his wife once over the next week, to get a 'feel' for how a regular walking program could fit into his life, and to watch a short video called 23 and ½ hours by Dr Mike Evans to help him understand how beneficial physical activity is for a healthy life.

Q1 "Brian is now aware that being physically active can reduce his risk of heart disease and stroke..."

This is an example of **providing information about the health consequences** of being physically active.

Consequences can be both positive and negative. Examples of a negative consequence are having an increased risk of heart disease if Brian remains inactive or continuing to feel elbow pain if he doesn't do his exercises.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q2 "Brian is now aware that being physically active...can help improve his mood..."

This is an example of **providing information about the emotional consequences** of being physically active.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q3 "Brian is now aware that being physically active...can provide opportunities to spend more time with his children by going bike riding to the local park, and with his wife by joining her on her after-dinner walk."

This is an example of **providing information about the social and environmental consequences** of being physically active. Another example can be telling Brian he might lose income if he needs time away from typing due to not completing exercises addressing his elbow pain.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q4 "You ask Brian what the pros and cons are of him becoming more active"

This is an example of asking about **pros and cons**.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q5 "...and he states he would like to be a good example to his children (which you encourage him to focus on)"

This is an example of asking Brian to **focus on himself as a role model** to others.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q6 "You recommend Brian sees his doctor to get advice on suitable pain relief medications for his elbow before your next consultation..."

This is an example of **providing pharmacological support**.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q7 "...and provide him with advice on elbow supports and some rehabilitation exercises to address the elbow pain "

This is an example of **facilitating changes to the body**, such as encouraging Brian to complete strengthening exercises so his elbow pain doesn't remain a barrier to activity, to help Brian become more physically active.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q8 "You encourage Brian to go for a walk after dinner with his wife once over the next week, to get a 'feel' for how a regular walking program could fit into his life"

This is an example of encouraging **practice of the new behaviour**, such as physical activity.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q9 "...and to watch a short video called 23 and ½ hours by Dr Mike Evans to help him understand how beneficial physical activity is for a healthy life."

This is an example of using a **credible source** that is in favour of physical activity or any behaviour you want your patient to participate in. The use of this technique can be verbal or visual.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Second contact

Brian comes to see you again with good news. His elbow pain is improving, he is happy with his exercises, he enjoyed the walk with his wife and he is thinking of doing it more often, maybe even joining the kids for a bike ride! You think this is a great opportunity to help Brian make a plan for how he can become more physically active.

You discuss with Brian what he might like to achieve by becoming more physically active, which leads to the discussion of setting some goals. Brian sets a short term goal of walking twice a week for six consecutive weeks with his wife, with the long term goal of riding to the park with the kids one Saturday a month. Brian remembers that being physically active can help improve his weight, so he sets a goal to reduce his weight by 1-2kg over the next month. You set a physical activity action plan together specifying what types of activity he will do, when, how often, for how long and with whom, suggesting to gently increase the distance he walks each week by up to one block. Brian states he is strongly committed to achieving his new goal and is curious to see how he goes. You ask him to sign the action plan as a form of informal contract. You also provide him with an exercise diary so he can monitor his walking progress and elbow exercises and ask him to keep track of his weight, measuring it once per week and noting it down in his exercise diary.

Brian mentions that sometimes he won't want to walk outside because of the weather, and that can make him less likely to go for a walk. You ask if Brian can think of any alternatives to walking outside and he suggests getting his wife's old treadmill up and running again, but he doesn't know how to use it. You show him the features of your gym treadmill and instruct him on how to use it safely. You then show him how to walk on the treadmill using different incline settings and ask him to try it himself. Brian is pleased with his activity plan and will return in one week.

Q10 "Brian sets a short term goal of walking twice a week for six consecutive weeks with his wife, with the long term goal of riding to the park with the kids one Saturday a month"

This is an example of **setting goals specific to a behaviour**, such as being physically active.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q11 "Brian remembers that being physically active can help improve his weight, so he sets a goal to reduce his weight by 1-2kg over the next month."

This is an example of **setting goals specific to an outcome of a behaviour**, such as losing weight as an outcome of being physically active. Another example of using this technique could be setting goals specific to change in elbow pain levels as Brian's exercises progress.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q12 "You set a physical activity action plan together...specifying what types of activity he will do, when, how often, for how long and with whom..."

This is an example of **action planning**.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q13 "Brian states he is strongly committed to achieving his new goal and is curious to see how he goes"

This is an example of gauging Brian's **commitment** to his goals.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q14 "...suggesting to gently increase the distance he walks each week by up to one block."

This is an example of using **graded tasks**, where the task becomes slightly harder each week.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q15 "...and ask him to sign the action plan as a form of informal contract"

This is an example of setting a **behavioural contract**.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q16 "You provide him with a diary so he can monitor his walking progress and elbow exercises..." This is an example of giving Brian the ability to **self-monitor his progress specific to the behaviour** (e.g. physical activity or performing elbow exercises).

This can also be done using wearable devices and smart phone applications.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q17 "...and ask him to keep track of his weight, measuring it once per week and noting it down in his exercise diary"

This is an example of giving Brian the ability to **self-monitor his progress specific to the outcomes of a behaviour**, such as weight loss as an outcome of physical activity or pain reduction as an outcome of doing his elbow exercises.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q18 "Brian mentions that sometimes he won't want to walk outside because of the weather, and that can make him less likely to go for a walk. You ask if Brian can think of any alternatives to walking outside and he suggests getting his wife's old treadmill up and running again"

This is an example of **problem solving**, where a problem is identified and a range of solutions are generated.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q19 "You show him the features of your gym treadmill and instruct him on how to use it safely"

This is an example of **instructing Brian how to perform his new behaviour**.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q20 "You then show him how to walk on the treadmill using different incline settings"

This is an example of **demonstrating the behaviour** to Brian.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block

Third contact

Brian returns to the clinic and you look at his exercise diary. You are pleased he was able to complete most of his elbow exercises and one additional walk last week. You congratulate him and suggest he adds another walk to his schedule this week.

You inform Brian that he is progressing well with both the walking and his elbow exercises, getting closer to achieving his goal of walking twice per week for six consecutive weeks, and ask if he has noticed a difference in his weight. Brian shows you a chart that he keeps of his weight changes. You explain to him that his weight has reduced slightly, as much as expected in this short time, so his current goal of 1-2kg should be achievable. You encourage Brian to focus on these achievements as he continues towards his long term goal of riding with his kids. Brian is pleased with this result but hopes to see greater reductions in the future.

Brian is having difficulty remembering to do his elbow exercises, so you suggest he place his hand weight next to his favourite chair as a prompt to do them while watching TV. Brian didn't like using a can of beans for this activity, so you provided a hand weight for him to use. After progressing Brian's elbow exercises, you return your focus to Brian's desire to lose more weight. Brian understands he needs to increase his physical activity further to lose more weight, but he is not sure how to do this.

You provide several suggestions:

1. Move the treadmill from the garage into the lounge, so he can walk while watching TV;
2. Brian mentioned a few of his colleagues walk at lunch time. You suggest he join them occasionally, rather than sitting in the lunch room with less active colleagues every day; and
3. Brian can ask his wife to place his walking shoes at the front door if he hasn't gone for a walk in a while. She can also ask him to join her twice per week on her evening walk.

You ask Brian to continue using his diary to track his elbow exercises and walking, and to think about ways he can reward himself when he achieves his goals. Before Brian leaves, you remind him of his achievements this week and emphasise to him that he will be able to increase his physical activity levels further despite his busy work schedule.

Q21 "...you look at his exercise diary. You are pleased that he was able to complete most of his elbow exercises and one additional walk last week...and suggest he adds another walk to his schedule this week"

This is an example of **reviewing goals specific to a behaviour**, such as walking twice per week.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q22 "You are pleased that he was able to complete most of his elbow exercises and one additional walk last week. You congratulate him..."

This is an example of **reward approximation**, where you reward any attempt Brian makes to become physically active or complete his elbow exercises.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q23 "...he was able to complete most of his elbow exercises and one additional walk last week. You congratulate him..."

This is an example of providing a **social reward**, where you provide a verbal or non-verbal reward (not a material reward) if Brian has progressed towards achieving his goals.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q24 "He was able to complete most of his elbow exercises and one additional walk last week...You inform Brian that he is progressing well with both the walking and his elbow exercises, getting closer to achieving his goal of walking twice per week for six consecutive weeks..."

This is an example of **providing feedback specific to the behaviour** of being physically active.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q25 "Brian shows you a chart that he keeps of his weight changes. You explain to him that...his current goal of 1-2kg should be achievable."

This is an example of **reviewing goals specific to the outcome of the behaviour**, such as losing some weight after becoming more physically active.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q26 "You explain to him that his weight has reduced slightly, as much as expected in this short time"

This is an example of **providing feedback specific to the outcome** of being physically active, such as weight loss.

You might also provide feedback on an outcome specific to doing elbow exercises, like changes in pain.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q27 "You encourage Brian to focus on these achievements as he continues towards his long term goal of riding with his kids"

This is an example of asking Brian to **focus on his past success**.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q28 "...you suggest he place his hand weight next to his favourite chair as a prompt to do them while watching TV"

This is an example of encouraging Brian to use **prompts or cues** to help him remember to do his exercises.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q29 "Brian didn't like using a can of beans for this activity, so you provided a hand weight for him to use"

This is an example of **adding objects to Brian's environment** to help him do his exercises.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q30 "Move the treadmill from the garage into the lounge..."

This is an example of **restructuring Brian's physical environment** to help him walk more often.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q31 "You suggest he join them occasionally, rather than sitting in the lunch room with less active colleagues every day"

Encouraging Brian to socialise with more active people occasionally is an example of **restructuring Brian's social environment** to help him walk more often.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q32 "Brian can ask his wife to place his walking shoes at the front door..."

This is an example of suggesting Brian uses **practical social support** to help him walk more often. Here, his wife is providing practical help or support.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q33 "She can also ask him to join her twice per week on her evening walk."

This is an example of suggesting Brian get **general or unspecified social support** to help him walk more often. Here, his wife is providing encouragement by suggesting walking opportunities.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q34 "...you remind him of his achievements this week and emphasise to him that he will be able to increase his physical activity levels further despite his busy work schedule."

This is an example of using **verbal persuasion to make Brian feel like he is capable** of walking more often.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Fourth contact

Brian has had a busy week at work. He didn't go for any walks and only did his elbow exercises once.

You read Brian's action plan with him and mention what he did this week fell short of what he planned to do. He asks for help maintaining a regular walking and exercise pattern. Brian is concerned boredom is stopping him from doing his usual evening walk. You suggest he choose another route or invite neighbours or friends to make walking more enjoyable. Brian likes this idea because it might make him consider the walk a social event, rather than exercise. You also encourage Brian to tell himself that a short walk will help improve his mood after a big day. For those times when Brian doesn't feel like going for a walk, you suggest he do anything active, like gardening or working on his cars, rather than relaxing on the couch. Brian doesn't like gardening, but says he'll happily work on his cars.

You ask Brian what rewards he will use when he completes his elbow exercises or goes for a walk. He has decided he will reward himself if, and only if, he completes two walks AND does his elbow exercises at least twice per week for three consecutive weeks. If he achieves this, he will buy himself a new portable music player to make his walks more enjoyable. His wife has also offered to purchase those expensive headphones Brian has been admiring, but only if he continues the walking for longer, six whole weeks!

You ask Brian if he knows anyone who has become more physically active recently. Brian's uncle started walking regularly one year ago and now "looks really fit" and gets plenty of compliments from the family. You prompt Brian to think about how his life might be different in six months if he becomes more active compared to staying the way he is. Brian would love to look as good as his uncle!

Q35 "You...mention what he did this week fell short of what he planned to do."

This is an example of demonstrating to Brian **how his current behaviour does not match his goals**.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q36 "Brian is concerned boredom is stopping him from doing his usual evening walk. You suggest he choose another route or invite neighbours or friends to make walking more enjoyable."

This is an example of **reducing negative emotions** (boredom) associated with physical activity.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q37 "Brian likes this idea because it might make him consider the walk a social event, rather than exercise"

This is an example of helping Brian **reframe** his thoughts about walking, encouraging him to think about walking in a more positive or enjoyable way.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q38 "You also encourage Brian to tell himself that a short walk will help improve his mood after a big day."

This is an example of using **self-talk** to help Brian continue his walking program. Self-talk can involve Brian reflecting (aloud or to himself) on the positives, or the benefits, of going for the walk or doing elbow exercises.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q39 "For those times when Brian doesn't feel like going for a walk, you suggest he do anything active, like gardening or working on his cars, rather than relaxing on the couch"

This is an example of using **behaviour substitution** to encourage Brian to avoid being sedentary (the unwanted behaviour) by doing anything else that is more active.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q40 "He has decided he will reward himself if, and only if, he completes..."

This is an example of asking Brian to set a **self-incentive**, where he plans to reward himself in the future only if he achieves his target.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q41 "If he achieves this, he will buy himself a new portable music player..."

This is an example of Brian **providing himself with a reward** for achieving his target.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q42 "His wife has also offered to purchase those expensive headphones...only if he continues the walking for longer, six whole weeks!"

If Brian does achieve his goal, his wife's action of giving the headphones is an example of **someone else providing a material reward**.

Please indicate how often you use this technique, either giving the reward yourself or encouraging someone else to give it, to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q43 "You ask Brian if he knows anyone who has become more physically active recently. Brian's uncle started walking regularly one year ago and now "looks really fit" and gets plenty of compliments from the family"

This is an example of encouraging Brian to **look at the consequences others have experienced** as a result of becoming more physically active.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q44 "You prompt Brian to think about how his life might be different in six months if he becomes more active compared to staying the way he is. Brian would love to look as good as his uncle!"

This is an example of asking Brian to **compare the future consequences of being physically active with the future consequences of being inactive.**

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Final contact

It has been a few weeks since you have seen Brian. He has been thinking more about how his father died of a heart attack and is shocked that he doesn't even know what his blood pressure is meant to be. Aside from advising Brian to visit his doctor for a check-up, you measure his blood pressure. You advise Brian that his blood pressure is 127/82, which is where it should be. You also ask Brian to see his exercise diary and note down changes in weight over the past month in his patient notes.

You ask Brian how he is going with his elbow exercises. He wished you asked about his physical activity, because he is going well with that! He has only completed his elbow exercises once per week and is still experiencing pain. You explain to Brian that most patients with this type of elbow pain, who complete their exercises, see a significant reduction in pain over one to two months. You also explain that if he lets the pain get worse, it might result in "painful muscle tears and scarring" and offer to show him a photo of elbow surgery. You ask Brian how much regret he will feel if he lets his elbow pain get to the point where it stops him working on his cars.

Brian has not experienced a significant reduction in pain, so you spend some time reviewing the exercises and making sure he is still able to do them correctly. You also remind him about using ice to help reduce the pain. You encourage him to think about a punishment he can arrange for himself if he does not complete his elbow exercises twice per week. His daughter made a lovely money box at school today, maybe he could add \$5 to it each time he skips his exercises? Brian didn't seem to like that idea...

Q45 "...you measure his blood pressure. You advise Brian that his blood pressure is 127/82..."

This is an example of using an external monitoring device to give information about the body (**biofeedback**) as part of helping Brian to become physically active.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q46 "You also ask Brian to see his exercise diary and note down changes in weight over the past month in his patient notes"

This is an example of **monitoring outcomes of Brian's behaviour without providing feedback**.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q47 "You explain to Brian that most patients with this type of elbow pain, who complete their exercises, see a significant reduction in pain over one to two months."

This is an example of **drawing attention to other people's actions so Brian can compare them to his own**.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q48 "...you also explain that if he lets the pain get worse, it might result in "painful muscle tears and scarring" and offer to show him a photo of elbow surgery"

This is an example of using specific, possibly exaggerated, methods to **make the consequences of not performing a behaviour more memorable**.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q49 "You ask Brian how much regret he will feel if he lets his elbow pain get to the point where it stops him working on his cars."

This is an example of asking Brian to **anticipate the regret** he will feel if he does not do his exercises.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q50 "You encourage him to think about a punishment...if he does not complete his elbow exercises...maybe he could add \$5 to (his daughter's money box)...?"

This is an example of working with Brian to discover a suitable self-inflicted **punishment** for not doing his exercises.

Please indicate how often you use this technique to encourage patients to:

	Never	Sometimes	About half the time	Most of the time	Always
Be physically active for general health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete rehabilitation exercises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Additional comments

Do you have anything else to add?

Please feel free to provide any comments or additional information you would like to share on the topic of promotion of non-treatment physical activity.

Thank you for participating in this study.



Appendix 3. 3 The TDF domains and their relationship to the questions used within the influencing factors part of the survey tool

TDF Domain	Definition [#]	Question in DIBQ	Example used in pilot survey	Number of questions included in pilot survey	Internal consistency (pilot)
Behavioural Regulation	Anything aimed at managing or changing objectively observed or measured actions.	I have a clear plan of how I will deliver [PA intervention] following the guidelines.	I have a clear plan of how I will deliver this intervention.	6	0.812**
Beliefs about Capabilities	Acceptance of the truth, reality, or validity about an ability, talent, or facility that a person can put to constructive use.	For me, delivering the training program is (very difficult – very easy).	For me, delivering the content of the intervention is easy.	11	0.775***
Beliefs about Consequences	Acceptance of the truth, reality, or validity about outcomes of a behaviour in a given situation.	For me, delivering [PA intervention] following the guidelines is (not worthwhile at all – very worthwhile).	Delivering a NTPA intervention is worthwhile.	12	0.869**
Goals	Mental representations of outcomes or end states that an individual wants to achieve.	How often is working on something else on your agenda a higher priority than delivering [PA intervention] following	Addressing other patient problems are a higher priority than delivering this intervention.	2	0.472

TDF Domain	Definition [#]	Question in DIBQ	Example used in pilot survey	Number of questions included in pilot survey	Internal consistency (pilot)
		the guidelines?			
Innovation	Any characteristics of the innovation that discourages or encourages the development of skills and abilities, independence, social competence, and adaptive behaviour.	It is possible to tailor [PA intervention] to participants' needs.	It is possible for me to tailor this intervention to my patients' needs.	5	0.665
Innovation Strategy	Any characteristics of the innovation strategy that discourages or encourages the development of skills and abilities, independence, social competence, and adaptive behaviour.	[Implementing organization] provides professionals with training to deliver [PA intervention].	My workplace provides training to deliver this intervention.	7	0.764***
Intentions	A conscious decision to perform a behaviour or a resolve to act in a certain way.	I intend to deliver [PA intervention] following the guidelines in the next three months (1-strongly	I intend to deliver this intervention in the next three months.	3	0.750***

TDF Domain	Definition [#]	Question in DIBQ	Example used in pilot survey	Number of questions included in pilot survey	Internal consistency (pilot)
		disagree to 7-strongly agree).			
Knowledge	An awareness of the existence of something.	I know how to deliver [PA intervention] following the guidelines.	I know how to deliver this intervention.	4	0.779***
Nature of the Behaviour	The nature of the aggregate of all responses made by an individual in any situation.	Delivering [PA intervention] following the guidelines is something I do automatically.	Delivering a NTPA intervention is something I do automatically.	6	0.742***
Negative Emotions	A complex negative reaction pattern, involving experiential, behavioural, and physiological elements, by which the individual attempts to deal with a personally significant matter or event.	When I work with [PA intervention] I feel nervous.	When I deliver a NTPA intervention, I feel nervous.	6	0.823**
Optimism	The confidence that things will happen for	In my work as a physiotherapist, overall, I expect more	In my work as a physiotherapist, overall, I expect	3	0.764***

TDF Domain	Definition [#]	Question in DIBQ	Example used in pilot survey	Number of questions included in pilot survey	Internal consistency (pilot)
	the best or that desired goals will be attained.	good things to happen than bad.	more good things to happen than bad.		
Organisation	Any characteristics of the organisation that discourages or encourages the development of skills and abilities, independence, social competence, and adaptive behaviour.	In the organization I work, all necessary resources are available to deliver [PA intervention].	In my workplace, all necessary resources are available to deliver this intervention.	4	0.905*
Patient	Any characteristics of the patient that discourages or encourages the development of skills and abilities, independence, social competence, and adaptive behaviour.	Participants of [PA intervention] are motivated (1-strongly disagree to 7-strongly agree).	Patients receiving NTPA interventions from me are motivated to do it.	2	0.866**
Positive Emotions	A complex positive reaction pattern, involving experiential, behavioural, and physiological elements, by which the	When I work with [PA intervention] I feel comfortable.	When I deliver a NTPA intervention, I feel comfortable.	6	0.851**

TDF Domain	Definition [#]	Question in DIBQ	Example used in pilot survey	Number of questions included in pilot survey	Internal consistency (pilot)
	individual attempts to deal with a personally significant matter or event.				
Skills	An ability or proficiency acquired through practice.	I have the skills to deliver [an intervention to increase physical activity for general health purposes] following the guidelines.	I have the skills to deliver this intervention.	3	0.750***
Social Influences	Those interpersonal processes that can cause individuals to change their thoughts, feelings, or behaviours.	Most people who are important to me think that I should deliver [PA intervention] following the guidelines.	Most people who are important to me think that I should deliver this intervention.	7	0.012
Social/professional Role and Identity	A coherent set of behaviours and displayed personal qualities of an individual in a social or work setting.	It is my responsibility as a physiotherapist to deliver [PA intervention] following the guidelines.	It is my responsibility as a physiotherapist to deliver this intervention.	3	0.439

TDF Domain	Definition [#]	Question in DIBQ	Example used in pilot survey	Number of questions included in pilot survey	Internal consistency (pilot)
Socio-political Context	Any characteristics of the socio-political context that discourages or encourages the development of skills and abilities, independence, social competence, and adaptive behaviour.	Government and local authorities provide sufficient support to interventions such as [PA intervention].	Government and local authorities provide sufficient support to deliver interventions like this.	3	0.806**

Notes:

[#]Definitions obtained from (Cane et al., 2012; VandenBos et al., 2007) as cited in Huijg, Gebhardt, et al. (2014, p. 10)

* Excellent internal consistency ($\alpha > 0.9$) as per the definition by (L'insalata et al., 1997)

** Good internal consistency ($\alpha = 0.8 - 0.89$) as per the definition by (L'insalata et al., 1997)

*** Acceptable internal consistency ($\alpha = 0.7 - 0.79$) as per the definition by (L'insalata et al., 1997)

Appendix 3. 4 The definitions of the 50 BCTs included in the second part of the survey tool

BCT*	Definitions
<i>Action planning</i>	Prompt detailed planning of performance of the behaviour (must include at least one of context, frequency, duration and intensity). Context may be environmental (physical or social) or internal (physical, emotional or cognitive).
<i>Adding objects to the environment</i>	Add objects to the environment in order to facilitate performance of the behaviour
	Note: Provision of information (e.g. written, verbal, visual) in a booklet or leaflet is insufficient.
<i>Anticipated regret</i>	Induce or raise awareness of expectations of future regret about performance of the unwanted behaviour.
<i>Behaviour substitution</i>	Prompt substitution of the unwanted behaviour with a wanted or neutral behaviour.
<i>Behavioural contract</i>	Create a written specification of the behaviour to be performed, agreed on by the person, and witnessed by another.
<i>Behavioural practice/rehearsal</i>	Prompt practice or rehearsal of the performance of the behaviour one or more times in a context or at a time when the performance may not be necessary, in order to increase habit and skill.
<i>Biofeedback</i>	Provide feedback about the body (e.g. physiological or biochemical state) using an external monitoring device as part of a behaviour change strategy.
<i>Body changes</i>	Alter body structure, functioning or support directly to facilitate behaviour change.

BCT*	Definitions
<i>Commitment</i>	Ask the person to affirm or reaffirm statements indicating commitment to change the behaviour.
<i>Comparative imagining of future outcomes</i>	Prompt or advise the imagining and comparing of future outcomes of changed versus unchanged behaviour.
<i>Credible source</i>	Present verbal or visual communication from a credible source in favour of or against the behaviour.
<i>Demonstration of the behaviour</i>	Provide an observable sample of the performance of the behaviour, directly in person or indirectly (e.g. via film or pictures) for the person to aspire to or imitate.
<i>Discrepancy between current behaviour and goal</i>	Draw attention to discrepancies between a current behaviour (in terms of the form, frequency, duration, or intensity of that behaviour) and the person's previously set outcome goals, behavioural goals or action plans.
<i>Feedback on behaviour</i>	Monitor and provide informative or evaluative feedback on performance of the behaviour (e.g. form, frequency, duration, intensity).
<i>Feedback on outcome(s) of behaviour</i>	Monitor and provide feedback on the outcome (e.g. knee pain) of performance of the behaviour (e.g. physical activity).
<i>Focus on past success</i>	Advise to think about or list previous successes in performing the behaviour (or parts of it).
<i>Framing/reframing</i>	Suggest the deliberate adoption of a perspective or new perspective on behaviour (e.g. its purpose) in order to change cognitions or emotions about performing the behaviour.
<i>Goal setting (behaviour)</i>	Set or agree on a goal defined in terms of the behaviour to be achieved.

BCT*	Definitions
<i>Goal setting (outcome)</i>	Set or agree on a goal defined in terms of a positive outcome of wanted behaviour.
<i>Graded tasks</i>	Set easy-to-perform tasks, making them increasingly difficult, but achievable, until behaviour is performed.
<i>Identification of self as a role model</i>	Inform that one's own behaviour may be an example to others.
<i>Information about emotional consequences</i>	Provide information (e.g. written, verbal, visual) about emotional consequences of performing the behaviour. Note: consequences can be related to emotional health disorders (e.g. depression, anxiety) and/or states of mind (e.g. low mood, stress); consequences can be for any target, not just the recipient(s) of the intervention; only emphasising the importance of the consequences is not sufficient.
<i>Information about health consequences</i>	Provide information (e.g. written, verbal, visual) about health consequences of performing the behaviour. Note: consequences can be for any target, not just the recipient(s) of the intervention; only emphasising the importance of the consequences is not sufficient.
<i>Information about social and environmental consequences</i>	Provide information (e.g. written, verbal, visual) about social and environmental consequences of performing the behaviour. Note: consequences can be for any target, not just the recipient(s) of the intervention; only emphasising the importance of the consequences is not sufficient.

BCT*	Definitions
<i>Instruction on how to perform a behaviour</i>	Advise or agree on how to perform the behaviour.
<i>Material reward (behaviour)</i>	Arrange for the delivery of money, vouchers or other valued objects if and only if there has been effort and/or progress in performing the behaviour.
<i>Monitoring outcome(s) of behaviour by others without feedback</i>	Observe or record outcomes of behaviour (e.g. improvements in knee pain) with the person's knowledge as part of a behaviour change strategy.
<i>Pharmacological support</i>	Provide, or encourage the use of or adherence to, drugs to facilitate behaviour change.
<i>Problem solving</i>	Analyse, or prompt the person to analyse, factors influencing the behaviour and generate or select strategies that include overcoming barriers and/or increasing facilitators.
<i>Prompts/cues</i>	Introduce or define environmental or social stimulus with the purpose of prompting or cueing the behaviour. The prompt or cue would normally occur at the time or place of performance.
<i>Pros and cons</i>	Advise the person to identify and compare reasons for wanting (pros) and not wanting to (cons) change the behaviour.
<i>Punishment</i>	Arrange for aversive consequence contingent on the performance of the unwanted behaviour.
<i>Reduce negative emotions</i>	Advise on ways of reducing negative emotions to facilitate performance of the behaviour.

BCT*	Definitions
<i>Restructuring the physical environment</i>	Change, or advise to change the physical environment in order to facilitate performance of the wanted behaviour or create barriers to the unwanted behaviour (other than prompts/cues, rewards and punishments).
<i>Restructuring the social environment</i>	Change, or advise to change the social environment in order to facilitate performance of the wanted behaviour or create barriers to the unwanted behaviour (other than prompts/cues, rewards and punishments).
<i>Review behaviour goal(s)</i>	Review behaviour goal(s) jointly with the person and consider modifying goal(s) or behaviour change strategy in light of achievement. This may lead to re-setting the same goal, a small change in that goal or setting a new goal instead of (or in addition to) the first, or no change.
<i>Review outcome goal(s)</i>	Review outcome goal(s) jointly with the person and consider modifying goal(s) in light of achievement. This may lead to resetting the same goal, a small change in that goal or setting a new goal instead of, or in addition to the first.
<i>Reward (approximation)</i>	Arrange for reward following any approximation to the target behaviour, gradually rewarding only performance closer to the wanted behaviour.
<i>Salience of consequences</i>	Use methods specifically designed to emphasise the consequences of performing the behaviour with the aim of making them more memorable (goes beyond informing about consequences).
<i>Self-incentive</i>	Plan to reward self in future if and only if there has been effort and/or progress in performing the behaviour.

BCT*	Definitions
<i>Self-monitoring of behaviour</i>	Establish a method for the person to monitor and record their behaviour(s) (e.g. physical activity) as part of a behaviour change strategy.
<i>Self-monitoring of outcome(s) of behaviour</i>	Establish a method for the person to monitor and record the outcome(s) of their behaviour (e.g. improvements in knee pain) as part of a behaviour change strategy.
<i>Self-reward</i>	Encourage your client to self-praise or self-reward if and only if there has been effort and/or progress in performing the behaviour.
<i>Self-talk</i>	Prompt positive self-talk (aloud or silently) before and during the behaviour.
<i>Social comparison</i>	Draw your client's attention to the performance of others to encourage comparison with their own behaviour.
<i>Social reward</i>	Arrange verbal or non-verbal reward if and only if there has been effort and/or progress in performing the behaviour.
<i>Social support (practical)</i>	Advise on, arrange, or provide practical help (e.g. from friends, relatives, colleagues, buddies or staff) for performance of the behaviour.
<i>Social support (unspecified)</i>	Advise on, arrange or provide social support (e.g. from friends, relatives, colleagues, buddies or staff) or non-contingent praise or reward for performance of the behaviour. This technique includes encouragement and counselling, but only when it is directed at the behaviour (e.g. being physically active).
<i>Verbal persuasion about capability</i>	Tell the person that they can successfully perform the wanted behaviour, arguing against self-doubts and asserting that they can and will succeed.

BCT*	Definitions
<i>Vicarious consequences</i>	Prompt observation of the consequences for others when they perform the behaviour.

Notes:

*Definitions provided as listed in the BCTTv1 (Michie, Richardson, et al., 2013)

Approval

Human Research Ethics Committee



Principal Researcher:	Professor Caroline Finch
Other/Student Researcher/s:	Mrs Breanne Kunstler Adjunct Professor Jill Cook Dr Joanne Kemp Dr Paul O'Halloran
School/Section:	ACRISP Faculty of Health
Project Number:	B16-026
Project Title:	Discovering the determinants of, and the behaviour change techniques (BCTs) used when, promoting non-treatment physical activity (NTPA) in Australian physiotherapy practice.
For the period:	21/04/2016 to 30/12/2017

Quote the Project No: B16-026 in all correspondence regarding this application.

Please note: Ethics Approval is contingent upon the submission of annual progress reports and a final report upon completion of the project. It is the responsibility of researchers to make a note of the following dates and submit these reports in a timely manner, as reminders may not be sent out. Failure to submit reports will result in your ethics approval lapsing.

REPORTS TO HREC:

An Annual report for this project must be submitted to the Ethics Officer on:

21 April 2017

A final report for this project must be submitted to the Ethics Officer on:

30 January 2018

These report forms can be found at:

<http://federation.edu.au/research-and-innovation/research-support/ethics/human-ethics/human-ethics3>

Fiona Koop

Ethics Officer

21 April 2016

Please see attached 'Conditions of Approval'.

Office Use Only					
RM		Sig Dates		Shared Drv:	Notes:

CONDITIONS OF APPROVAL

1. The project must be conducted in accordance with the approved application, including any conditions and amendments that have been approved. You must comply with all of the conditions imposed by the HREC, and any subsequent conditions that the HREC may require.
2. You must report immediately anything which might affect ethical acceptance of your project, including:
 - Adverse effects on participants;
 - Significant unforeseen events;
 - Other matters that might affect continued ethical acceptability of the project.
3. Where approval has been given subject to the submission of copies of documents such as letters of support or approvals from third parties, these must be provided to the Ethics Office before the research may commence at each relevant location.
4. Proposed changes or amendments to the research must be applied for, using a '**Request for Amendments**' form, and approved by the HREC before these may be implemented.
5. If an extension is required beyond the approved end date of the project, a '**Request for Extension**' should be submitted, allowing sufficient time for its consideration by the committee. Extensions cannot be granted retrospectively.
6. If changes are to be made to the project's personnel, a '**Changes to Personnel**' form should be submitted for approval.
7. An '**Annual Report**' must be provided by the due date specified each year for the project to have continuing approval.
8. A '**Final Report**' must be provided at the conclusion of the project.
9. If, for any reason, the project does not proceed or is discontinued, you must advise the committee in writing, using a '**Final Report**' form.
10. You must advise the HREC immediately, in writing, if any complaint is made about the conduct of the project.
11. You must notify the Ethics Office of any changes in contact details including address, phone number and email address.
12. The HREC may conduct random audits and / or require additional reports concerning the research project.

Failure to comply with the *National Statement on Ethical Conduct in Human Research (2007)* and with the conditions of approval will result in suspension or withdrawal of approval.

Annual/Final Project Report

Human Research Ethics Committee



Please indicate the type of report	<input type="checkbox"/> Annual Report (Omit ,3b, 5b) <input checked="" type="checkbox"/> Final Report
Project No:	B16-026
Project Name:	Discovering the determinants of, and the behaviour change techniques (BCTs) used when, promoting non-treatment physical activity (NTPA) in Australian physiotherapy practice.
Principal Researcher:	Professor Caroline Finch
Other Researchers:	Mrs Breanne Kunstler Adjunct Professor Jill Cook Dr Joanne Kemp Dr Paul O'Halloran
Date of Original Approval:	21/4/16
School / Section:	ACRISP/Faculty of Health
Phone:	53276580
Email:	c.finch@federation.edu.au, breannekunstler@students.federation.edu.au

Please note: For HDR candidates, it is a requirement of candidature to submit Candidature reports annually to research.degrees@federation.edu.au in addition to Ethics Annual/Final reports.

1) Please indicate the current status of the project:				
1a) Yet to start			<input type="checkbox"/>	
1b) Continuing			<input type="checkbox"/>	
1c) Data collection completed			X	
1d) Abandoned / Withdrawn:			<input type="checkbox"/>	
1e) If the approval was subject to certain conditions, have these conditions been met? (If not, please give details in the comments box below)		X Yes	<input type="checkbox"/> No	
Comments:				
1f) Data Analysis	<input type="checkbox"/> Not yet commenced	X Proceeding	<input type="checkbox"/> Complete	<input type="checkbox"/> None
1g) Have ethical problems been encountered in any of the following areas:				
Study Design			<input type="checkbox"/> Yes	X No
Recruitment of Subjects			<input type="checkbox"/> Yes	X No

Annual/Final Project Report

Human Research Ethics Committee



Finance Facilities, Equipment (If yes, please give details in the comments box below)	<input type="checkbox"/> Yes <input type="checkbox"/> Yes	X No X No
Comments:		

2a) Have amendments been made to the originally approved project?	
<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes
2b) If yes, was HREC approval granted for these changes?	
<input checked="" type="checkbox"/> Yes	Provide detail: <input checked="" type="checkbox"/> Yes Application for Amendment to an Existing Project <input type="checkbox"/> Yes Change of Personnel <input checked="" type="checkbox"/> Yes Extension Request
<input type="checkbox"/> No	If you have made changes, but not had HREC approval, provide detail as to why this has not yet occurred:
2c) Do you need to submit any amendments now?	
<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes Application for Amendment to an Existing Project <input type="checkbox"/> Yes Change of Personnel <input type="checkbox"/> Yes Extension Request * NB: If 'Yes', download & submit the appropriate request to the HREC for approval: Please note: Extensions will not be granted retrospectively. Apply well prior to the project end date, to ensure continuity of HRE approval.

3a) Please indicate where you are storing the data collected during the course of this project:
Online (https://www.qualtrics.com/ which is the online program used to collect responses) and FUA OneDrive accessed offsite using an FUA laptop with password access.
3b) For Final Reports only: Advise when & how stored data will be destroyed
All collected data will be transferred from Breanne Kunstler's laptop to Professor Finch for storage until 28 February 2023, when the data will be permanently deleted.

4) Have there been any events that might have had an adverse effect on the research participants OR unforeseen events that might affect continued ethical acceptability of the project?	
<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes * NB: If 'yes', please provide details in the comments box below:

Annual/Final Project Report

Human Research Ethics Committee



Comments:	

5a) Please provide a short summary of results of the project so far (no attachments please):

216 full responses have been provided by Australian physiotherapists working in private practice and outpatient settings and treating patients primarily with musculoskeletal complaints. Responses have been collected from rural, regional and metro areas and from every state and/or territory in Australia. Participants have offered comments at the end of the survey to indicate it was well received.



142 participants chose to receive a \$20 gift card for their time, 2 participants selected to receive nothing and the remainder (72) were entered into a draw to win one of 5 \$200 gift cards (yet to be drawn).

5b) Final Projects only: Were the aims of the project (as stated in the application for Approval) achieved?

Upon data analysis, yes.

6) The HREC welcomes any feedback on:



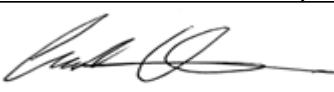
- Difficulties experienced with carrying out the research project; or
- Appropriate suggestions which might lead to improvements in ethical clearance and monitoring of research.

7) Signatures			
Principal Researcher:		Date:	05/06/2017
	Print name: Caroline Finch		
Other/Student Researchers:		Date:	5/6/17
	Print name: Breanne Kunstler		
			5/6/17

Annual/Final Project Report

Human Research Ethics Committee



	 Print name: Jill Cook	Date:	
	 Print name: Joanne Kemp	Date:	5/6/17
	 Print name: Paul O'Halloran	Date:	5/6/17

Submit to the Ethics Officer, Gippsland or Mt Helen campus, by the due date:
research.ethics@federation.edu.au

Plain Language Information Statement



School of Health Science and Psychology and the Australian Collaboration for Research into Injury in Sport and its Prevention research centre (ACRISP)

PROJECT TITLE:	Discovering the determinants of, and the behaviour change techniques (BCTs) used when, promoting non-treatment physical activity (NTPA) in Australian physiotherapy practice.
PRINCIPAL RESEARCHER:	Professor Caroline Finch
OTHER/STUDENT RESEARCHERS:	Ms Breanne Kunstler (PhD student): breannekunstler@students.federation.edu.au Professor Jill Cook: j.cook@latrobe.edu.au Dr Joanne Kemp: j.kemp@latrobe.edu.au Dr Paul O'Halloran: p.ohalloran@latrobe.edu.au

You are invited to complete a questionnaire as part of a study looking at how Australian physiotherapists, who treat patients with musculoskeletal injuries, support them to become physically active.

Completion of the first part of the online questionnaire will involve thinking about factors that make it easy or hard for you to promote, or encourage, physical activity to your patients. The type of physical activity used throughout the questionnaire is called 'non-treatment physical activity' (NTPA) and is physical activity used to maintain health and prevent development of disease, as opposed to the physical activity you might prescribe to help treat a musculoskeletal condition.

The second part involves thinking about the techniques you use to promote NTPA. Techniques will be presented throughout the questionnaire as behaviour change techniques, or BCTs, which are techniques used by clinicians to help patients change their behaviour. We will present a case study to you and simply ask how often you use the BCTs from the case study to encourage patients to participate in NTPA or adhere to their rehabilitation exercises.

The questionnaire will take **approximately 25 minutes to complete** and can be completed over several sessions. You can withdraw from completing the questionnaire at any time. To thank you for your time, you will be provided with the opportunity to volunteer your email, name and postal address to be sent a **\$20 gift voucher**. Alternatively, you can choose to be placed in a draw to win one of several \$200 gift cards. The questionnaire will close once 150 responses have been received.

Your participation in this study is completely voluntary and any refusal to participate requires no explanation. Consent to participate in the questionnaire will be established by you submitting responses. Your email, name and postal address will not be used to identify your responses or for any purpose except to send you your gift card.

All data provided by you will be collected using Qualtrics (Qualtrics, Provo, UT) software, through the internet, on your computer or smart device. The questionnaire data, as well as your email, name and postal address, will be accessible only to the research team above and stored for five years on a password-secured computer at Federation University Australia until it is permanently destroyed.

Findings from this research will be published in peer-reviewed journals and presented at national and international conferences. No identifying information will be used in any publications or presentations. Funding for this project is provided by a 2016 Tagged Grant awarded by the Physiotherapy Research Foundation.

Although unexpected, if you experience any distress while completing this questionnaire, you can contact support organisations external to the research team, such as Beyond Blue on 1300 22 4636 or Lifeline on 13 11 14.

If you have any questions, or you would like further information regarding the project above, please contact

Plain Language Information Statement



the Principal Researcher, **Professor Caroline Finch** of ACRISP.

Phone: **03 5327 6338**

Email: **c.finch@federation.edu.au**

Should you (i.e. the participant) have any concerns about the ethical conduct of this research project, please contact the Federation University Ethics Officers, Research Services, Federation University Australia, P O Box 663 Mt Helen Vic 3353 or Northways Rd, Churchill Vic 3842.

Telephone: (03) 5327 9765, (03) 5122 6446

Email: research.ethics@federation.edu.au

CRICOS Provider Number 00103D

Ethics approval number: B16-026

Appendix 3. 8 The questions that were deleted from the influencing factors part of survey after the pilot stage

When I consider using a non-treatment physical activity intervention in my practice:

1. I have control over delivering this intervention
2. For me, performing the re-assessment of physical activity levels is easy
3. For me, reporting about the progress of the intervention to a referring professional is easy
4. It is possible for me to tailor this intervention to my needs
5. Professionals with whom I associate with think I should deliver this intervention
6. Professionals with whom I associate with deliver this intervention
7. Other professionals deliver this intervention
8. I am confident I can deliver this intervention even when other professionals with whom I work do not do this
9. I have a clear plan to deliver this intervention even when other professionals with whom I work choose not to deliver the intervention
10. I have a clear plan when I will deliver this intervention
11. If I deliver the intervention, I will feel satisfied
12. Delivering this intervention will strengthen the collaboration with professionals with whom I work
13. My workplace provides sufficient financial reimbursement for delivering this intervention
14. When I deliver a non-treatment physical activity intervention, I get financial reimbursement

15. Delivering a non-treatment physical activity intervention is useful
16. Delivering a non-treatment physical activity intervention is pleasurable
17. Delivering a non-treatment physical activity intervention is interesting
18. When delivering a non-treatment physical activity intervention, I feel calm
19. When delivering a non-treatment physical activity intervention, I feel depressed
20. When delivering a non-treatment physical activity intervention, I feel sad
21. When delivering a non-treatment physical activity intervention, I feel relaxed
22. When delivering a non-treatment physical activity intervention, I feel agitated
23. When delivering a non-treatment physical activity intervention, I feel elated
24. When I deliver a non-treatment physical activity intervention, I get recognition
from patients
25. Delivering a non-treatment physical activity intervention is something I start
doing before I realise I'm doing it
26. Delivering a non-treatment physical activity intervention is something I seldom
forget

Appendix 3. 9 The internal consistency of each of the 18 TDF behavioural domains included in the survey tool

Behavioural (TDF) domain	Number of variables in the domain	Alpha	Corrected item-total correlation (range)
Behavioural Regulation	4	0.831	0.654 – 0.682*
Belief about Capability	6	0.788	0.495 – 0.586**
Belief about Consequences	5	0.682	0.305 – 0.637**
Goals	2	0.719	0.561 – 0.561*
Innovation	4	0.686	0.350 – 0.572**
Innovation Strategy	4	0.869	0.639 – 0.785*
Intention	3	0.875	0.733 – 0.780*
Knowledge	4	0.813	0.597 – 0.715*
Nature of the Behaviour	4	0.897	0.653 – 0.871*
Negative Emotions	3	0.763	0.566 – 0.648*
Optimism	3	0.596	0.332 – 0.529**
Organisation	4	0.837	0.431 – 0.786**
Patient	2	0.587	0.415 – 0.415**
Positive Emotions	3	0.771	0.579 – 0.632*
Skills	3	0.700	0.493 – 0.582**
Social Influences	3	0.668	0.208 – 0.655
Socio-political Context	3	0.600	0.371 – 0.446**
Socio-professional Role and Identity	3	0.729	0.522 – 0.603*

Notes:

TDF = Theoretical domains framework

* Desirable corrected item-total correlation (>0.5) as per the definition by Ferketich (1991)

** Good corrected item-total correlation (0.30 - 0.50) as per the definition by Ferketich (1991)

Appendix 3. 10 All variables that were included in the first stage of the binary logistic regression analysis used to identify the factors influencing physiotherapists' decision to promote NTPA

Variable type	Variable name	Measure	Description
Dependent	NTPALR	Nominal	Frequency the physiotherapist promotes NTPA
Independent	ExQualLR	Nominal	Physiotherapist holds qualifications in exercise science
	SConsultDich	Nominal	The amount of time (minutes) the second consultation with a patient usually takes
	TConsultDich	Nominal	The amount of time (minutes) the final consultation with a patient usually takes
	Manager	Nominal	Physiotherapist is, or is not, a clinic manager
	PTPALevel	Ordinal	The physiotherapists' PA level
	BehavRegM	Scale	Mean of four Behavioural Regulation variables
	BeliefCapaM	Scale	Mean of six Belief about Capability variables
	BeliefConseqM	Scale	Mean of five Belief about Consequences variables
	GoalsM	Scale	Mean of two Goals variables

Variable type	Variable name	Measure	Description
	InnovationM	Scale	Mean of four Innovation variables
	InnovStratM	Scale	Mean of four Innovation Strategy variables
	IntentionsM	Scale	Mean of three Intentions variables
	KnowledgeM	Scale	Mean of four Knowledge variables
	NatOfBehavM	Scale	Mean of four Nature of Behaviour variables
	NegEmoM	Scale	Mean of three Negative Emotions variables
	OptimismM	Scale	Mean of three Optimism variables
	OrganisationM	Scale	Mean of four Organisation variables
	PatientM	Scale	Mean of two Patient variables
	PosEmoM	Scale	Mean of three Positive Emotions variables
	SkillsM	Scale	Mean of three Skills variables
	SocInfluenceM	Scale	Mean of three Social Influences variables

Variable type	Variable name	Measure	Description
	SocProfRoleM	Scale	Mean of three Social/professional Role and Identity variables

Appendix 3. 11 The frequency of responses to all domain statements from 486 Australian physiotherapists who partially or fully completed a national survey examining the factors influencing physiotherapists' decision to promote NTPA

Domain	Statement (n = number of responses)	Agree (%)	Neither agree nor disagree (%)	Disagree (%)
Behavioural Regulation	I have a clear plan of how I will deliver this intervention (n = 263)	180 (68.4)	45 (17.1)	38 (14.5)
	I have a clear plan under what circumstances I will deliver this intervention (n = 263)	192 (73.0)	42 (16.0)	29 (11.0)
	I have a clear plan of how to deliver this intervention when patients are not motivated (n = 263)	125 (47.5)	53 (20.2)	85 (32.3)
	I have a clear plan of how to deliver this intervention when there is little time (n = 263)	133 (50.6)	56 (21.3)	74 (28.1)
Beliefs about Capabilities	For me, delivering the content of the intervention is easy (n = 274)	218 (79.6)	34 (12.4)	22 (8.0)
	For me, giving attention to my patients' maintenance of physical activity behaviour outside the clinic is easy (n = 274)	148 (54.0)	52 (19.0)	74 (27.0)
	For me, performing the initial assessment of physical activity levels is easy (n = 274)	183 (66.8)	52 (19.0)	39 (14.2)
	I am confident that I can deliver this intervention (n = 263)	237 (90.1)	11 (4.2)	15 (5.7)

Domain	Statement (n = number of responses)	Agree (%)	Neither agree nor disagree (%)	Disagree (%)
Beliefs about Consequences	I am confident that I can deliver this intervention even when there is little time (n = 263)	160 (60.8)	40 (15.2)	63 (24.0)
	I am confident that I can deliver this intervention even when patients are not motivated (n = 263)	118 (44.9)	49 (18.6)	96 (36.5)
	My patients will be appreciative if I deliver a non-treatment physical activity intervention (n = 258)	181 (70.2)	60 (23.3)	17 (6.6)
	If I deliver a non-treatment physical activity intervention, my patients will become more physically active (n = 258)	212 (82.2)	39 (15.1)	7 (2.7)
	If I deliver a non-treatment physical activity intervention, it will be effective (n = 258)	175 (67.8)	69 (26.7)	14 (5.4)
	For me, delivering a non-treatment physical activity intervention is worthwhile (n = 258)	251 (97.3)	3 (1.2)	4 (1.6)
Goals	I get recognition from the work context when I deliver a non-treatment physical activity intervention (n = 258)	85 (33.0)	103 (39.9)	70 (27.1)
	Addressing other patient problems are a higher priority than delivering this intervention (n = 263)	168 (63.9)	65 (24.7)	30 (11.4)
	Addressing other patient problems are more urgent than delivering this intervention (n = 263)	153 (58.2)	75 (28.5)	35 (13.3)
Innovation	It is possible for me to tailor this intervention to my patients' needs (n = 273)	258 (94.5)	11 (4.0)	4 (1.5)

Domain	Statement (n = number of responses)	Agree (%)	Neither agree nor disagree (%)	Disagree (%)
Innovation Strategy	This intervention takes little time to deliver (n = 273)	153 (56.0)	51 (18.7)	69 (25.3)
	This intervention is well suited to daily practice (n = 273)	221 (81.0)	42 (15.4)	10 (3.7)
	This intervention is simple to deliver (n = 273)	181 (66.3)	55 (20.2)	37 (13.6)
	My workplace provides training to deliver this intervention (n = 249)	108 (43.4)	55 (22.1)	86 (34.5)
	My workplace provides sufficient intervention materials to support implementation and delivery (n = 252)	139 (55.2)	36 (14.3)	77 (30.6)
	My workplace provides assistance with delivering this intervention (n = 247)	141 (57.1)	49 (19.8)	57 (23.1)
	My workplace provides support meetings where I can get my questions answered about delivering this intervention (n = 240)	116 (48.3)	45 (18.8)	79 (32.9)
	I intend to deliver this intervention in the next three months (n = 273)	247 (90.5)	21 (7.7)	5 (1.8)
	My intention to deliver this intervention in the next three months is strong (n = 273)	241 (88.3)	23 (8.4)	9 (3.3)
Intentions	I will definitely deliver this intervention in the next three months (n = 273)	245 (89.7)	19 (7.0)	9 (3.3)

Domain	Statement (n = number of responses)	Agree (%)	Neither agree nor disagree (%)	Disagree (%)
Knowledge	I know how to deliver this intervention (n = 273)	247 (90.5)	14 (5.1)	12 (4.4)
	The objectives of this intervention and my role in this are clearly defined for me (n = 273)	203 (74.4)	36 (13.2)	34 (12.5)
	With regard to promoting non-treatment physical activity, I know what my responsibilities are (n = 273)	214 (78.4)	33 (12.1)	26 (9.5)
	With regard to promoting non-treatment physical activity, I know exactly what is expected from me (n = 273)	190 (69.6)	48 (17.6)	35 (12.8)
Nature of the Behaviour	Delivering a non-treatment physical activity intervention is something I do automatically (n = 258)	201 (77.9)	20 (7.8)	37 (14.3)
	Delivering a non-treatment physical activity intervention is something I do without having to consciously remember (n = 258)	193 (74.8)	27 (10.5)	38 (14.7)
	Delivering a non-treatment physical activity intervention is something I do without thinking (n = 258)	166 (64.3)	34 (13.2)	58 (22.5)
	Delivering a non-treatment physical activity intervention is something I never forget to do (n = 258)	190 (73.6)	36 (14.0)	32 (12.4)
Negative Emotions	I feel nervous when I deliver a non-treatment physical activity intervention (n = 259)	45 (17.4)	50 (19.3)	164 (63.3)
	I feel pessimistic when I deliver a non-treatment physical activity intervention (n = 259)	22 (8.5)	48 (18.5)	189 (73.0)

Domain	Statement (n = number of responses)	Agree (%)	Neither agree nor disagree (%)	Disagree (%)
Optimism	I feel uncomfortable when I deliver a non-treatment physical activity intervention (n = 259)	25 (9.7)	34 (13.1)	200 (77.2)
	In my work as a physiotherapist, in uncertain times, I usually expect the best (n = 258)	158 (61.2)	66 (25.6)	34 (13.2)
	In my work as a physiotherapist, I am optimistic about the future (n = 258)	222 (86.1)	22 (8.5)	14 (5.4)
Organisation	In my work as a physiotherapist, overall, I expect more good things to happen than bad (n = 258)	218 (84.5)	30 (11.6)	10 (3.9)
	My workplace provides all necessary resources to deliver this intervention (n = 254)	157 (61.8)	34 (13.4)	63 (24.8)
	The management of my workplace is willing to listen to my problems with delivering this intervention (n = 231)	189 (81.8)	24 (10.4)	18 (7.8)
	The management of my workplace is helpful when delivering this intervention (n = 230)	180 (78.3)	32 (13.9)	18 (7.8)
Patient	I can count on support from the management of my workplace when things get tough around promoting non-treatment physical activity (n = 230)	183 (79.6)	30 (13.0)	17 (7.4)
	Patients receiving non-treatment physical activity interventions from me are motivated to do it (n = 262)	152 (58.0)	75 (28.6)	35 (13.4)
	Patients receiving non-treatment physical activity interventions from me are positive about the intervention (n = 262)	132 (50.4)	90 (34.4)	40 (15.3)

Domain	Statement (n = number of responses)	Agree (%)	Neither agree nor disagree (%)	Disagree (%)
Positive Emotions	I feel optimistic when I deliver a non-treatment physical activity intervention (n = 259)	214 (82.6)	31 (12.0)	14 (5.4)
	I feel cheerful when I deliver a non-treatment physical activity intervention (n = 259)	195 (75.3)	49 (18.9)	15 (5.8)
	I feel comfortable when I deliver a non-treatment physical activity intervention (n = 259)	212 (81.9)	33 (12.7)	14 (5.4)
Skills	I have been trained in delivering this intervention (n = 273)	174 (63.7)	42 (15.4)	57 (20.9)
	I have the skills to deliver this intervention (n = 273)	229 (83.9)	29 (10.6)	15 (5.5)
	I have experience delivering this intervention (n = 273)	238 (87.2)	23 (8.4)	12 (4.4)
Social Influences	Most people who are important to me think that I should deliver this intervention (n = 273)	157 (57.5)	99 (36.3)	17 (6.2)
	Professionals with whom I work are willing to listen to my problems with delivering this intervention (n = 249)	212 (85.1)	28 (11.2)	9 (3.6)
	Professionals with whom I work helpful with delivering this intervention (n = 247)	214 (86.6)	21 (8.5)	12 (4.9)
Socio-political Context	Government and local authorities provide sufficient support to deliver interventions like this (n = 274)	55 (20.1)	83 (30.3)	136 (49.6)

Domain	Statement (n = number of responses)	Agree (%)	Neither agree nor disagree (%)	Disagree (%)
	Insurance companies provide sufficient support to deliver interventions like this (n = 274)	42 (15.3)	70 (25.6)	162 (59.1)
	Primary health care is sufficiently oriented towards disease prevention (n = 274)	61 (22.3)	43 (15.7)	170 (62.0)
Social/professional Role and Identity	Delivering this intervention is part of my work as a physiotherapist (n = 273)	252 (92.3)	12 (4.4)	9 (3.3)
	As a physiotherapist, it is my job to deliver this intervention (n = 273)	257 (94.1)	7 (2.6)	9 (3.3)
	It is my responsibility as a physiotherapist to deliver this intervention (n = 273)	254 (93.1)	10 (3.7)	9 (3.3)

Notes:

Majority responses are **bolded**

NTPA = Non-treatment physical activity

% = percentage that does not include missing cases

Appendix 3. 12 The unadjusted associations between responses to behavioural domain questions and the frequency that 486 Australian physiotherapists promoted NTPA (defined as always or irregularly)

Behavioural (TDF) domain	Rho	p
Behavioural Regulation	0.242	<0.001
Belief about Capability	0.267	<0.001
Belief about Consequences	0.226	<0.001
Goals	-0.181	0.003
Innovation	0.254	<0.001
Innovation Strategy	0.218	<0.001
Intention	0.269	<0.001
Knowledge	0.337	<0.001
Nature of the Behaviour	0.326	<0.001
Negative Emotions	-0.179	0.004
Optimism	0.180	0.004
Organisation	0.205	0.001
Patient	0.104	0.093
Positive Emotions	0.319	<0.001
Skills	0.244	<0.001
Social Influences	0.267	<0.001
Socio-political Context	0.027	0.654
Socio-professional Role and Identity	0.281	<0.001

Notes:

NTPA = Non-treatment physical activity

TDF = Theoretical domains framework

Plain Language Information Statement



School of Health Science and Psychology and the Australian Collaboration for Research into Injury in Sport and its Prevention research centre (ACRISP)

PROJECT TITLE:	What are the experiences of physiotherapists who promote physical activity to patients with musculoskeletal conditions? A qualitative study.
PRINCIPAL RESEARCHER:	Professor Caroline Finch (Office 025, E Building, SMB campus).
OTHER/STUDENT RESEARCHERS:	Ms Breanne Kunstler (PhD student): breannekunstler@students.federation.edu.au Professor Jill Cook: j.cook@latrobe.edu.au Dr Joanne Kemp: j.kemp@latrobe.edu.au Dr Paul O'Halloran: p.ohalloran@latrobe.edu.au

You are invited to participate in a project exploring the factors influencing the use of behaviour change techniques (BCTs) and promotion of non-treatment physical activity (NTPA) to patients with musculoskeletal injury.

A BCT is a technique, e.g. goal setting, used by physiotherapists to help patients change their behaviour. Non-treatment physical activity is physical activity engaged in to maintain health and prevent development of disease, as opposed to the physical activity physiotherapists might prescribe to help treat a musculoskeletal condition. If these terms are unfamiliar to you, don't worry, that's something we will explore in the interview.

What do I need to do?

If you volunteer to participate in this project, you will be asked to complete a short, **3 minute questionnaire** prior to an interview to establish your eligibility for the study as well as provide general information about your work and education. This questionnaire is voluntary, you do not have to complete it and you can withdraw at any time without prejudice. However, if you do not complete the questionnaire, your eligibility for the interview study cannot be established and you will not be able to participate in an interview. Once ten participants have been recruited, the questionnaire will close and recruitment will cease.

The interview will begin by discussing your experiences promoting NTPA and using BCTs in your clinical practice and where you might have come across or learnt about these concepts. We will also discuss your perception of the physiotherapist's role in promoting healthy behaviours and using BCTs to do this. There are no right or wrong answers. I, Breanne Kunstler (interviewer), am interested in your views, opinions and beliefs. You are always going to be the expert on those.

The session will take **up to 90 minutes** to complete, including 60 minutes for the interview and 30 minutes for administrative tasks, and can be completed at time and location convenient for you. Upon completion, you will be provided with a **\$20 gift voucher** to thank you for your time.

Things to remember when participating in this project

Your participation in this study is completely voluntary and any refusal to participate requires no explanation. You can choose not to answer questions asked in the interview if you choose. Your name and any other personal information will not be used to identify you during analysis of your answers or publishing of results. The information you provide will remain confidential (subject to legal limitations). You can withdraw your consent to participate at any time, up until data processing, without prejudice.

All data provided by you will be audio recorded and is accessible only to the research team above. Anonymous recordings will be transcribed and stored for five years in a password-secured facility at Federation University Australia until it is permanently destroyed.

Findings and unidentified quotes provided by you during the interview will be published in peer-reviewed journals and presented at national and international conferences. No identifying information will

Plain Language Information Statement



be used in any publications or presentations, instead pseudonyms will be used to present quotes. Funding for this project is provided by a 2016 Tagged Grant awarded by the Physiotherapy Research Foundation.

Although unexpected, if you experience any distress while participating in this interview, please contact Professor Finch (details below) if desired. You might also like to contact an organisation external to the research team. You can contact Beyond Blue on 1300 22 4636 Lifeline on 13 11 14.

If you have any questions about this project, or you would like further information regarding the project above, please contact the Principal Researcher, **Professor Caroline Finch** of ACRISP.

Phone: **03 5327 6338**

Email: c.finch@federation.edu.au

Should you (i.e. the participant) have any concerns about the ethical conduct of this research project, please contact the Federation University Ethics Officers, Research Services, Federation University Australia,
P O Box 663 Mt Helen Vic 3353 or Northways Rd, Churchill Vic 3842.

Telephone: (03) 5327 9765, (03) 5122 6446

Email: research.ethics@federation.edu.au

CRICOS Provider Number 00103D

Ethics approval number: B16-131

Consent Form



PROJECT TITLE:	What are the experiences of physiotherapists who promote physical activity to patients with musculoskeletal conditions? A qualitative study.
PRINCIPAL RESEARCHER:	Professor Caroline Finch
OTHER/STUDENT RESEARCHERS:	Ms Breanne Kunstler (PhD student): breannekunstler@students.federation.edu.au Professor Jill Cook: j.cook@latrobe.edu.au Dr Joanne Kemp: j.kemp@federation.edu.au Dr Paul O'Halloran: p.ohalloran@latrobe.edu.au

Consent – Please complete the following information:

I, of (address)
.....
hereby consent to participate as a subject in the above research study.

The research program in which I am being asked to participate has been explained fully to me, verbally and in writing, and any matters on which I have sought information have been answered to my satisfaction.

I understand that all information I provide (including questionnaires) will be treated with the strictest confidence, subject to legal limitations, and data will be stored separately from any listing that includes my name and address.

- I agree to have my responses during the interview recorded and the audio material to be transcribed and analysed for the purposes of discovering themes related to physical activity promotion and behaviour change in physiotherapy practice.
- I accept that aggregated results and unidentified quotes (using pseudonyms) will be used for research purposes and may be reported in scientific and academic journals.
- I will receive a thank-you gift of a \$20 gift card.
- I give permission for Jill Boatman (Administration officer, Federation University Australia Ph: 03 5327 9067) to use my name and address to post me my gift card (if required).
- ***I am free to withdraw my consent at any time during the study in which event my participation in the research study will immediately cease and any information obtained from it will not be used.***
- ***Once information has been aggregated it is unable to be identified, and from this point it is not possible to withdraw consent to participate***

SIGNATURE: DATE:

Approval

Human Research Ethics Committee



Principal Researcher:	Professor Caroline Finch
Other/Student Researcher/s:	Mrs Breanne Kunstler Professor Jill Cook Dr Joanne Kemp Dr Paul O'Halloran
School/Section:	ACRISP, Faculty of Health, School of Health Science and Psychology
Project Number:	B16-131
Project Title:	What are the experiences of physiotherapists who promote physical activity to patients with musculoskeletal conditions? A qualitative study.
For the period:	25/08/2016 to 31/12/2017

Quote the Project No: B16-131 in all correspondence regarding this application.

Please note: Ethics Approval is contingent upon the submission of Annual Progress reports and a Final report upon completion of the project. It is the responsibility of researchers to make a note of the following dates and submit these reports in a timely manner, as reminders may not be sent out. Failure to submit reports will result in your ethics approval lapsing

REPORTS TO HREC:

An Amendment report for this project must be submitted to the Ethics Officer on:
25 August 2017

A Final report for this project must be submitted to the Ethics Officer on:
31 January 2018

These report forms can be found at:

<http://federation.edu.au/research-and-innovation/research-support/ethics/human-ethics/human-ethics3>



Fiona Koop
Ethics Officer
25 August 2016

Please see attached 'Conditions of Approval'.

Approval

Human Research Ethics Committee

CONDITIONS OF APPROVAL

1. The project must be conducted in accordance with the approved application, including any conditions and amendments that have been approved. You must comply with all of the conditions imposed by the HREC, and any subsequent conditions that the HREC may require.
2. You must report immediately anything which might affect ethical acceptance of your project, including:
 - Adverse effects on participants;
 - Significant unforeseen events;
 - Other matters that might affect continued ethical acceptability of the project.
3. Where approval has been given subject to the submission of copies of documents such as letters of support or approvals from third parties, these must be provided to the Ethics Office before the research may commence at each relevant location.
4. Proposed changes or amendments to the research must be applied for, using a '**Request for Amendments**' form, and approved by the HREC before these may be implemented.
5. If an extension is required beyond the approved end date of the project, a '**Request for Extension**' should be submitted, allowing sufficient time for its consideration by the committee. Extensions cannot be granted retrospectively.
6. If changes are to be made to the project's personnel, a '**Changes to Personnel**' form should be submitted for approval.
7. An '**Annual Report**' must be provided by the due date specified each year for the project to have continuing approval.
8. A '**Final Report**' must be provided at the conclusion of the project.
9. If, for any reason, the project does not proceed or is discontinued, you must advise the committee in writing, using a '**Final Report**' form.
10. You must advise the HREC immediately, in writing, if any complaint is made about the conduct of the project.
11. You must notify the Ethics Office of any changes in contact details including address, phone number and email address.
12. The HREC may conduct random audits and / or require additional reports concerning the research project.

Failure to comply with the *National Statement on Ethical Conduct in Human Research* (2007) and with the conditions of approval will result in suspension or withdrawal of approval.

Annual/Final Project Report

Human Research Ethics Committee



Please indicate the type of report	<input type="checkbox"/> Annual Report (Omit ,3b, 5b) <input checked="" type="checkbox"/> Final Report
Project No:	B16-131
Project Name:	What are the experiences of physiotherapists who promote physical activity to patients with musculoskeletal conditions? A qualitative study.
Principal Researcher:	Professor Caroline Finch
Other Researchers:	Mrs Breanne Kunstler Adjunct Professor Jill Cook Dr Joanne Kemp Dr Paul O'Halloran
Date of Original Approval:	26/8/16
School / Section:	ACRISP/Faculty of Health
Phone:	53276580
Email:	c.finch@federation.edu.au, breannekunstler@students.federation.edu.au

Please note: For HDR candidates, it is a requirement of candidature to submit Candidature reports annually to research.degrees@federation.edu.au in addition to Ethics Annual/Final reports.

1) Please indicate the current status of the project:				
1a) Yet to start			<input type="checkbox"/>	
1b) Continuing			<input type="checkbox"/>	
1c) Data collection completed			<input checked="" type="checkbox"/>	
1d) Abandoned / Withdrawn:			<input type="checkbox"/>	
1e) If the approval was subject to certain conditions, have these conditions been met? (If not, please give details in the comments box below)		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
Comments:				
1f) Data Analysis		<input type="checkbox"/> Not yet commenced	<input checked="" type="checkbox"/> Proceeding	<input type="checkbox"/> Complete <input type="checkbox"/> None
1g) Have ethical problems been encountered in any of the following areas: Study Design Recruitment of Subjects			<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No

Annual/Final Project Report

Human Research Ethics Committee



Finance	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Facilities, Equipment	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
(If yes, please give details in the comments box below)	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Comments: Ten physiotherapists participated in this study. They were offered one \$20 gift card each as a thank you. These were to be purchased and sent by my Faculty. The first 5 participants got their cards within approx. 1 month of their interview. The final 5 had to wait 4-5 months due to the coles-myer cards never arriving at the Faculty of Health, and attempts to follow them up failing, despite being ordered on time by Faculty staff. The cards were re-ordered from Woolworths and were posted on May 11 2017.		

2a) Have amendments been made to the originally approved project?	
<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes
2b) If yes, was HREC approval granted for these changes?	
<input checked="" type="checkbox"/> Yes	Provide detail: <input checked="" type="checkbox"/> Yes Application for Amendment to an Existing Project <input type="checkbox"/> Yes Change of Personnel <input type="checkbox"/> Yes Extension Request
<input type="checkbox"/> No	If you have made changes, but not had HREC approval, provide detail as to why this has not yet occurred:
2c) Do you need to submit any amendments now?	
<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes Application for Amendment to an Existing Project <input type="checkbox"/> Yes Change of Personnel <input type="checkbox"/> Yes Extension Request * NB: If 'Yes', download & submit the appropriate request to the HREC for approval: Please note: Extensions will not be granted retrospectively. Apply well prior to the project end date, to ensure continuity of HRE approval.

3a) Please indicate where you are storing the data collected during the course of this project:
Online (https://www.qualtrics.com/ which is the online program used to collect demographic data), FUA OneDrive and NVivo software program accessed offsite using an FUA laptop with password access.
3b) For Final Reports only: Advise when & how stored data will be destroyed
All collected data will be transferred from Breanne Kunstler's laptop to Professor Finch for storage until 31 December 2022, when the data will be permanently deleted.

Annual/Final Project Report

Human Research Ethics Committee



4) Have there been any events that might have had an adverse effect on the research participants OR unforeseen events that might affect continued ethical acceptability of the project?

X No	<input type="checkbox"/> Yes * NB: If 'yes', please provide details in the comments box below:
Comments:	

5a) Please provide a short summary of results of the project so far (no attachments please):

Ten Australian physiotherapists working in private practice and outpatient settings and treating patients primarily with musculoskeletal complaints participated in semi-structured interviews. Responses have been collected from physiotherapists in regional and metro areas and from four states and/or territories in Australia. Preliminary data suggest that physiotherapists feel it's their role to promote non-treatment physical activity (NTPA) to patients. However, several factors can influence their decision to promote NTPA (e.g. avoiding overstepping professional boundaries) and their promotion methods (e.g. using a conservative approach). These preliminary data have been included in an abstract submitted for presentation at the Australian Physiotherapy Association's October 2017 conference.


5b) Final Projects only: Were the aims of the project (as stated in the application for Approval) achieved?

Yes

6) The HREC welcomes any feedback on:

- Difficulties experienced with carrying out the research project; or
- Appropriate suggestions which might lead to improvements in ethical clearance and monitoring of research.




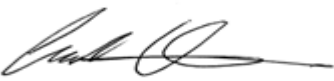
7) Signatures

Principal Researcher:	 Print name: Caroline Finch	Date:	05/06/2017
Other/Student		Date:	5/6/17

Annual/Final Project Report

Human Research Ethics Committee



Researchers:			
	Print name: Breanne Kunstler		
		Date:	5/6/17
	Print name: Jill Cook		
		Date:	5/6/17
	Print name: Joanne Kemp		
		Date:	5/6/17
	Print name: Paul O'Halloran		

Submit to the Ethics Officer, Gippsland or Mt Helen campus, by the due date:
research.ethics@federation.edu.au

Appendix 4. 5 The running sheet that was used to guide the questions asked and their order when conducting the 10 interviews during the interview study

This sheet is a summarised version of the interview guide and was used for quick reference during interviews.

Introductions

Welcome

Explain the interview

There are no right or wrong answers. I am interested in your views, opinions and beliefs. You are always going to be the expert on those.

Provide consent form and PLIS

Any questions?

Sign the consent form

Turn off phones

Ask the participant to introduce themselves for the recording.

Part 1: What influences the physiotherapist's decision to promote NTPA?

QUESTIONS START

Topic: Compatibility of NTPA and clinical practice

Q1 "Can you please tell me about your experiences promoting NTPA in a normal day and comment on how compatible this is with your daily practice?"

“Some physiotherapists are unsure if NTPA promotion is compatible, or fits well, with regular daily practice. They also say that primary health care is more focused on treatment rather than disease prevention.”

Prompts

1. Other professionals more appropriate
2. What things make NTPA compatible or not

Topic: Planning to promote NTPA and what makes those plans difficult to implement

Q2 “Do you want to promote NTPA to your patients?”

“Do you plan to promote NTPA to all patients?”

“Some physiotherapists plan to promote NTPA, but these plans can be hard to follow when patients aren’t motivated. Have you tried to promote NTPA to a patient with low motivation?”

Prompts

1. What do you do to try and help these people become PA?
2. What makes this hard?

Topic: Time as a barrier to promoting NTPA

Q3 “Do you experience any barriers that make it hard to promote NTPA?”

“Some physiotherapists have said that they don’t have enough time to promote NTPA in a typical consultation.”

Prompts

1. How much time does it take?
2. Does the length of time needed to promote NTPA influence your decision to promote NTPA?
3. What other things make it hard to promote NTPA?

Topic: Patient presentation and how that influences the decision to promote NTPA.

Q4 “I would like to know if your decision to promote NTPA depends on patient presentation.

Can you please tell me if there are any patient-specific things that would make you more or less likely to promote NTPA?”

“Some physiotherapists have said they would be more inclined to promote NTPA to some patients more than others.”

Prompts

1. Are there any patient characteristics that make you think they need to increase their PA levels?
2. For these patients, how often would you then assess their PA levels?
3. How often would this be followed by a treatment plan to increase their PA?
4. Are there any patient characteristics that make you think they don't need to increase PA?

Topic: Training/Skills/Knowledge to promote NTPA

Q5 “Can you please tell me if you feel you have the training to deliver this intervention (and why?)”

“Some physiotherapists have reported they are not trained to promote NTPA to patients.”

Prompts

1. Have you learnt how to promote NTPA and from where?
2. Do you feel confident promoting NTPA?

Topic: Support from government, insurance companies and the workplace

Q6 “Can you please tell me about the support you have received, or you feel you could benefit from, when promoting non-treatment physical activity?”

“Some physiotherapists feel they get little support from government, health insurance companies and the workplace to promote non-treatment physical activity.”

Prompts

1. What would make it easier to promote NTPA on a regular basis?
2. Who needs to provide these things?

Topic: Use of BCTs

Q7 “Is it within the physiotherapist’s scope of practice to change behaviour?”

Prompts

1. Do you want to be able to change patient behaviour?
 - What if this behaviour was exercise adherence?
2. Other professionals

Show list of BCTs

Q8 “Have you used any of these techniques clinically?”

Prompts

1. What situation did you use it? E.g. NTPA promotion or exes adherence
2. Did it work?
3. How often do you use it?
4. Are you familiar with the other BCTs on the sheet?
 - Do you feel capable of using these in the future?
 - Do you want to use these techniques?
5. What support would you need to use more techniques like these?

QUESTIONS END

This is the end of the interview. Would you like to add any final thoughts regarding the content we have explored today? Or do you have any questions for me?

I am going to turn the audio recording device off now. Anything you say once this has happened will not be used in the study.

Additional questions

1. Are your patients receptive of your advice to become more physically active?
2. What tools or strategies do you use with your patients to encourage them to be more physically active?
 - a. What about to encourage them to adhere to the exercises you give them?
3. Do you help patients change any other behaviours: diet, weight loss, smoking, alcohol consumption?
4. Should physiotherapy students be learning how to promote NTPA to their patients?
 - a. What about how to use BCTs?