

BEHAVIOURAL CHANGE TECHNIQUES FOR  
CHRONIC LOW BACK PAIN:  
A PHYSIOTHERAPY PRACTICE STUDY

by

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Submitted in partial fulfilment of the requirements  
for the degree of Master of Science

at

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DALHOUSIE UNIVERSITY  
SCHOOL OF PHYSIOTHERAPY

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## **Dedication Page**

To my husband Tim who stood by me throughout the many long nights and weekends, doing whatever was required to make this thesis a reality. Thank you for your support and love at every step. To my daughter Grace and my son Joshua who also sacrificed many treasured family moments to allow “Mommy” to work on this project. I love you all so much.

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## **Abstract**

Chronic non-specific low back pain (CNSLBP) is prevalent in the Canadian Forces. Physiotherapists use behavioural change techniques (BCT) to challenge maladaptive cognitions and behaviours in the treatment of CNSLBP. The aim of this study was to determine the range and type of BCT used in the “Back to Fitness” class at CFB Halifax. A nomenclature integrating a psychology BCT checklist and relevant physiotherapy literature was used to create a physiotherapist BCT checklist tool that was piloted in a field study. A wide range (n=24) and type (cognitive, behavioural and motivational) of BCT were identified in three settings (lecture, two exercise sessions). The nomenclature produced in this first examination of BCT in physiotherapy practice, will be useful for future research and training. This project revealed an overlap between psychology and physiotherapy that could lead to improved interprofessional communication and earlier access to behaviour change interventions for patients with CNSLBP.

## List Of Abbreviations Used

ADLs-	Activities of Daily Living
BCT –	Behavioural Change Techniques
BeST-	Back Skills Training Program
CB-	Cognitive Behavioural
CBT –	Cognitive Behavioural Therapy
CFB –	Canadian Forces Base
CLBP-	Chronic Low Back Pain
CNSLBP-	Chronic Non-Specific Low Back Pain
CT	Combined Therapy
HCP –	Health Care Professionals
LBP –	Low Back Pain
MSK -	Musculoskeletal
ODI –	Oswestry Disability Index
PGAP –	Progressive Goal Attainment Program
PI –	Primary Investigator
PT –	Physiotherapist
Quad VAS-	Quadruple Visual Analogue Scale
RCT –	Randomized Controlled Trial (s)
RTW –	Return to Work
SCT –	Social Cognitive Theory
SET -	Self-Efficacy Theory
TSK –	Tampa Scale of Kinesiophobia
WDL –	Work Days Lost
WLC –	Wait List Controls

## Glossary

**“Back to Fitness” class** – A six week educational and exercise program that incorporates behaviour change into the treatment of military members with CNSLBP and high levels of fear avoidance. This class is based on the original “Back to Fitness” program as described by Klaber Moffett (2000)<sup>2</sup>.

**Behavioural Change Techniques** – processes used to influence thoughts and actions. These may include commonly applied techniques such as goal setting, pacing, shaping, and positive reinforcement. Psychologists, as well as other health care practitioners including physiotherapists use these techniques.

**Cognitive Behavioural Therapy** – A comprehensive treatment approach used by psychologists to address or change behaviours.

**Cognitive Behavioural Approaches**- This is the term used in the physiotherapy literature to describe the use of behavioural change techniques by physiotherapists to influence maladaptive behaviours and promote healthy behaviours (not to be confused with Cognitive Behavioural Therapy).



## Chapter 1 Introduction

Chronic low back pain (CLBP) is a disabling condition that affects approximately one to nine percent of all persons with low back pain<sup>3-5</sup>. Of those people with CLBP, approximately 85 to 90% have no identifiable cause<sup>6, 7</sup> - this population often carry the diagnosis of chronic *non-specific* low back pain (CNSLBP). It has been reported that 60 to 75% of patients experiencing their first episode of LBP will have symptoms of pain and related disability long-term, persisting beyond one year<sup>8-10</sup>. The prevalence and persistence of CLBP, the associated affects on a patient's quality of life and the economic burden of costs associated with workdays lost and long-term disability demands innovative and evidence-based management.

In addition to the experience of pain, chronic musculoskeletal conditions such as CNSLBP, are associated with changes in physical behaviour such as: decreased activity, periods of over activity followed by under activity, increased bouts of rest and maladaptive behaviours that result from fear of pain such as the avoidance of movement<sup>11</sup>. These behavioural changes are believed to be linked to a combination of psychological [e.g., thoughts, beliefs and perceptions (cognitions)], social (e.g., stress, social support) and biological factors (physical health)<sup>12</sup>. And their presence may prolong or perpetuate symptoms<sup>12-14</sup>.

Cognitive behavioural therapy is a psychological intervention that addresses psychological and social factors that affect physical health and behaviours<sup>15</sup>. This treatment approach includes the use of cognitive and behavioural change techniques (BCT) to modify behaviours<sup>16, 17</sup>. Recently, there has been a growing awareness and inquiry regarding the contribution that physiotherapy makes in positive behaviour change as part of treatment. What has become clear is that although cognitive behavioural therapy is a comprehensive psychological approach, behaviour change techniques are used by other health professionals, including physiotherapists.

The use of BCT by physiotherapists has been studied in recent years. Despite methodological issues in these studies that include: diverse chronic pain populations, differing comparator groups, varied treatment doses and inconsistent behavioural change technique use, results suggest that physiotherapists' use of behaviour change techniques in treating patients with CNSLBP is associated with noted improvements in self-report levels of disability, return to work outcomes and levels of modifiable psychological risk factors both in the short and long term<sup>18-24</sup>.

Although these outcomes are promising, the research is still in its infancy. There is little direct measurement of behaviour change in patients and also little understanding of what physiotherapists actually do to encourage behaviour change. CFB Halifax has a CNSLBP rehabilitation program called "Back to

Fitness” where the physiotherapist incorporates behaviour change techniques into the treatment program (Appendix A). The objective of this thesis project was to answer the following research question:

1. What are the range and type of behavioural change techniques used in a six-week education and exercise program, the “Back to Fitness” class, aimed at improving self-management behaviours in military members with CNSLBP and modifiable psychological risk factors?

However, before being able to study what physiotherapists do in the “Back to Fitness” class, the need to have a common language for the behavioural change techniques used in physiotherapy practice was identified. Part of the challenge in interpreting or reproducing physiotherapy research results is the lack of foundational work such as the absence of a consistent nomenclature (with definitions) for behavioural change techniques used by physiotherapists.

Therefore the project also had as a second objective:

2. To develop a provisional nomenclature of behavioural change techniques (BCT) used by physiotherapists in conjunction with exercise for patients with chronic non-specific low back pain.

To accomplish this second objective, three studies were conducted.

- a. Tool Development - This thesis reports on the creation of a physiotherapy-specific checklist for use in observational studies of physiotherapy practice. In the absence of an agreed nomenclature, two main resources were used: the behavioural change technique checklist developed for psychology research\* and published research that included descriptions of techniques used by physiotherapists.
- b. Expert Opinion- The checklist content validity was tested, in parallel with the other phases of the study, through the use of a survey of experts.
- c. Tool Testing – An analysis was performed to test the validity and reliability of the checklist.

The checklist was then used in a field study to answer the primary research question. This study examined physiotherapy practice with the intent to improve our understanding of what physiotherapists do to encourage behaviour change.

This is the first examination of behaviour change techniques in physiotherapy clinical practice in both lecture and exercise settings. The nomenclature along with definitions produced from this study provides a necessary foundational step for future research and training in behaviour change in physiotherapy. This project revealed an overlap in the use of behavioural change techniques between

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\* Abraham and Michie<sup>1</sup> created a checklist of behavioural change techniques (BCT), which could be broadly applied to identify BCT in published articles about psychologist-led programs. This valid and reliable checklist has 26 items (with definitions) and was based on the Transtheoretical

psychology and physiotherapy practice that could lead to improved interprofessional communication and earlier access to behaviour change interventions in patients with CNSLBP.

## Chapter 2 Background

### CHRONIC LOW BACK PAIN

Chronic low back pain (CLBP) is a persistent and multifactorial health care problem that has been reported with wide prevalence<sup>3, 4, 25</sup>. Conservative estimates indicate that approximately one to nine percent of all people who injure their backs transition to a stage of chronicity<sup>3, 26</sup>. In addition, estimates of long-term pain and disability have been documented to range between 60 to 75% of patients initially reporting their first episode of LBP<sup>8, 10</sup>. Pain reoccurrence is also a health care concern with as many as 73% of those injured encountering single or multiple recurrences within one year<sup>27</sup>, with a lifetime prevalence of 11 to 84%<sup>25</sup>. The prevalence of CLBP is widespread and its persistence accompanied by the related pain and disability can have a notable effect on a patient's quality of life<sup>28</sup> and health care costs<sup>29</sup>.

For those whose pain persists there is an array of functional and emotional issues that result in a significant social and economic burden for Western societies. Of those people who develop CLBP, approximately 5% are associated with very high costs due primarily to absenteeism and disability<sup>29</sup>. In addition, those individuals suffering from CLBP experience physical suffering, and functional, psychological and social limitations that greatly impact their quality of life<sup>28</sup>.

Despite the wide prevalence of this condition, as many as 85% of patients with CLBP have no clear diagnosed disease, radiculopathy or anatomical abnormality to explain their symptoms and are labeled as having chronic non-specific low back pain (CNSLBP)<sup>3, 30</sup>. Due to its impact on quality of life and the financial repercussions of this condition, a great deal of research has been conducted into appropriate treatments to both lessen the impact and prevent future occurrences of CNSLBP. It is now generally accepted that the cause and treatment are multifactorial and this understanding has led in recent years to the evolution from a biomedical to a primarily biopsychosocial model of care<sup>20, 31, 32</sup>.

#### **THE BIOPSYCHOSOCIAL FRAMEWORK**

The biopsychosocial framework allows for an understanding of the interaction of biological, psychological and social factors that may affect an individual's health<sup>33</sup>. Application of this framework to CNSLBP creates a link between an acute biological impairment and the prediction or explanation of chronic pain through the mediation of social and/or psychological factors<sup>34, 35</sup>. Biological factors of importance in CNSLBP refer to physical health, while environmental and social barriers related to the work environment that include stress, job satisfaction, perceived abilities, lack of support and understanding from both employers and coworkers, are believed to play a role in the initiation and perpetuation of chronicity<sup>36</sup>. Additionally, the perception or experience of pain is dependent on psychological factors including: past experiences, beliefs, coping strategies, anxiety, attention, and perceptions which all affect how pain is interpreted<sup>36-38</sup>.

Multidimensional biopsychosocial treatment approaches result in decreased disability and improved function and are recommended for CNSLBP as indicated in recent clinical reviews and guidelines<sup>29, 39, 40</sup>.

## **TREATMENT OF CHRONIC NON-SPECIFIC LOW BACK PAIN**

Under the biopsychosocial approach, existing clinical practice guidelines outline a variety of treatment options for CNSLBP including supervised exercise therapy, cognitive behavioural therapy, short courses of manual therapy, brief educational interventions with a focus on maintaining an active lifestyle, multidisciplinary biopsychosocial rehabilitation, medications and as a last resort, surgery<sup>39, 40</sup>.

When low levels of disability are present, evidence-based therapies such as exercise in addition to brief forms of other interventions and medications may be sufficient<sup>39, 40</sup>. For those patients with CNSLBP with moderate to high levels of disability, or those at risk for poor outcomes including chronic pain and disability, additional therapy may be required for adequate rehabilitation. In these patients with or at risk of poor outcomes, identification and treatment of modifiable psychological risk factors have received a great deal of attention for their role in improving outcomes in patients with CNSLBP. Exercise therapy has been examined for its relation to CNSLBP and modifiable psychological risk factors.



## EXERCISE THERAPY

With the development of CNSLBP, patients will tend to decrease their level of activity<sup>11</sup>. With this decrease in activity level, physical changes occur in strength, flexibility and cardiovascular fitness in what is known as a “deconditioning syndrome”<sup>11</sup>. Although there is debate over the mechanism of this deconditioning syndrome, there is consensus on a general decrease in the various aspects of fitness<sup>11</sup>. It cannot be concluded what types of exercises may best suit this population<sup>7, 41</sup>, but increased intensity and individualization do tend to improve outcomes<sup>7, 41-43</sup>. Exercise therapy has been shown to decrease pain, improve function and decrease disability in persons with CLBP<sup>7, 9, 41, 44</sup>.

The role of exercise and modifiable psychological risk factors on CNSLBP has also been studied<sup>45-47</sup>. In a study of 148 patients with CNSLBP undergoing three months of active therapy without any psychologist-led interventions, a positive change was noted in fear avoidance, catastrophizing and self-efficacy<sup>47</sup>. It was hypothesized that the performance of exercises without experiencing harm directly challenged maladaptive thoughts and beliefs, and this led to decreases in modifiable psychological risk factors<sup>47</sup>.

Correlations have also been noted between lower levels of physical activity and high fear avoidance and pain catastrophizing beliefs<sup>45</sup>. One study found that individuals with CNSLBP who performed only two to four hours per week of exercise were up to six times more likely to have high fear avoidance and/or pain

catastrophizing than those performing more or higher intensity exercise<sup>45</sup>. Increases in pain-related fear were also positively correlated with diminished walking speeds (in both preferred and fast walking)<sup>48</sup> and decreased muscle strength<sup>49, 50</sup>. In a small cohort study of 25 patients with CLBP, and 25 age and gender matched controls, it was revealed that increased psychological distress and higher pain levels were associated with lower peak quadriceps torque<sup>50</sup>. The authors concluded that it might not be a true decrease in strength but rather submaximal muscle performance due to moderating psychological induced inhibition<sup>50</sup>. In a larger RCT of 124 subjects it was found that 46% of the variation in back muscle strength over one year could be attributed to improvement in pain, fear avoidance beliefs and pain self-efficacy beliefs whereas no significant changes were related to exercise<sup>51, 52</sup>. It has been suggested that changes in beliefs and behaviour may be relevant to improvements to physical health and exercise<sup>38</sup>. These studies highlight the close associations between exercise and maladaptive beliefs and behaviours that may explain poor patient outcomes.

## **BEHAVIOUR**

Human behaviour refers to conscious or unconscious, and learned or instinctive actions or reactions to specific situations, like pain, or the environment<sup>53</sup>.

Learned behaviours in response to pain reflect how people deal with their pain experience, occasionally interfering with normal recovery, and these ineffective behaviours are considered to be maladaptive<sup>53</sup>. Maladaptive behaviours in response to pain have been associated with the development and perpetuation of

CNSLBP and are termed psychological risk factors<sup>12-14</sup>. Avoidance of feared or painful positions, for example, has been positively correlated with poor outcomes such as decreased function and increased self-perceived disability in patients with CNSLBP<sup>14</sup>. This avoidance behaviour is believed to be related to decreased physical activity and associated deconditioning as well as increased social isolation and fewer opportunities to correct the errant beliefs perpetuating the avoidance<sup>14</sup>.

Thoughts also strongly influence behaviours. Persistent, irrational and exaggerated thoughts, such as catastrophizing, are positively correlated with poor outcomes and are identified as psychological risk factors for the development or perpetuation of CNSLBP<sup>12, 13, 54-56</sup>. It has been suggested that the maladaptive thoughts and behaviours that have been learned in response to pain might also be amenable to treatment and be unlearned<sup>53</sup>. Research has demonstrated that addressing these maladaptive thoughts and behaviours is associated with improved outcomes for CNSLBP<sup>57</sup>. In a study of 54 patients with CLBP, patients treated with a cognitive behavioural therapy approach to reduce fear avoidance and levels of catastrophizing, demonstrated significant decreases in self-reported levels of disability<sup>57</sup>. The ability to change these learned maladaptive behaviours has resulted in their identification as modifiable psychological risk factors<sup>58</sup>.

## **MODIFIABLE PSYCHOLOGICAL RISK FACTORS**

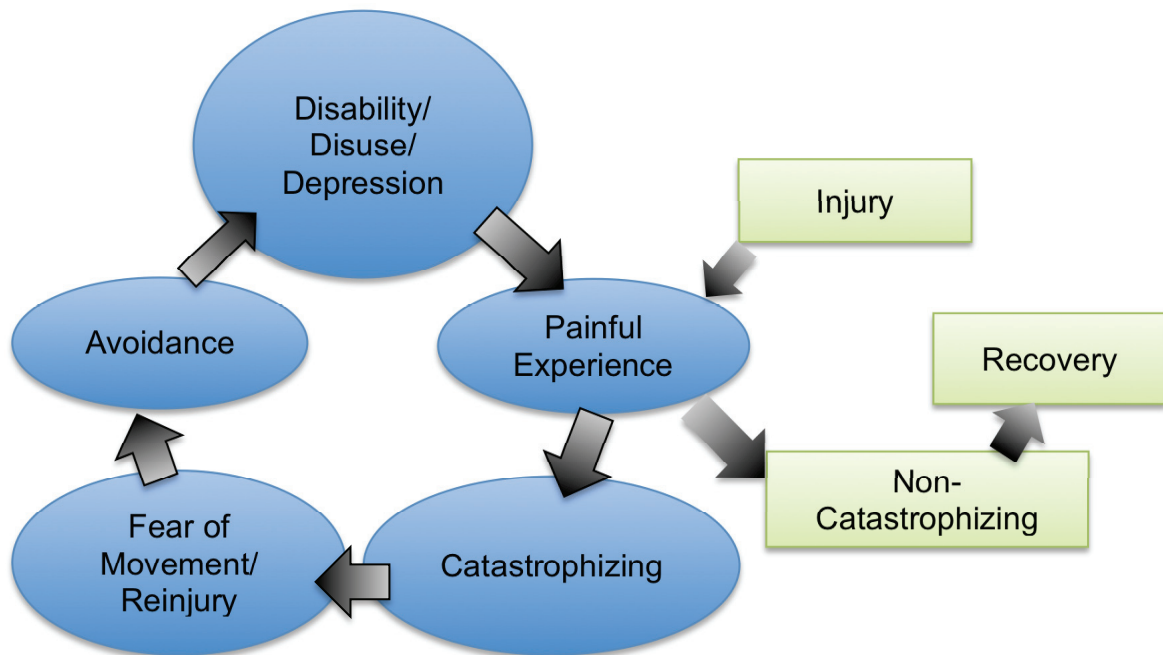
A broad range of modifiable psychological risk factors exist that can be targeted in the screening and treatment of CLBP. Modifiable psychological risk factors include: fear of movement, catastrophizing, passive coping strategies, poor perceived control, distorted pain cognitions, increased self-perceived disability, lack of motivation, depressed mood and decreased readiness to change<sup>10, 34, 59</sup>. These risk factors have been examined for their capacity to predict future disability and symptom persistence (chronicity)<sup>59</sup>. For example, a study of 363 individuals with acute and sub-acute low back pain found that 35% of subjects with a fear avoidant profile and 62% of subjects with a fear avoidant and psychologically distressed profile, progressed to long term sick leave (determined by the Orebro Musculoskeletal Pain Screening Questionnaire)<sup>60</sup>. In the same study subjects with a depressed mood had a significantly higher usage of health care during the seven-month follow up period<sup>60</sup>. Since disability and decreased function may be predicted by modifiable psychological risk factors (also known as yellow flags)<sup>34, 61</sup>, they have been recommended as screening tools for CLBP to identify subpopulations who may be more appropriately targeted for treatment<sup>10, 34, 39, 62</sup>.

Targeting modifiable psychological risk factors using behavioural change techniques (BCT) has been associated with improved function and decreased disability<sup>47</sup>. One study of 148 patients with CNSLBP that aimed to identify factors affecting self-rated disability, following three months of active therapy, determined

that decreases in fear avoidance along with changes in pain and psychological distress were responsible for significant decreases in disability following therapy<sup>47</sup>. Understanding how these modifiable psychological risk factors, are linked to behaviour change and treatment outcome is necessary for targeting effective treatments for CNSLBP.

### **THE FEAR AVOIDANCE MODEL OF CHRONIC PAIN**

The Fear Avoidance Model describes how modifiable psychological risk factors can lead to chronic pain and disability<sup>12</sup>. In the Fear Avoidance Model<sup>12</sup> it is suggested that a patient may either confront their fear of pain and recover, or attach a high threat value to pain which results in activity avoidance. Although fear avoidance is a normal response to high levels of pain, it can be particularly resistant to extinction where the behaviour continues even when the risk of reinjury or of experiencing pain is no longer present<sup>63-65</sup>. It is believed that when a patient who is fear avoidant engages in activities, hypervigilance leads to perpetuation of muscle activity or muscle guarding which in turn generates increases in fear and anxiety and subsequent avoidance of movement<sup>57, 63</sup>. This avoidance can eventually lead to disability, disuse and depression<sup>12, 13, 66</sup>. This model is depicted graphically below in Figure 1.



**FIGURE 1: FEAR AVOIDANCE MODEL OF PAIN**

(Adapted From Vlaeyen <sup>12</sup>)

As it is indicated in Figure 1, catastrophizing and fear of movement or reinjury are key elements that perpetuate the cycle of fear avoidance. Catastrophizing may be conceived as inflated negative beliefs concerning pain and the threat that pain represents<sup>56</sup>. These exaggerated thoughts and perceptions can lead to pain-related fear and modifications in behaviours. The behaviours tend to be avoidance and hyper vigilance to pain perceptions leading to disuse and increased levels of disability<sup>67</sup>. In a systematic review of literature on back and neck pain, Linton showed a link between psychological variables, neck and back pain development and perpetuation at all stages from acute to chronic<sup>38</sup>. This review revealed high quality evidence to indicate that cognitive factors (attitudes,

fear avoidance beliefs and passive coping) and pain cognitions such as catastrophizing were positively related to pain and disability<sup>38</sup>.

Pain catastrophizing has long been linked to chronic pain, specifically in the transition from acute stages of injury<sup>12</sup>. In a sample of 121 Nova Scotians on workers' compensation, an early decrease in the level of pain catastrophizing during psychologist-led CBT programs was found to be a unique and significant predictor of return to work while fear avoidance and pain intensity were non-significant contributors to return to work status<sup>54</sup>. It was concluded that reductions in pain catastrophizing were significantly and uniquely correlated with decreases in pain-related outcomes and improved return to work rates<sup>54</sup>.

Fear of movement or reinjury is a very specific fear attached to physical movements with the firm, although inaccurate, belief that a certain activity will result in injury<sup>12</sup>. The specific feared activity will vary between individuals, but it generally leads to a change in behaviour, particularly an avoidance of that movement. This fear or phobia can eventually result in disuse, disability and depression<sup>55</sup>.

Research supports the close association between fear avoidance (including fear of movement or reinjury), catastrophizing, and the perpetuation of chronic disability<sup>12, 13, 47, 54, 60, 67-74</sup>. There are several studies that report a clear link between fear avoidance and diminished activities of daily living (ADL) and

increased workdays lost (WDL). In a sample of 210 patients with CLBP, Waddell demonstrated that 23% of the variability in disability associated with ADLs, and 26% of lost work time could be explained by fear avoidance beliefs<sup>74</sup>. Other research has consistently found that workdays lost due to sickness and return to work status were significantly and positively impacted by the targeting of pain-related fears through advice to maintain or improve activity levels<sup>75-77</sup>. Additionally, fear avoidance and the presence of pain-related fears and catastrophizing have been found to negatively influence prolonged work disability<sup>76-78</sup>. Vlaeyen et al postulated that decreases in fear avoidance may lead to decreases in hypervigilance and normalization of muscle activity<sup>12, 57</sup>.

With a theoretical model outlining the link between modifiable psychological risk factors and disability, and a perception of how the factors are related to chronic conditions such as CNSLBP, treatment oriented towards modification of these factors can be more easily planned. To modify these psychological risk factors a change in the maladaptive or at-risk behaviours must be replaced by healthy, movement-oriented behaviours. Behaviour change has been studied extensively and many theories exist on how behaviour change is implemented or encouraged in patients with chronic pain.

## **THEORIES OF BEHAVIOUR CHANGE**

The theoretical basis for behaviour change is extensive and many of these theories have been applied in the treatment of chronic pain. Three key theories



applied to behaviour change within a rehabilitation setting will be discussed. These are Psychomotor or Motor Learning Theory<sup>79</sup> which involves the development of skilled movement through practice, Operant Conditioning Theory<sup>80</sup> which addresses the link between behaviour change and rewards, and Social Cognitive Theory<sup>81, 82</sup> which deals with the cognitive aspects of self-efficacy and outcome expectancies in maintaining or implementing value-based behaviours.

### ***Psychomotor Learning Theory***

Psychomotor Learning Theory proposes that the development of coordinated, skilled movement patterns results from a patient's understanding of relevant information about their condition and physical practice of the new movements supplemented with feedback<sup>83</sup>. The key component of skill acquisition is the implementation of practice to induce a permanent change in the patient's motor performance and behaviour<sup>84</sup>. New behaviours are required to recover from injury and to prevent the reoccurrence of that injury. A permanent change in motor skill acquisition is demonstrated when there is a consistent display of a skill regardless of changes in the environment (e.g., exercises at home), the participant's situation (e.g., under stress) or needs (e.g., dealing with a flare up). To achieve this permanent change, patients need to be cognitively and physically challenged in their skill development.

According to this theory, the role of the physiotherapist in assisting behaviour change is to provide the necessary education to encourage the development of proper movement patterns through the use of demonstration and feedback<sup>83</sup>. To ensure that skills are permanently acquired, the physiotherapist should challenge the patient through problem-solving and progressive goal setting activities aimed at improving the patient's self-reliance<sup>84</sup>. This last step confirms the patient's new knowledge and physical capabilities despite an underlying injury and assures the patient that they can achieve their outlined goals.

This theory explains many of the practices used to create new movement behaviours in patients with MSK conditions. However, in the application of this theory to chronic MSK conditions, this theory fails to address modifiable psychological risk factors that may prevent long-term skills acquisition and behaviour change, although as noted previously, improvements in activity levels have been shown to positively correlate with decreases in modifiable psychological risk factors<sup>47</sup>. Behaviour change interventions, however, are described from multiple theory perspectives. The combination of Psychomotor Learning Theory<sup>79</sup> with other theories in the process of changing behaviour may create a more effective approach in the treatment of CNSLBP in the presence of modifiable psychological risk factors.

## ***Operant Learning Theory***

Operant Learning Theory<sup>85</sup>, explains that behaviour may either be maintained or modified, encouraged or discouraged through the application of rewards or punishments. Fordyce proposed that the behaviours associated with chronic pain might also be shaped through the application of similar rewards and punishments<sup>80</sup>. According to this theory, the greatest influence on persistence of a behaviour is the consequence of past behaviours, rather than any cognitive event<sup>80, 86</sup>. Fordyce argued that pain behaviours continue because they are reinforced, but adaptive behaviours could be introduced through the application of rewards<sup>86</sup>. For patients with chronic pain, alterations in pain, improved function, or therapist encouragement may all be considered as rewards. Punishments may take the form of increases in pain, decreased abilities or lack of therapist response to patient outcomes (withdrawal).

Operant conditioning principles are commonly used either in isolation or as an adjunct to other forms of treatment in the rehabilitation of MSK conditions<sup>87-90</sup>. In physiotherapy, operant conditioning is frequently used, we reward our patients for achieving pre-set goals, we use overt comments and we use a covert reward system of attention-paying and smiling and nodding. The behaviour change techniques (BCT) most clearly associated with operant conditioning reported in the rehabilitation setting are: the use of graded exercise with pre-defined quotas and graded activity delivered with positive reinforcement. The application of

graded activity approaches has been shown to improve functional and work related outcomes<sup>87, 91</sup>. A study of a physiotherapy-led graded activity program for 67 sick listed workers with LBP versus usual care<sup>91</sup> noted improved return to work rates, fewer episodes of recurrence and reduced number of total sick days for the group in the graded activity program. These findings are supported by a recent Cochrane review of behavioural treatments for CLBP that found that the application of operant conditioning has been supported (moderate quality evidence) as an effective short-term behavioural treatment for the management of CLBP<sup>92</sup>. A recent preliminary review, however, found less support for the use of graded activity interventions as compared to graded exposure or acceptance and commitment therapy\* in the treatment of chronic MSK pain<sup>93</sup>. The use of operant conditioning in the form of graded exercises and positive reinforcement in the treatment of MSK conditions is generally found to be effective although recent research notes that it may not be as effective as other types of treatment for chronic MSK pain.

Criticisms of this theory, including its use of debatable concepts such as “pain behaviour” and its exclusion of cognitive processes from the role of behaviour change, along with conflicting research, support a broader view of behaviour change<sup>16</sup>. In rehabilitation applications, operant conditioning provides a behavioural means of influencing behaviour change but in isolation it may not be

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\*. Acceptance and commitment therapy involves having the patient focus on participating in valued activities despite pain, and teaching the patient to accept the pain without trying to control it. This therapy has demonstrated promising outcomes in the treatment of chronic MSK pain<sup>93</sup>.

as effective as more robust theories that include either more extensive behavioural modifications or the addition of cognitive techniques.

### ***Social Cognitive Theory***

Social Cognitive Theory<sup>82</sup>, and the related Self-Efficacy Theory<sup>81</sup>, explains that behaviour change is based on what a patient believes themselves capable of performing and the value they attach to performing that action or behaviour<sup>81, 82</sup>. Critically important to behaviour change are self-perceived levels of self-efficacy and outcome expectancy. Self-efficacy is a patient's belief in their ability to perform a behaviour or implement a planned goal such as improving their lower body strength<sup>82</sup>. Outcome expectancy is the patient's belief concerning whether adopting a new behaviour (e.g., exercising to improve strength) will lead to the desired outcome, such as climbing three flights of stairs<sup>82</sup>. These beliefs affect both thoughts and emotional reactions. Bandura noted that self-efficacy is a important precursor to behaviour change<sup>81, 82</sup>.

Research supports the idea that high levels of self-efficacy are positively correlated with the ability to perform a behaviour, and especially in the completion of more complex behaviours<sup>81, 82, 94</sup>. It has been shown that involving patients in their care, increasing self-efficacy and empowering patients, even in the presence of modifiable psychological risk factors, is an effective means of decreasing disability<sup>95</sup>. In one study examining a physiotherapy-led program for

patients with CLBP, decreases in both physical and work-related fear avoidance beliefs and increases in perceived self-efficacy were uniquely correlated with decreases in perceived levels of disability with these three factors explaining up to 71% of the variation in disability scores<sup>57</sup>. The program involved 17.5 hours of sessions that included goal setting, education, advice to maintain activity, exposure and exercise therapy. An additional study by the same author noted that self-efficacy can act as a moderator between psychological risk factors and outcomes, specifically pain related fear and both disability and pain intensity<sup>95</sup>. From these findings the author proposed that in the presence of high levels of both self-efficacy and pain related fear there may be less opportunity for increases in pain and disability<sup>95</sup>.

It has been hypothesized that improvements in self-efficacy can lead to improved self-management outcomes in the treatment of patients with chronic pain<sup>96</sup>. Klaber Moffett suggested that promotion of self-management may improve long-term prognosis for individuals with low back pain<sup>97</sup>. This includes the ability to self-reinforce positive behaviours and recognize gains as personal successes<sup>97</sup>.<sup>98</sup> Patients also require skills to enable independence from the clinical setting through the use of various BCT in home settings, first as homework and then as part of everyday life<sup>24</sup>. Linton stressed that the key to successful behaviour change is to give the patient active control over their pain or, in other words, increase their own self-reliance and efficacy<sup>99</sup>.

According to SCT, self-efficacy can be modified by any combination of personal or observational experiences and verbal encouragement although the power of the techniques varies<sup>81, 82</sup>. The most powerful of these factors is personal experience as it is a direct confirmation of what the patient is capable or conversely, not capable, of doing<sup>81, 82</sup>. Observation of others successfully performing a behaviour or receiving verbal encouragement can also influence an individual's way of thinking and can allow a patient to consider alternate behaviours<sup>81, 82</sup>. Although not as powerful as past experience, the more closely a patient can align themselves with the person they are observing, the more likely that the patient will feel an increased self-efficacy and to try to reproduce similar actions<sup>81, 100</sup>. Due to the relative power of personal experience, however, physical attempts to perform the behaviour may supersede these feelings and provide more immediate influences on self-efficacy<sup>81</sup>.

The Social Cognitive Theory outlines the important cognitive concepts of self-efficacy and outcome expectancy and the role that a physiotherapist or others may perform to assist behaviour change<sup>82</sup>. The role of physical performance (and therefore behaviour) is also integral to the achievement of self-efficacy<sup>81, 82</sup>. Research supports the link between the concept of self-efficacy and the physical performance of behaviours and lends itself to the application of chronic pain management. This model appears to fit well with rehabilitation of chronic pain.

## ***Summary***

Self-efficacy, as described by SCT<sup>81, 82</sup>, is an important characteristic that aligns well with the ultimate goal of many chronic pain treatment programs, that of self-management. The Psychomotor Learning Theory notes the importance of establishing more permanent links to behaviour change through encouraging independent problem solving and physical skill acquisition. Although the Operant Conditioning Theory<sup>80</sup> does not focus on cognitive factors associated with long-term behaviour change, there is merit in the establishment of physical changes to promote behaviour change as also evidenced in the Psychomotor Learning Theory<sup>79</sup> and SCT<sup>82</sup>. A combination of aspects of these theories may be the best means to induce positive behavioural changes in patients with CLBP, especially in the presence of modifiable psychological risk factors. Cognitive behavioural approaches, based on Cognitive Behavioural Therapy (CBT)<sup>15</sup> are one of the most commonly applied approaches to the modification of the maladaptive thoughts and behaviours associated with the treatment of CNSLBP.

## **COGNITIVE BEHAVIOURAL APPROACHES**

Cognitive behavioural approaches refer to a wide variety of treatment interventions that incorporate aspects of the cognitive and behavioural theoretical models outlined above in addition to addressing the biological, psychological and social factors outlined in the BPSA<sup>16</sup>. Specifically, this approach uses BCT to



address previous experience and associated learning, beliefs and outcome expectancies in addition to a patient's physical injuries in the treatment of chronic pain<sup>16</sup>. These approaches are delivered by a variety of health care professionals.

Cognitive behavioural (CB) approaches are based on the premise that maladaptive thoughts and behaviours will impact physical symptoms in addition to recovery from an illness or injury<sup>15</sup>. Health care providers use cognitive (problem solving, feedback on performance, cognitive restructuring) and behavioural (goal setting, graded exercises, graded exposure) change techniques (BCT) aimed at altering maladaptive behaviours<sup>16, 17</sup>. It is believed that maladaptive behaviours may, when combined with somatic and social factors, lead to increased pain and related disability and promote chronicity<sup>17, 101</sup>.

In CB approaches, behavioural change is achieved by challenging inaccurate thoughts, beliefs or attitudes where the end result is focused on reduced disability and increased function rather than pain reduction<sup>16, 17</sup>. Fear is an unpleasant emotion that can elicit cognitive responses including the maladaptive catastrophizing and behavioural responses such as avoidance<sup>16</sup>. This is an important insight that links directly to treatment programs and has been used to successfully address the psychological contributors and the resultant disability associated with CNSLBP<sup>102, 103</sup>.

### ***The Use Of CB Approaches***

Traditionally CB approaches for CLBP have been reserved for the later stages of chronic pain, being offered primarily in multidisciplinary clinics with a CBT portion delivered by either a psychologist or behavioural therapist. CBT was normally incorporated as part of a pain management program where costs to staff resources and patient time can be considerable<sup>103</sup>. The importance of identifying and treating modifiable psychological risk factors and treating them earlier in the development of chronic conditions, such as CNSLBP, and in a wider variety of settings has been the focus of recent research<sup>18, 62, 104, 105</sup>.

At present there is very little research on the use of CB approaches led by health care professionals (HCP) other than psychologists in a primary care setting. Studies involving CB approaches for chronic conditions, such as CNSLBP, suggest that consideration should be given to incorporating a broader range of HCP in their delivery<sup>102, 105, 106</sup>. The use of more types of HCP could allow easier access to treatment for larger numbers of patients, a practical solution considering the substantial need for these approaches and the relatively small number of trained HCP<sup>102, 105, 106</sup>. This need was also recognized through recommendations in clinical guidelines for the treatment of CNSLBP<sup>39</sup>. It has even been suggested that other HCP could competently deliver CBT due to the presence of common pain management skills across professions<sup>105</sup>. Increased access by patients to CB approaches could lead to improvements in all aspects outlined in the biopsychosocial approach while potentially decreasing

inappropriate health care utilization, the numbers of patients with CNSLBP and decreasing the level of disability<sup>102, 103</sup>.

### ***Physiotherapy And CB Approaches***

Physiotherapists are uniquely positioned to deliver treatment with a CB approach<sup>105</sup>. Many patients with CLBP already seek care in physiotherapy clinics<sup>63</sup> and, in Canada, given direct access to physiotherapy care, many more patients may achieve early access to CB approaches to care if delivered by physiotherapists. Physiotherapists already possess the abilities, knowledge and skills to perform many BCT such as graded activities, goal setting, education and positive reinforcement. In addition, the fact that physiotherapists work directly with patients through the medium of physical and functional movement, they can immediately challenge maladaptive thoughts and behaviours associated with movement, potentially effecting greater changes in behaviours such as fear avoidance. Furthermore, research provides support for the effectiveness of physiotherapy-led CB approaches to care<sup>18, 19, 22-24</sup>.

A 2008 systematic review found strong evidence to support the effectiveness of integrating the treatment of cognitive and behavioural factors in physiotherapy for improving function and decreasing pain intensity<sup>22</sup>. The techniques incorporated within the trials included graded exposure, education, empowerment, goal setting, therapist monitoring, graded exercises and home exercise programs<sup>22</sup>. Other studies support the reduction of self-perceived disability, sick leave,

modifiable psychological risk factors and improved return to work statistics through physiotherapy-led CB approaches<sup>18, 19, 107, 108</sup>.

### ***Physiotherapy-Led Combined CB And Exercise Programs***

One additional benefit of physiotherapy-led programs is the ability to combine active approaches, with BCT<sup>98</sup>. As previously highlighted, there is a high negative correlation between cognitive (catastrophizing, fear of movement, depression, pain) and physical factors (exercise)<sup>38, 45, 47, 49, 50, 54</sup>. Treatment approaches addressing catastrophizing (through cognitive restructuring), maladaptive behaviours (exposure, graded exercises) and disability (strengthening, cardiovascular conditioning, endurance training) have been delivered in a combined program and research results suggest that the combination of CB approaches, using BCT, and exercise or activity could be an effective blend for the treatment of CLBP for improving self-reported pain and disability<sup>109</sup>.

Physiotherapy delivered programs that combine CB and exercise approaches demonstrated that, given together, they produce more successful results, with improvements on measures of psychological and physical disability, for patients with CLBP than exercise alone or usual care<sup>23, 24, 110</sup>. In a single case study, Johansson demonstrated the benefit of an individualized physiotherapy-led CB approach with specific and individualized goals in combination with graded exercises and found that it was more successful than exercises alone for the

treatment of CLBP<sup>24</sup>. Although generalizations cannot be made beyond this individual study, it does tend to support the findings of other authors<sup>23, 40</sup>. Four programs reported in the literature on physiotherapy-led combined CB and exercise programs for chronic conditions, including CNSLBP, had encouraging results supporting this combined approach, but there are challenges in methodology in regards to the use of control groups, intervention dosage and the use of common BCT nomenclature that make comparison of results challenging<sup>18-21</sup>.

A multicenter study examined the application of a cognitive intervention, the “Back Skills Training Trial” (BeST) program, by several professionals including physiotherapists, as compared to active advice<sup>19, 102</sup>. A cohort of 399 patients with sub acute and CLBP were monitored for changes in self-reported disability, pain and in addition, the program was examined for cost effectiveness at 12 months<sup>19</sup>. The BeST program used a variety of behaviour change techniques including: collaborative goal setting, exercise practice and discussion of progress, explanations of the causes of chronic pain and demonstrations that hurt does not equal harm, a discussion of the evidence regarding low back pain and the need to self-monitor behaviour, pacing, problem solving, understanding the role of thoughts and feelings, homework, relaxation, and coping with flare-ups<sup>102</sup>. The research results indicated that the program resulted in significant improvements in disability and pain as compared to the active advice group and was cost effective<sup>19</sup>.

Results from this study, however must be interpreted carefully because the control group was not active. They received a 15-minute information session on remaining active and a copy of the “Back Book”, whereas the intervention group had six, 90-minute group sessions in addition to a 90-minute initial assessment<sup>102</sup>. To keep the groups similar, an estimated 95% of treatment time was used for the application BCT and only 5% was dedicated to exercises in the clinic with the focus on home exercises<sup>102</sup>. Many factors, including attention from the instructor, social support from the group and increased treatment dosage, may account for a portion of the observed differences. One other challenge with this study is that the outcomes were not defined by the professional instructing the program, so although overall results are positive, individual professional differences, which may also have contributed to differential outcomes, were not assessed. Despite these shortcomings, the application of behavioural change techniques in combination with an active treatment approach was once again supported.

In another study, the “Back to Fitness” program (combining progressive exercise with a CB approach), was compared to usual primary care for 187 patients with sub acute and CLBP<sup>20</sup>. Patients were evaluated post treatment and at 6 and 12-months’ follow-up to determine disability, pain, workdays lost and use of health care services. Behavioural change techniques applied in this approach included: goal setting, advice to keep active, education on posture, sleep hygiene, the importance of body mechanics, the role of maintaining fitness in dealing with

reoccurrences of pain, the role of stress and tension, pacing, activity reassurance during reoccurrence, the importance of making a public commitment and asking patients how they plan to continue with changes after class completion<sup>2, 20</sup>. The results from this study showed significant improvements in self-reported disability at both 6 months and 1 year, and significant changes in self-perceived pain. Decreases in workdays lost and health care usage were noted at one year in favor of the intervention group<sup>20</sup>. A later study by the same author compared the “Back to Fitness” program to usual general practitioner care and, using similar intervention parameters, found significant improvement in self reported disability, especially for those patients with high fear avoidance<sup>23</sup>.

A comparison of the two approaches (BeST<sup>19</sup> and “Back to Fitness”<sup>20</sup> programs) reveals favorable support for the effect of the physiotherapy-led combined CB and exercise programs both in regard to short and long-term results. There are some challenges to comparing the studies, in particular the use of control groups, intervention dosage and the lack of a common nomenclature. For example, the use of non-comparable control groups, unmonitored usual care, (“Back to Fitness”)<sup>20</sup> and minimal advice (BeST)<sup>19</sup> undermines the confidence in the results and makes between group comparisons difficult. The dosage of the intervention varies among programs studied (e.g, eight, one hour sessions in “Back to Fitness”<sup>20</sup>, and six, 90-minute sessions with a 90-minute initial assessment BeST<sup>19</sup>). The variance in individual as compared to group treatment also complicates comparison. However, one of the most striking differences is the

variability in the BCT applied in the two studies. In the application of BCT in these two programs there is a wide array in the types and language of the BCT used between interventions and it is unclear if similar messages were imparted to patients but described differently. This lack of a standardized nomenclature to describe the BCT used contributes to the difficulty in interpretation. These underlying concerns in methodological rigor challenge outright conclusions on the efficacy of combined CB and exercise programs but the positive results in these two studies are promising for the combination of these approaches.

Both studies mentioned above, the “Back to Fitness”<sup>20</sup> and BeST<sup>19</sup> programs, involved the treatment of patients with either CLBP or sub acute and CLBP. These studies targeted modifiable psychological risk factors, identified *a priori*, in addition to physical factors, to improve outcomes. The BeST<sup>19</sup> program focused on addressing fear of movement and catastrophizing with cognitive interventions, and exercise and demonstrated significant improvements on pain and disability at one-year follow-up. The “Back to Fitness” program<sup>20</sup> that focused on improving patient self-management resulted in reduced pain and disability for up to a year<sup>20</sup> and as observed in a later study, with the greatest effects in patients with high fear avoidance<sup>23</sup>. These programs demonstrate positive outcomes in the short and long-term for the combination of CB and exercise in the treatment of CNSLBP and modifiable psychological risk factors. It has been suggested that adapting programs to individual psychological risk profiles or through the identification of subpopulations with specific modifiable risk factors prior to



treatment may enhance the use of CB approaches<sup>62</sup>. Programs have focused the use of CB and activity approaches through the identification of specific modifiable psychological risk profiles and on sub populations of patients with chronic pain in the presence of modifiable risk factors.

One study examined the effects of tailoring treatment according to individual psychosocial risk profiles and functional needs in comparison to active physiotherapy treatment with a cohort of 97 patients, primarily with chronic MSK pain (81%)<sup>21</sup>. The tailored intervention incorporated an array of behaviour change techniques: self-monitoring through use of a diary, basic and applied skill acquisition and generalization, maintenance and relapse prevention, reinforcement, establishing quota based activity, therapist monitoring, feedback on performance, booster sessions and stimulating the patient's ability to "predict and manage events in daily life"<sup>21</sup>. At three months, the tailored intervention group had significant improvements in self-reported disability and pain control and greater, although non-significant, improvements in pain and fear of movement as compared to the active physiotherapy group<sup>21</sup>. Both treatment groups showed improvements in self-efficacy and physical performance. The use of an active physiotherapy program as a comparison strengthens the observed outcomes. These results support the other studies in the use of combined CB and exercise programs. This study also supports the tailoring of treatment to accommodate for individual psychological risk profiles and functional restrictions. Another means of tailoring treatment programs is through the

identification of subpopulations of patients with chronic pain prior to treatment, which has been shown to be very effective for improving patient outcomes.

In a 10-week psychosocial and activity based intervention (Progressive Goal Attainment Program; PGAP) a sample of 70 patients with whiplash associated chronic pain and moderate levels of either catastrophizing or fear of movement/reinjury were studied<sup>18</sup>. Patients receiving PGAP with physiotherapy, for 10, one-hour sessions, were compared to a historical cohort of patients (n=60) receiving three weekly treatments of 2.5 hours of functional restoration physical therapy. At four weeks post treatment the cohorts were assessed for changes in self-perceived disability and return to work (RTW) measures. The physiotherapy-led program used progressive goal setting, education and reassurance through the use of video, activity encouragement, activity monitoring through an activity log, activity prescription and scheduling with the physiotherapist, graded activity including walking, thought recording, reappraisal, cognitive restructuring, positive reinforcement and barrier identification to prompt behaviour change<sup>18</sup>. The physiotherapy-led PGAP resulted in a 75% RTW rate as compared to 50% with physiotherapy alone<sup>18</sup>. This study had comparable treatment dosage, the use of an active control condition gives strength to the results and the application of CB and activity based approaches. Although this study has the added benefit of providing more descriptive detail to the way some of these techniques were applied when compared to previously identified programs (individually tailored<sup>21</sup>,

BeST<sup>19</sup>, “Back to Fitness”<sup>20</sup>) the techniques used to modify behaviour are different making it difficult to make direct comparisons.

### **Summary**

Research for the combination of CB and active physiotherapy approaches seems to hold promise, but critical methodological issues require attention to improve the quality of obtained results. Some of these issues are: the clarification of patient sub populations, comparability of control groups (both in the treatment type and dosage), and one of the most notable issues is the lack of a consistent nomenclature and definitions. Each study used different descriptions and definitions of the BCT used, making comparisons between physiotherapy-led approaches difficult. Currently there is no identified nomenclature for BCT used within physiotherapy-led CB approaches.

### ***Nomenclature For Physiotherapy Approaches***

The identification of a nomenclature and standard definitions for the application of BCT within CB approaches in a physiotherapy setting could greatly assist with characterization of treatment approaches, thereby assisting in research comparisons and replication. A nomenclature grounded in both physiotherapy and psychology practice may also improve interprofessional communication and research comparisons. The identification of a nomenclature and relevant

definitions could also improve our broader understanding of the capabilities physiotherapists may have with respect to applications of CB approaches.

### ***Understanding Physiotherapy Use Of BCT***

Currently there is very little known about physiotherapy use of BCT in CB approaches. When included in a research project, treatment programs usually are described in detail with specific guidelines for technique use and the BCT that are implemented. Some of these programs are monitored for adherence, but the adherence is based on the dictates of the treatment protocol. However, outside of research protocols, the only study of the use of BCT in physiotherapy practice has been through survey research.

Surveys have been performed to identify BCT used within physiotherapy practice. In a recent telephone survey of members of the geriatric and orthopedic sections of the American Physical Therapy Association, 152 physiotherapists who treated chronic pain conditions in the elderly indicated that pacing (81%) and scheduling of pleasurable activities (30%) were the key BCT that they used most frequently<sup>111</sup>. Lack of knowledge and skills in the use of CB approaches in addition to time and reimbursement constraints were identified as the main reasons for the limited application of these techniques. The identification of only two techniques may be related to the relatively small number of sampled techniques in the survey, and that only six BCT were identified in the literature review in Beissner's paper<sup>111</sup>. These techniques were: activity pacing, relaxation,

visualization or imagery, distraction, cognitive restructuring and pleasurable activity scheduling. A UK survey study examining the differences in psychological content of the treatment of sports injuries by non-club (n=42) versus club-contracted (n=45) physiotherapists found that a wider range of techniques were used (this study used a modified version of the 12-item Athletic Training and Sport Psychology Questionnaire<sup>112</sup>) by non-club physiotherapists. The techniques were: creating variety in rehabilitation exercises, using short term goals, enhancing self-confidence, encouraging effective communication, encouraging positive self-thoughts, reducing stress and anxiety, improving social support, reducing depression, teaching relaxation techniques and teaching emotional control strategies. Results indicated that all techniques were used, with the first six, as listed, used 50% or more of the time, and the rest, less frequently<sup>112</sup>. Differences in practice settings were noted with non-club physiotherapists using social support, reducing stress and anxiety and reducing depression more frequently than club-contracted physiotherapists, who reported more use of short-term goal setting. The authors suggested that the use of different techniques would lead to a different recovery process for the athlete in the two environments<sup>112</sup>.

Both of these surveys reveal some information about how physiotherapists provide CB approaches and apply BCT to modify behaviour in different orthopedic settings; however this is only through self-report. It is unknown how well self-report of practice correlates to the actual practice of applying BCT in CB

approaches for MSK conditions. Some of the challenges involved in studying this aspect of practice include: a lack of a defined nomenclature and related definitions and a lack of a tool to measure practice. As a result, the study of physiotherapy-led CB approaches may under report the occurrence of BCT and fail to link the application of BCT to treatment outcomes. To date no studies have examined the content of physiotherapy practice in any setting to determine the range and type of BCT used by physiotherapists.

#### **PURPOSE OF THIS STUDY**

To address the shortcomings outlined above and to improve our understanding of physiotherapy-led CB approaches to care, this study aims to identify the range and type of BCT used in a combined CB and exercise program, the “Back to Fitness” class, for military members with CNSLBP in the presence of high levels of fear of movement.

## Chapter 3                      Methods

### STUDY PARTICIPANTS

In this study there were two sets of participants, the physiotherapists who instructed the “Back to Fitness” class and the patients participating in the combined CB and exercise program.

#### *Physiotherapists*

Two federal public servant physiotherapists working at CFB Halifax, who instructed the November 2010 “Back to Fitness” class, participated in the tool testing and field study portion of this research study. These physiotherapists consented (verbal and written) to the researchers’ viewing of previously recorded videotapes of the November 2010 “Back to Fitness” class. General information on the physiotherapists’ level of experience was collected according to the Physiotherapist’s Work Experience Form in Appendix B. Information was collected to describe the physiotherapist participants delivering the “Back to Fitness” class based on the Physiotherapist’s Work Experience Form.

#### *Patients*

The patient population included patients who participated in the “Back to Fitness” class through the CFB Halifax Physiotherapy Section in November 2010. The patients consented (verbal and written) to the viewing of videotapes by researchers of the “Back to Fitness” class for the purposes of studying physiotherapy practice. Patients were selected by CFB Halifax physiotherapists for participation in the program based on the presence of low back pain ( $\leq 50\%$  on

the Quadruple visual analogue scale (Quad VAS) Appendix C )<sup>113</sup> lasting greater than three months, moderate disability ( $\geq 21$ -40% on the Oswestry Disability Index (ODI), Appendix D)<sup>114, 115</sup>, and high of fear of movement/ reinjury ( $\geq 37$  on Tampa Scale of Kinesiophobia (TSK), Appendix E)<sup>116</sup>, persisting issues with poor movement patterns and a requirement for improved self-management skills. The Quad VAS, ODI and TSK scores were recorded for each patient in the Research Participant Data Sheet, Appendix F. Descriptive analysis of patient participant demographics and outcome measures were used to define the patient participant group receiving the care based on the information collected in the Patient Participant Data Sheet. These measures are routinely collected and are reported in this thesis to describe the population, but otherwise are not used in the study.

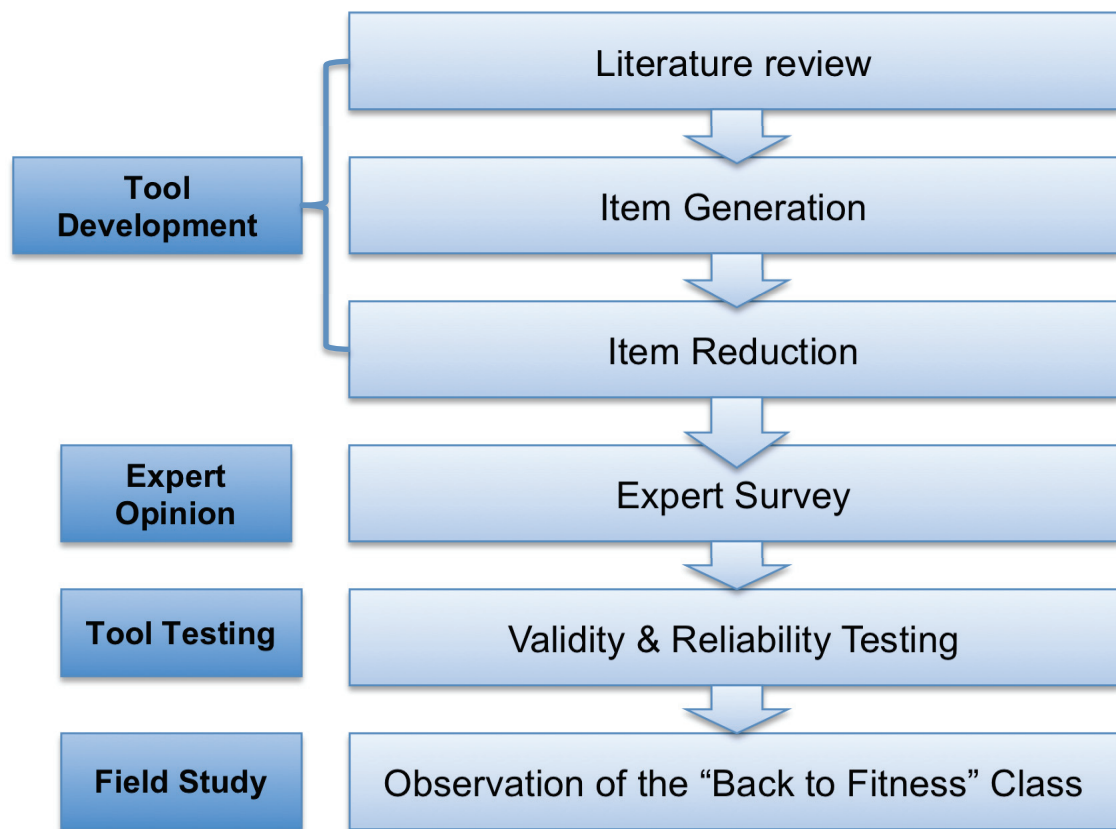
## **PROCEDURE**

### ***Study Design***

This study was performed in four phases (see Figure 1 for flowchart). The objective of the first phase, tool development, was to develop a BCT nomenclature, definitions and a checklist tool derived from the nomenclature. This phase involved a literature review of physiotherapy-led CB approaches to identify BCT, a comparison with an existing BCT checklist<sup>1</sup> for psychologists and the creation of a preliminary BCT checklist.



The objective of the second phase was to test the checklist tool for content validity through the use of expert opinion. This phase involved a survey of content experts. The third phase was intended to test the content and face validity as well as the intra and inter-rater reliability of the physiotherapy BCT checklist. The fourth phase, the field study, was an observational study that used the checklist to answer the research question: “What is the range and type of BCT used in the “Back to Fitness” class?”.



**FIGURE 2:** THE STUDY METHODOLOGY FLOW CHART FOR EVALUATION OF THE RANGE AND TYPE OF BCT USED BY PHYSIOTHERAPISTS IN THE “BACK TO FITNESS” CLASS. THIS STUDY INVOLVES FOUR PHASES; THE DETAILS OF EACH PHASE WILL BE OUTLINED BELOW.

This study was granted ethics approval by the Dalhousie University Human Research and Ethics Board, Halifax, NS, Canada (February, 2011). As per military regulations, this study also required and was granted chain of command approval and endorsement from the Canadian Forces' Surgeon General's Health Research Program (December, 2010).

### ***1. Tool Development***

In this phase of the study a literature search was performed to identify relevant articles, behavioural change techniques were identified and recorded from the relevant articles and combined with an existing BCT checklist for psychologists in the item generation, and these BCT were then examined and collapsed into the modified physiotherapy (PT) BCT checklist during item reduction.

#### **Literature Search**

The purpose of this initial phase was to identify BCT used by physiotherapists in a rehabilitation environment for musculoskeletal (MSK) injuries as published in the scientific literature. To do this, the primary investigator (PI) performed a literature review to identify successfully implemented CB approaches to care that were either currently used or recommended for use by physiotherapists for the rehabilitation of acute, sub acute or chronic MSK conditions. Measures of success were based on clinical or significant improvements in patient self-perceived levels of disability, activity, fear avoidance or catastrophizing or significant improvements in levels of impairment or function. In the absence of a clear definition of the ideal timing for the treatment of modifiable psychological

risk factors and the ideal BCT to treat risk factors, the search was not restricted to issues of only chronic pain but rather expanded to acute and sub acute conditions. The search included all types of MSK injuries since modifiable psychological risk factors and pain have been linked to disability and decreased function across conditions. Due to the inclusion of interventional studies, reviews and clinical papers, the selected articles were not evaluated or ranked for methodological rigor, but instead they were merely examined for the inclusion of BCT used by physiotherapists.

In collaboration with a research librarian, a literature search was conducted in both PubMed and CINAHL for English articles, published between 1991 and 2011 using the MESH search terms, “Cognitive Therapy” and “Physical Therapy”. Articles that examined multidisciplinary CB approaches to the management of MSK pain as well as descriptive articles on physiotherapy (PT) and CB approaches or articles that incorporated physiotherapists’ views on the use of CB approaches were included for examination. Articles that pertained to ongoing disease processes such as cancer or rheumatoid arthritis and those articles pertaining to neurological or cardio respiratory issues were excluded. Treatment types including electrotherapy, medication or pharmacotherapy, hypnotherapy were also excluded along with certain patient populations including gamblers and alcoholics or diagnoses of panic disorder, obsessive-compulsive disorder, phobias, dementia, and drug addictions. The search strategy for both Pub Med and CINAHL is recorded in Appendix G.

Upon completion of the literature search, a title scan was performed to eliminate articles that did not involve the use of BCT in the treatment of MSK injuries. The resulting articles from Pub Med and CINAHL were then combined and duplicates eliminated before an abstract scan was performed. The remaining articles were then examined for their methodology to ensure that the role of the PT in providing BCT was clearly defined. If the PT role was clearly defined, the article was included in the study. The reference list for the selected articles were then scanned and any additional articles whose title reflected the application of BCT approaches by physiotherapists were obtained and examined for inclusion. Following the same procedure outlined above, any additional articles that met the inclusion criteria were included in the study. Articles that were inconclusive or vague on the role of BCT use by the physiotherapist were omitted from the study.

### **Item Generation**

The articles that met the inclusion criteria were then examined for the behavioural change techniques (BCT) used by physiotherapists. The identified BCT, as described in the articles, were then extracted and compiled in a physiotherapy (PT) BCT summary database. Once all of the articles had been examined and the BCT extracted, a list of PT BCT was compiled from the database.

Although a gold standard for BCT does not exist, there is a previously described nomenclature for BCT for psychologists<sup>1</sup>. This current study aimed to create a similar result for the physiotherapy profession. To incorporate the largest range

of BCT that may be practiced by physiotherapists, the entire 26 BCT from the psychologist checklist were initially incorporated into the *combined* PT BCT list.

### **Item Reduction**

The primary investigator (PI), a physiotherapist with 16 years of clinical experience in the treatment of MSK conditions, examined the combined PT BCT list of techniques and duplicate BCT were omitted. The PI then wrote definitions for each remaining technique using descriptions in the relevant articles. This information was then compiled for further evaluation.

At this point an iterative process was initiated with the secondary investigator (SI), a physiotherapist with a Doctorate in psychology and a faculty member of the Dalhousie University School of Physiotherapy, to examine and modify the *combined* PT BCT list. Through a series of emails and meetings the PI and SI jointly reviewed the definitions of the BCT and those that described similar processes were grouped together and reduced so that redundancy was eliminated. Any BCT that were not reflected in the research articles on physiotherapy-led CB approaches and, in the opinion of the PI and SI, did not accurately reflect physiotherapy practice, such as psychotherapy techniques, were either modified in their definition to more accurately reflect physiotherapy-led approaches, or eliminated from the *combined* PT BCT list. When in doubt as to whether or not to include a BCT, the BCT was included for further discussion and evaluation. As a second step to this process, a thematic analysis was

performed and BCT were grouped into common categories. From this process, a *simplified* PT BCT list was created.

The next step was a discussion of this *simplified* PT BCT list with a clinical behavioural psychologist and researcher (MV). We considered each item and the definition as well as the categorical organization of the items. Several iterations over several weeks were created and examined until a consensus was reached. The final result of this phase was the creation of a *modified* PT BCT checklist along with operational definitions for each BCT that are recorded in the Expert Survey (reported in the results section see Appendices M and N).

## **2. Expert Opinion**

In this phase of the study that was intended to test tool content validity, identified clinical and research experts in the application of BCT by physiotherapists, garnered from the literature search and local recommendations, were surveyed. They were asked to consider a patient with CNSLBP with the presence of modifiable psychological risk factors such as fear avoidance or catastrophizing and respond to the following statement, “This BCT is important to the practice of physiotherapy”, for each of the identified BCT in the modified PT BCT checklist. The order of the items on the *modified* PT BCT checklist were randomized to prevent identification of BCT type, and the respondents evaluated each BCT using a five point Likert Scale with the end markers of “strongly agree” and “strongly disagree”. The responses for each BCT were then compiled for analysis

to determine what type and range of BCT in the modified PT BCT checklist the experts supported.

Candidates for the survey were the clinical and research experts identified in the literature review in addition to locally identified clinicians who study or practice CB approaches to care. These clinical and research experts were asked to complete general information questions regarding their field of expertise (clinical or research), years using or researching the use of BCT by physiotherapists and their sex so that respondents could be characterized.

Opinio™ is an online survey system that allows potential respondents to be contacted via email and then allows them to respond anonymously by logging into the Opinio™ website. All respondents were assigned a code and all answers were tagged to that code instead of the individual, giving them anonymity. The survey was conducted in parallel with the last two phases of the study and the results of the survey were not obtained until after the field study was completed (May 2011). The timing of the survey therefore precluded any influence on either the tool testing or field study phases of the investigation.

### ***3. Tool Testing***

In this phase, video clips from the combined CB and exercise program, the “Back to Fitness” class, currently used at CFB Halifax to treat patients with CNSLBP

and issues of fear avoidance, were used to determine validity and reliability of the modified PT BCT checklist. The six-week, group oriented, “Back to Fitness” class was comprised of twelve 1.5 hour sessions, including weekly 20 to 50 minute lectures and individually directed exercises on six consecutive Tuesday classes and general strengthening, cardiovascular training, a review of individual exercises and relaxation training on each of six Thursday, 1.5 hour sessions.

### **Video And Audio Recording Procedure**

The “Back to Fitness” class was digitally recorded at the CFB Halifax, Dockyard gym classroom and multipurpose room. To improve the ability to hear conversations between the physiotherapists and patients, three additional external microphones were used. To prepare the videos of the “Back to Fitness” class for viewing, the digital tapes were converted to MPEG-2 files by information technology staff (EL) at Canadian Forces Health Services Center Atlantic. To allow for editing and viewing on Macintosh software, these MPEG-2 files were then converted to movie files by the IT technician (JC) at the Dalhousie University School of Physiotherapy and combined with external audio tracks using Macintosh iMovie, Quick Time Pro and Audacity software. The final product was video that could be easily viewed in QuickTime Player version 10.

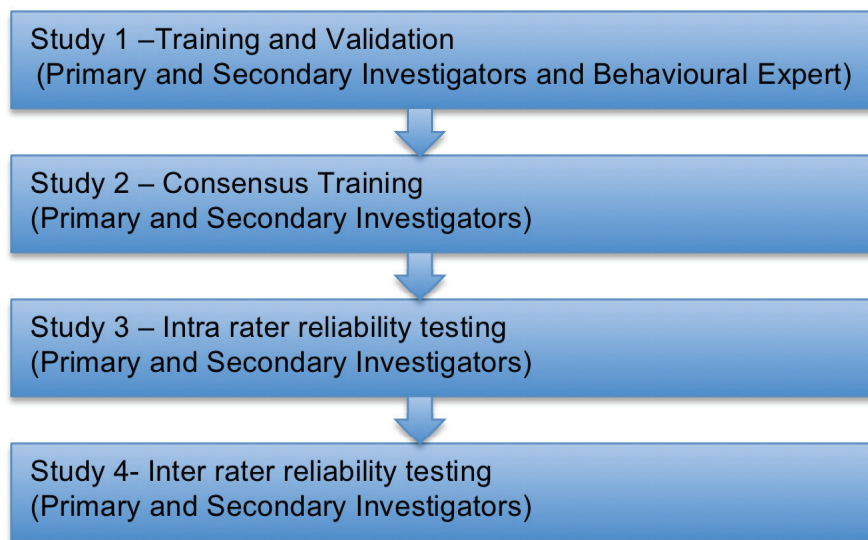
### **Video Sampling Procedure**

Physiotherapy lecture and video sessions have not previously been examined for the use of BCT so it was unknown what the best means of sampling was for the observation of these settings in clinical practice. To provide the widest range of



samples, each lecture, Tuesday and Thursday exercise session from the “Back to Fitness” class video recordings were then segmented into four equal parts to allow for a video clip of each of the four different studies. A block randomization procedure was then used to ensure that video clips from each session across the six weeks were included in the final sample of video clips for each study. The video clip sampling procedure is described in Appendix H. The resulting four groups of video clips were then randomly assigned to studies 1 through 4. The studies are outlined in Figure 3.

### Validity And Reliability Testing



**FIGURE 3:** STUDIES 1 THROUGH 4 WERE PERFORMED IN SUCCESSION IN ORDER TO COMPLETE THE INITIAL VALIDATION, CONSENSUS TRAINING, INTRA AND INTER-RATER RELIABILITY.

## *Training and Validation (Study 1)*

### Training

The PI and SI met with the expert in behavioural psychology (MV) to use the *modified* PT BCT checklist with video observation for the first time. The intent of this study was to acquire training with MV to: (i) provide validity to the *modified* PT BCT checklist by ensuring that the BCT on the checklist could be identified on the videos and (ii) ensure that the definitions matched the physiotherapy practice. In this training session, video clips were collaboratively viewed and the observed BCT were discussed. The definitions of the observed techniques were confirmed and viewing continued until all three members felt comfortable identifying the BCT observed. Those techniques not viewed on the videotapes during the consensus training were then discussed and a consensus was achieved on what the remaining BCT would look like in a physiotherapy clinical scenario. The PI recorded any additional characteristics for each BCT that were required to clarify the identification of a BCT. These clarifications were incorporated into the BCT checklist companion document that acted as a reference document for the PI and SI for the remaining phases of the study.

### Validation

Content validation occurred as the PI and SI identified the BCT and the behavioural expert verified that each observed BCT corresponded with both the outlined description and BCT as identified in psychology. All observed BCT, all BCT that were initially in dispute but agreed to after discussion and all BCT that remained in dispute were tabulated between video clips. This process served as

continued training and confirmation of measurement of the *modified* PT BCT checklist in addition to content validation.

### *Consensus Training (Study 2)*

The PI and SI met to collaboratively view and discuss the second set of video clips. Using the *modified* PT BCT checklist the PI and SI began collaboratively viewing and scoring the video clips. When discrepancies in scoring occurred, the video clips were paused and discussion ensued until the PI and SI could come to a consensus on the BCT that was viewed. When the investigators completed a minimum of six video clips, had established consensus of the viewed BCT, and were comfortable with the identification of the observed BCT as described in the *modified* PT BCT checklist, consensus training was complete and reliability testing began.

### *Intra Rater Reliability (Study 3)*

Following the consensus training intra rater reliability of the *modified* PT BCT checklist was determined through the viewing and scoring of unique, unused samples of previously recorded video clips of the “Back to Fitness” class. Each rater independently and successively viewed three, five-minute video clips. Each rater then participated in the fourth study for inter rater testing for one hour before returning to view the same three, five-minute video clips in the same order. The three, five-minute video clips were then viewed and the BCT observed were indicated on the *modified* PT BCT checklist.

After the second viewing all scores for each rater on the first and second viewing were recorded. Levels of agreement, as described by Portney and Watkins<sup>117</sup> and described in Table 1 and Figure 4, were compared for observed and not observed BCT on repetitive viewing of the same video clips with the same rater. Levels of agreement as described by Portney and Watkins<sup>117</sup> were scored as a “1” for an agreement of occurrences of a BCT between the first and second viewing by one rater. A “0” was scored for an agreement of non-occurrences of a BCT between the first and second viewing for one rater. Non-agreement of observances or non-observances was not scored. The percent level of agreement was a total of the agreement of occurrences and non-occurrences over the total possible number of BCT that were observed. When total levels of agreement reached  $\geq 75\%$  with three successive video clips, the intra rater reliability was considered strong. When the total levels of agreement were  $< 75\%$ , the raters continued to view and score video clips (two times each) for three video clips, then the levels of agreement were reassessed until values of  $\geq 75\%$  were reached for three successive video clips. This process is described in Table 1 and Figure 4.

**TABLE 1:** EXAMPLE OF DATA COLLECTED BY ONE RATER ON ONE VIDEO FOR TWO SEPARATE VIEWINGS FOR THE BCT INTRA-RATER RELIABILITY CALCULATION.

Trial #	BCT 1	BCT 2	BCT 3	BCT 4	BCT 5	BCT 6	BCT 7	BCT 8
1	1	1	1	1	0	0	1	1
2	1	1	0	1	0	1	1	0
<b>Agreement</b>	1	1		1	0		1	

In the example in Table 1, the agreement of an occurrence is denoted by a “1” within the two viewings and scoring of one video clip where “0” indicates an agreement of non-occurrence for a BCT as indicated on the *modified* BCT checklist. For those BCT where agreement was not reached between the two viewings of the same video clip, the agreement cell remained empty. In other words, 100% agreement on two trials was required to score either a “1” or a “0” in the agreement tally. The rate of agreement was then calculated for each of the three video samples as follows:

**Percent agreement for occurrences** = (# agreed occurrences / # of occurrences of BCT noted) \*100%

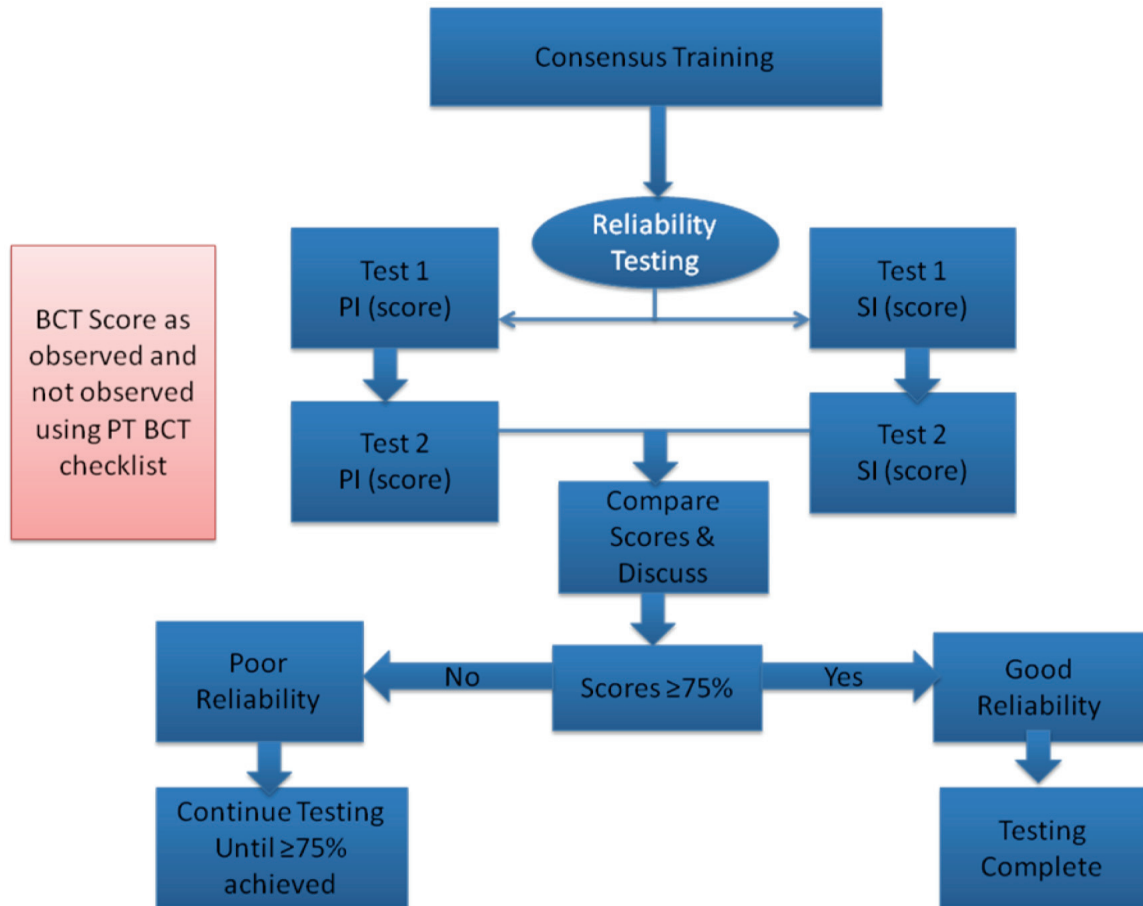
**Percent agreement for non-occurrences** = (# agreed non-occurrences / # of non-occurrences noted)\* 100%

**Total percent agreement** = (# agreed occurrences+ # agreed non-occurrences / total # events possible (29 BCT))\*100%

#### *Inter-Rater Reliability (Study 4)*

The PI and SI tested for inter-rater reliability by independently viewing and scoring the same three video clips using the *modified* PT BCT checklist. The

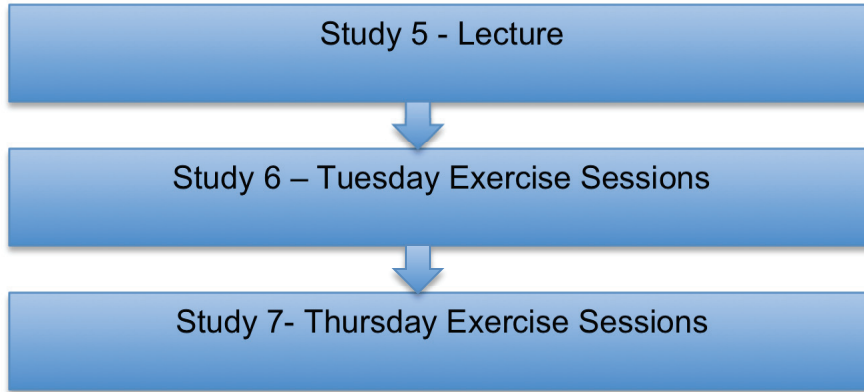
levels of agreement between the raters were then compared in the same manner as for the intra rater testing. The process of rating continued in an independent fashion with unique sets of video clips each time, with both the PI and SI viewing the same three video clips of the “Back to Fitness” class until total levels of agreement between the two raters reached  $\geq 75\%$  on three successive videotaped clips. On occasions where the levels of agreement failed to reach the target of  $\geq 75\%$ , the PI and SI reviewed the three video clips collaboratively and discussed the BCT observed and clarified any differences between scoring before proceeding with the next round of inter rater testing. Once total levels of agreement reached  $\geq 75\%$  the inter-rater reliability was considered to be strong. This process is described in Table 1 and Figure 4.



**FIGURE 4:** THE PROCESS OF VIDEO EXAMINATION IS DESCRIBED FOR BOTH INTRA AND INTER RATER RELIABILITY. NOTE, THE PRIMARY INVESTIGATOR IS DENOTED AS PI AND THE SECONDARY INVESTIGATOR IS DENOTED AS SI.

#### 4. Field Study

In the final phase of the study, the *modified* PT BCT checklist was used to evaluate the range and type of BCT used in the “Back to Fitness” class. To do this the videos were divided into the three components (lecture, Tuesday and Thursday exercise sessions), and examined in their entirety in the form of three separate studies. See Figure 5 below.



**FIGURE 5:** REPRESENTS THE THREE STUDIES (5, 6, 7) THAT WERE PERFORMED AS PART OF THE FIELD STUDY TO DETERMINE THE RANGE AND TYPE OF BCT INCLUDED WITHIN THE “BACK TO FITNESS” CLASS AT CFB HALIFAX. THE PRIMARY AND SECONDARY INVESTIGATORS CONDUCTED EACH STUDY.

### **Video Observation**

The PI and SI were involved in the viewing of all sessions of the field study. The PI and SI collaboratively viewed and scored all sessions of the “Back to Fitness” class in 10-minute blocks of time using the modified PT BCT checklist. An observance of any BCT during the lectures, Tuesday or Thursday classes during the 10-minute blocks of time was recorded as a single observance for the session being viewed. If an additional observance of a technique was observed in the 10-minute block, it was not recorded. These data were then collapsed to reflect BCT observed over an entire session where any single observance during any 10-minute video segment was recorded as only one observance for the particular exercise session. Multiple observations across the cumulative 10-minute segments were not used in the analysis. Each investigator also maintained field



notes on their observations throughout the sessions. These notes included comments about the use of tone, style observations, and other aspects of the classes that they felt were important but not necessarily captured by the checklist.

### **Lectures, Tuesday And Thursday Exercise Sessions**

After completing the viewing of all video recordings from the lectures and Tuesday and Thursday exercise sessions, the range and type of BCT were tabulated across each setting across the six weeks. The data were compiled to indicate the overall type and range for the entire “Back to Fitness” class and then the BCT were examined by type. As an overall observance, all BCT observed in all of the sessions were combined for visual comparison. The range and type of the BCT were described within each lecture, Tuesday and Thursday exercise session and across the six weeks.

### ***Final Component***

Throughout all four phases of the study, the *modified* PT BCT checklist and companion document with the operational definitions were modified based on discussions, viewings and feedback. A *final* PT BCT checklist and companion document was created based on these viewings and discussions across the whole period of data collection.

## Chapter 4 Results

### STUDY PARTICIPANTS

#### *Physiotherapists*

Two physiotherapists with an average of 12 years of experience and 5 years using CB approaches provided the “Back to Fitness” class. Their experience in CB approaches had come from a combination of formal training and experience working with CB interventions in either a multidisciplinary approach or in direct physiotherapy interventions. The November 2010 “Back to Fitness” classes that were used in this study were primarily taught by one physiotherapist with 6 years of experience in the application of CB approaches to care. This physiotherapist provided all of the lectures and was the primary instructor during the exercise classes. The second physiotherapist along with one to two physiotherapy assistants also provided care and patient monitoring throughout the “Back to Fitness” class.

The CFB Halifax Physiotherapy Section considers the physiotherapists involved in the instruction of the “Back to Fitness” class, to be specialists in the application of CB approaches for MSK conditions. Both instructors have taught the “Back to Fitness” class on multiple occasions and both were involved in the design of the physiotherapy component of a multidisciplinary clinic for patients with chronic pain. Additionally the primary instructor was responsible for the proposal and development of the “Back to Fitness” class at CFB Halifax and with ongoing

patient feedback she has continued to tailor the program to the military members it serves.

### ***Patients***

There were a total of 12 patients that participated in the “Back to Fitness” class. The average age of the patients was 45 with a range from 28 to 60 years. The majority of the patients were male (n=10) and 6 were on full duties while the other 6 were on modified duties. Baseline scores on questionnaires were taken before the start of the program and they were:

- Quad VAS <sup>113</sup> (a score of < 50% is low intensity pain and ≥ 50% is considered to be high intensity pain): median 47% (range 23 – 70%) indicating a low intensity level of pain as expected from the inclusion criteria.
- ODI <sup>114, 115</sup> (a score of 0-20% means minimal disability, 21-40% moderate disability, 41-60% severe disability, and >61% is complete disability): median 20% (range 4 – 48%) indicating a range in level of disability from minimal to severe, with most reporting minimal levels of disability. This was lower than the anticipated moderate disability in the inclusion criteria.
- TSK <sup>116</sup> (a score of ≥37 is a high fear of movement<sup>12</sup>): median 39 (range 24-49) indicating a combination of patients with low and high levels of fear of movement. The median level was reflective of a high fear of movement as intended by the program inclusion criteria.

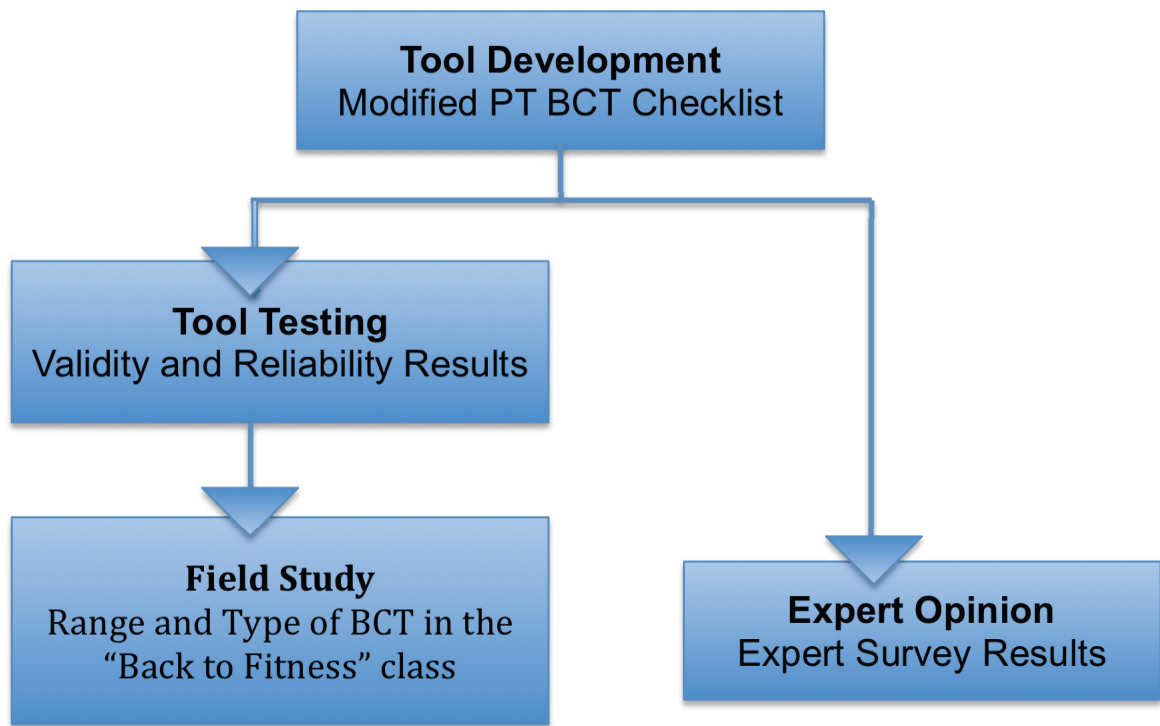
The patient demographics and scores are recorded in Table 2.

**TABLE 2: SUMMARY OF THE DEMOGRAPHICS AND QUESTIONNAIRES FOR THE PATIENTS THAT PARTICIPATED IN THE “BACK TO FITNESS” CLASS.**

<b>Patient</b>	<b>Age</b>	<b>Sex</b>	<b>Duties</b>	<b>QUAD VAS (%)</b>	<b>ODI (%)</b>	<b>TSK</b>
<b>1</b>	53	M	2	33	34	24
<b>2</b>	33	M	1	70	30	47
<b>3</b>	60	M	2	53	28	35
<b>4</b>	54	M	2	60	14	49
<b>5</b>	28	M	1	40	4	40
<b>6</b>	44	F	1	67	26	42
<b>7</b>	41	M	1	23	5	37
<b>8</b>	31	F	1	47	13	28
<b>9</b>	47	M	2	60	48	43
<b>10</b>	51	M	1	30	10	39
<b>11</b>	46	M	2	53	24	45
<b>12</b>	46	M	2	33	20	32
<b>Average</b>	45	10=M	6=FT	(Median) 47	(Median) 20	(Median) 39
<b>SDEV</b>	<b>10</b>	2=F	6=PT			
<b>Range</b>	33-60			23-70	4-48	24-49

## STUDY OUTCOMES

The results from each phase of the study are recorded in Figure 6.



**FIGURE 6:** A FLOWCHART OF THE FIVE PHASES AND THE RESULTING DATA FOR ALL THE STUDIES. (PT = PHYSIOTHERAPY, BCT = BEHAVIOURAL CHANGE TECHNIQUE)

Each phase and its corresponding results will be discussed in the following sections.

### **1. Tool Development**

#### ***Literature Search***

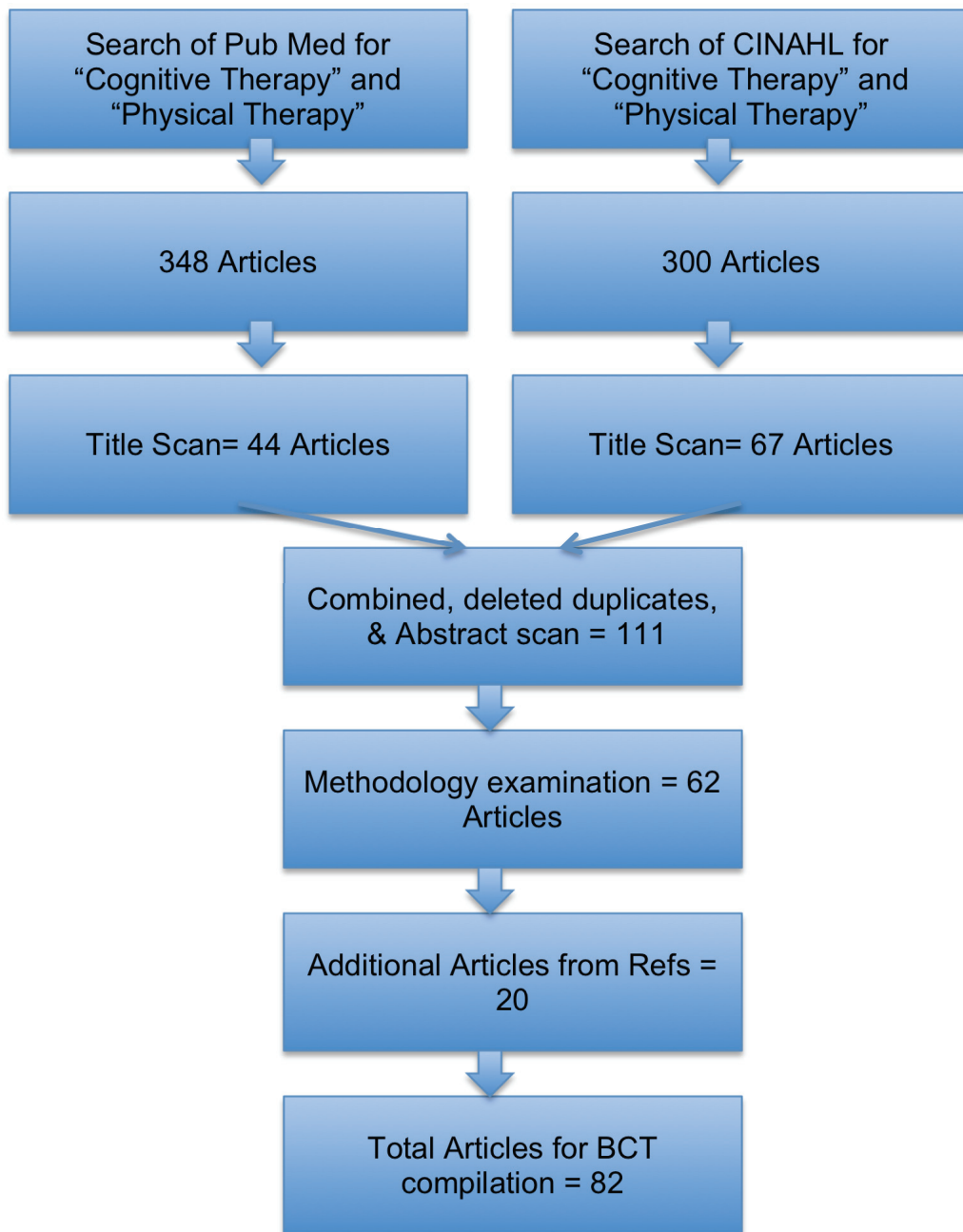
Using the MESH search terms “Cognitive Therapy” and “Physical Therapy”, a total of 348 articles were located in Pub Med. When qualifiers were included to eliminate ongoing disease processes, neurological and cardiovascular conditions,

various treatment processes as well as those studies that concentrated on patients with pre existing addictions or psychological conditions, 109 articles remained. The literature search terms are included in Appendix G.

A title scan further reduced the potential articles to 44 for further analysis.

The initial CINAHL scan was performed using the same major search headings, “Cognitive Therapy” and “Physical Therapy”. From the initial CINAHL scan 300 articles were identified. The additional qualifiers, identified above, were added to the search terms and the new search resulted in 88 articles. After a scan of the titles, 67 articles remained for further analysis. The search terms for the CINAHL search are outlined in Appendix G.

The 44 articles from the Pub Med search were then combined with the 67 CINAHL articles, duplicates were eliminated and an abstract review was performed leaving 111 articles for methodological examination of BCT used by physiotherapists. After examination, 62 articles were found to contain sufficient description of the physiotherapists’ role in the provision of CB approaches to be included within the study. An additional 20 articles were added through reference scanning of the 62 articles. This resulted in a total of 82 articles. The literature review process is outlined in Figure 7.



**FIGURE 7:** LITERATURE SEARCH RESULTS THE LITERATURE SEARCH WAS PERFORMED TO IDENTIFY ARTICLES ON PHYSIOTHERAPIST’S USE OF BCT. A TOTAL OF 82 ARTICLES WERE IDENTIFIED FOR INCLUSION AFTER PERFORMING DUAL SEARCHES IN PUB MED AND CINAHL, AND VERIFYING THE PHYSIOTHERAPIST’S ROLE IN THE PROVISION OF BCT.

### ***Item Generation***

The PT BCT summary database was compiled from the 82 articles identified in the literature review. From the database, 37 BCT were compiled into an initial PT BCT list. This list was then combined with the techniques from Abraham and Michie's BCT checklist for psychologists, which included an additional 26 BCT<sup>1</sup>. This combined PT BCT list, (provided in Appendix I), along with the proposed definitions, was then examined for item reduction.

### ***Item Reduction***

The PI examined the 63 items in the combined PT BCT list, duplicates from the two checklists were eliminated (21) and the remaining BCT were compiled into a master list of potential PT BCT for discussion and further item reduction. The PI and SI met to review the list of proposed PT BCT. In the first meeting the BCT were examined for common themes. After discussion, it was decided that three distinct categories of techniques existed, one that related to behavioural change, one that related to cognitive change and a group of techniques that were more related to accountability and motivation. BCT in each category were then examined to identify techniques that were addressing similar issues.

When BCT appeared to address a similar technique they were grouped together as one BCT. For example, the teaching of biomechanics, training of basic physical skills such as muscle activation, advanced physical skills such as



chaining basic skills and generalization of those skills to function such as picking up a toddler, were grouped under physical skills acquisition. Next, techniques that appeared to duplicate concepts were also collapsed. As an example, *advice to remain active despite an injury* was included under cognitive restructuring. In another example, *diary maintenance* was incorporated under prompting self-monitoring of behaviour, a technique that appeared to be more inclusive. One BCT that did not appear to reflect physiotherapy practice, *prompt self-talk*, was eliminated. Other BCT that were believed to be part of everyday practice such as *education* and *providing general encouragement* were also eliminated. The decision process for this reduction of BCT is incorporated as Appendices I, J, K, and L.

This process continued over several meetings and through emails and then a meeting was arranged with the behavioural expert to discuss the current combined PT BCT list. Discussions concerning the BCT to include, the wording of the definitions and the organization of the list ensued with the PI, SI and behavioural expert. The definitions were modified to more accurately recognize the unique features of physiotherapy within the application of each BCT. Three types of BCT were agreed upon, they included behavioural, cognitive and motivational. The PI then arranged the BCT in order of expected occurrence within each subcategory (behavioural, cognitive and motivational). Through consensus of the PI, SI and behavioural expert it was agreed that the BCT listed accurately represented the BCT identified in the literature and previously

established checklist. From this list of BCT and their corresponding definitions, a *modified* PT BCT checklist and companion document were created and then used for the remaining phases of the research. The checklist is included in Appendix N. Only the final version of the PT BCT companion document is included in the final component of the results. The definitions for the *modified* PT BCT companion document are included within the expert survey (Appendix O).

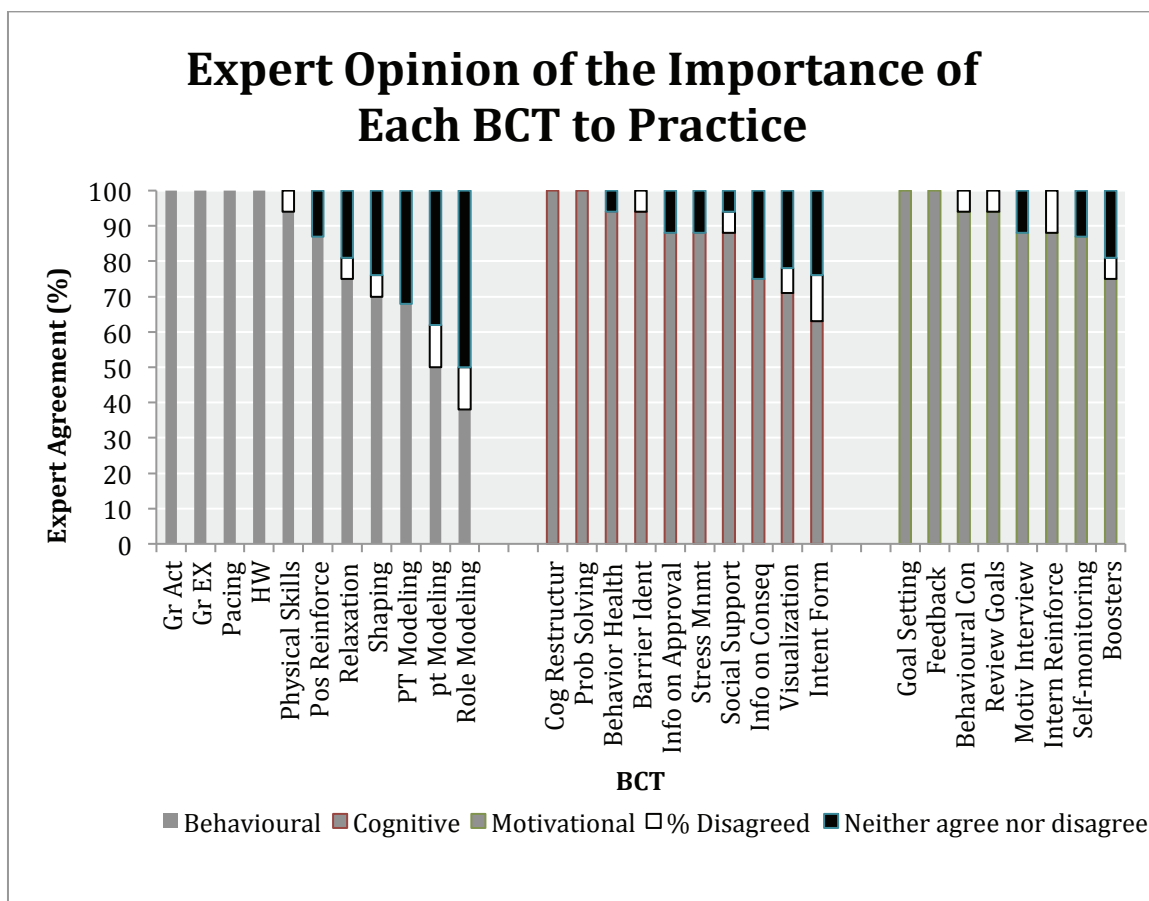
## **2. Expert Opinion**

Using the *modified* PT BCT checklist and companion document, an Opinio™ Survey was created to obtain expert feedback. The survey was sent to 31 experts drawn primarily from the PT BCT database (n=25) and researcher recommendations (n=6). Survey responses were received after all other data collection had been completed and the results were analyzed in parallel with other phases of data analysis.

There were 19 respondents to the survey but only 16 that completed 90% or more of the survey questions, giving the survey a 52% response rate. Of those that did not complete the survey, two completed only the demographics and were therefore dropped from the survey analysis and one partial respondent, completed comments on the first four BCT and the responses given were used in the survey assessment. Analysis of the response was based on the total number of responses for each question; non-responses were not used in the calculation of agreements.

The respondents were: primarily males (10/16; 63%). Their background was: researcher and clinicians (10/16; 63%), researcher (4/16; 25%) or clinician (2/16;12%). Their levels of experience working with cognitive behavioural approaches in physiotherapy ranged from 0-5yrs (2 or 12%), 6-10 years (4 or 25%), 11-15 years (6 or 38%) to 16 or more years (4 or 25%). The partial respondent was a female clinician and researcher, with 6-10 years of experience working with cognitive behavioural therapy approaches in physiotherapy.

The majority of respondents agreed that the BCT listed with definitions were important to the practice of physiotherapy. All BCT received support from greater than 50% of the respondents except for one, *prompting patient role modeling* (38% agreed and 50% neither agreed nor disagreed). For ten BCT there were some respondents who disagreed that they were important to physiotherapy, there was only a maximum of two respondents to two items and the remaining eight had only one disagree response. When examined by type it is noted that experts supported the importance of the full range of behavioural, cognitive and motivational techniques. The results are summarized in Figure 8 and the complete results of the Expert Survey are recorded in Appendix O.



**FIGURE 8:** EXPERT OPINION OF THE IMPORTANCE OF EACH BCT TO PRACTICE. SUMMARY OF THE EXPERT SURVEY RESULTS CATEGORIZED BY BEHAVIOURAL, COGNITIVE AND MOTIVATIONAL TECHNIQUES. THE EXPERT WAS ASKED IF THEY AGREED THAT THE LISTED BCT WAS IMPORTANT TO THE PRACTICE OF PHYSIOTHERAPY. EACH BAR REPRESENTS THE COMBINED PERCENT WHO: (I) AGREED (STRONGLY AGREED + AGREED), (II) DISAGREED AND (III) NEITHER AGREED NOR DISAGREED WITH EACH BCT. (N=16; FOR GR EX, SHAPING, PROB SOLVING AND FEEDBACK N=17; FOR BCT INTENT FORM AND VISUALIZATION N=14), SEE APPENDIX O FOR FULL BCT DESCRIPTION.

### 3. Tool Testing

#### Video And Audio Recording Procedure

All sessions of the November 2010 “Back to Fitness” classes were recorded, with verbal consent, by the PI. For the lectures only video recording (with internal

microphone) was required due to the small size of the room. In the exercise sessions three additional external microphones, all attached to a hand held four-channel digital audio recording device, were added to improve the ability of the observers to hear the conversations of the physiotherapist with the patients. Microphones were set up in three corners of the multipurpose gymnasium. All audio and video recording devices were set up before each session and continued for the duration of the session. Recordings ceased when the class ended.

When tapes were switched, brief interruptions occurred in video recordings, but all classes were recorded. One lecture (16 November) and one Tuesday exercise class (16 November), with the exception of the last 10 minutes, were lost during transfer from digital video format. The Thursday (10 November) session had to be relocated to a larger multipurpose gymnasium and the resulting video and audio files were of insufficient quality for use in this study. The remaining 15 hours of video were transferred to iMac and converted from Mpeg-2 files to Quick Time Player Professional version 7 where the video and audio files were combined for viewing with either Quick Time Player version 10 or iMovie version 8.0.6. These videos with audio were then used in the validation and field-testing portions of the study.

### ***Video Sampling Procedure***

The videos were divided as per the video sampling procedure (Appendix H) into equal segments for studies 1 through 4. The video clips assigned to each study

were randomized and then used sequentially for each study. Viewing of segments for each study continued until the purpose of the studies (validation, consensus training, intra-rater reliability and inter-rater reliability) was achieved.

### ***Validity And Reliability Testing***

Four separate studies are reported here, the training and validation, consensus training, intra rater and inter-rater reliability.

#### **Training And Validation (Study 1)**

##### *Training*

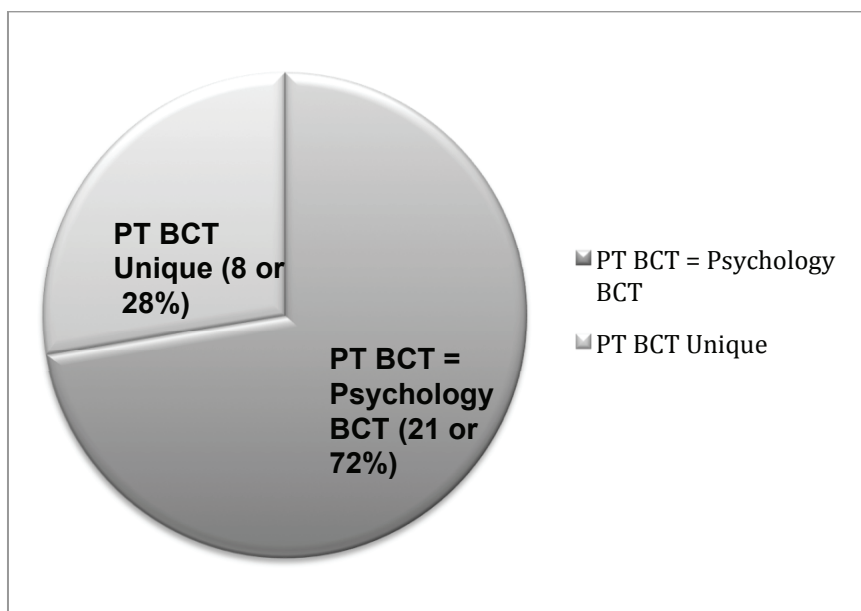
The PI and SI met on two separate occasions with the behavioural expert to view video clips of the “Back to Fitness” class for a total of approximately 4.5 hours. During that time the 24 of the 29 identified BCT were collaboratively observed and discussed.

##### *Validation*

Content and face validity of the modified BCT checklist and their definitions was achieved by four different steps:

1. The harvesting of PT BCT from both the PT literature and the previously established psychology BCT checklist. This is reported elsewhere.
2. The *modified* PT BCT was compared to the BCT checklist for psychologists. It can be seen from Figure 9 and Appendix J that 72% of the techniques from the *modified* PT BCT checklist correspond directly to the techniques listed in Abraham and Michie’s checklist<sup>1</sup>. The remaining 8 BCT are unique

to the *modified* PT BCT checklist and include: providing graded exposure, shaping, relaxation training, pacing, prompting homework, cognitive restructuring, prompting visualization, and facilitating internal reinforcement. An additional three BCT from the psychologist BCT checklist were also considered as part of another technique and incorporated into the relevant BCT from the *modified* PT BCT listed. These three BCT include: time management into *problem solving/ dealing with flare-ups*, teach to use prompts or cues into *prompting homework* and provide instruction under *prompting physical skills acquisition* as listed in Appendix L. When the collapsed BCT are considered, 82% of the psychologist BCT checklist is included in the *modified* PT BCT checklist (24/26 BCT) although only 21 BCT directly overlap. This comparison is explained in more detail with the overlapping BCT (as listed in Appendices I, J, K, L). This degree of overlap between the two BCT checklists strongly supports the content validity of the *modified* PT BCT checklist.



**FIGURE 9:** COMPOSITION OF THE PT BCT CHECKLIST INCLUDING THE NUMBER OF BCT UNIQUE TO THE BCT CHECKLIST AND IN COMMON WITH THE PSYCHOLOGY BCT CHECKLIST.

3. The expert survey demonstrated that the majority supported the importance of each BCT in the *modified* PT BCT checklist and  $\leq 12\%$  disagreed with any single technique in physiotherapy.
  
4. Prior to using the *modified* PT BCT checklist in the field study, the PI and SI went through training and validating sessions with the behavioural expert (MV).

Three video clips (one of each: lecture, Tuesday and Thursday exercise sessions) were viewed to come to a shared understanding of the nomenclature used in the *modified* PT BCT checklist and the BCT demonstrated by the instructing physiotherapists. Consensus was achieved among the PI, SI and behavioural expert after viewing, scoring and discussing the video clips. After the



training period, ten video clips were collaboratively viewed and independently scored using the *modified* PT BCT checklist. Following the viewing of each video clip, the results were discussed. BCT that varied between the raters were presented and the reasoning behind the BCT identification was explained. In an open discussion and consensus format, the BCT definitions were challenged and clarified in relation to the video.

After the completion of the ten video clips over two meetings, the PI, SI and behavioural expert agreed with the identification of all observed BCT (24/29) in accordance with the BCT definitions. Discussions and descriptions of the missing five BCT were reviewed and clarified, they were: setting graded activities or exercises, providing graded exposure, motivational interviewing, seeking agreement to a behavioural contract and providing booster sessions.

The PI and SI continued developing their skills in using the *modified* PT BCT checklist in the following three studies.

### **Consensus Training (Study 2)**

The PI and SI completed three hours of collaborative viewing and rating of video clips of the “Back to Fitness” class using the *modified* PT BCT checklist before each rater felt comfortable identifying each BCT. Throughout this period, definition modification of each BCT continued.

### Intra Rater Reliability (Study 3)

The PI and SI viewed and scored a unique set of 3, 5-minute video segments of the “Back to Fitness” class and reviewed and rescored the same video segments one hour later. Each rater achieved strong levels of intra rater agreement >75% (Portney and Watkins)<sup>117</sup> after the viewing of the first round of three video segments. The average level of agreement for intra rater reliability was 96% for rater 1 while rater 2 was 91%. The level of agreement process for raters 1 and 2, the primary and secondary investigator respectively, is recorded in Table 3.

**TABLE 3:** INTRA-RATER RELIABILITY RESULTS FOR THE PT BCT CHECKLIST FOR THE PI AND SI, RATERS 1 AND 2 RESPECTIVELY.

<b>Rater</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>2</b>
<b>Agreement</b>	Clip 1	Clip 2	Clip 3	Clip 1	Clip 2	Clip 3
<b>% Agreement occurrences</b>	100	73	86	63	78	67
<b>% Agreement non occur</b>	100	86	96	88	91	87
<b>Total % Agree</b>	100	90	97	90	93	90
<b>Average</b>	Rater 1= 96%			Rater 2 = 91%		

### Inter-Rater Reliability (Study 4)

For the inter-rater reliability, two separate observations and scorings of 3, 5-minute videos clips (6 unique video clips) were required to achieve consistent ≥75% levels of agreement. To improve levels of agreement after each round of

three video clips, the PI and SI collaboratively viewed and discussed the previous three video segments to determine where the discrepancies in agreement occurred. Necessary modifications to the definitions continued throughout this process. The level of agreement for each trial is recorded below in Table 4. The average level of agreement for each series of three video clips is 78% for trial 1 and 91% for trial 2.

**TABLE 4:** LEVEL OF AGREEMENT FOR INTER RATER RELIABILITY ARE RECORDED FOR THE VIEWING OF EACH OF THREE SUCCESSIVE VIDEO SEGMENTS. TWO TRIALS WERE REQUIRED TO ACHIEVE A CONSISTENT  $\geq 75\%$  LEVEL OF AGREEMENT.

<b>Trial</b>	1	1	1	2	2	2
<b>Agreement</b>	Clip 1	Clip 2	Clip 3	Clip 5	Clip 6	Clip 7
<b>% Agreement occurrences</b>	50	44	46	71	67	44
<b>% Agreement non occur</b>	78	80	68	92	92	80
<b>Total % Agree</b>	79	83	72	93	97	83
<b>Average</b>	Trial 1 = 78%			Trial 2 = 91%		

#### **4. Field Study**

The field study involved the video observation of the entire set of lectures, Tuesday and Thursday exercise sessions described in studies 5, 6 and 7 respectively.

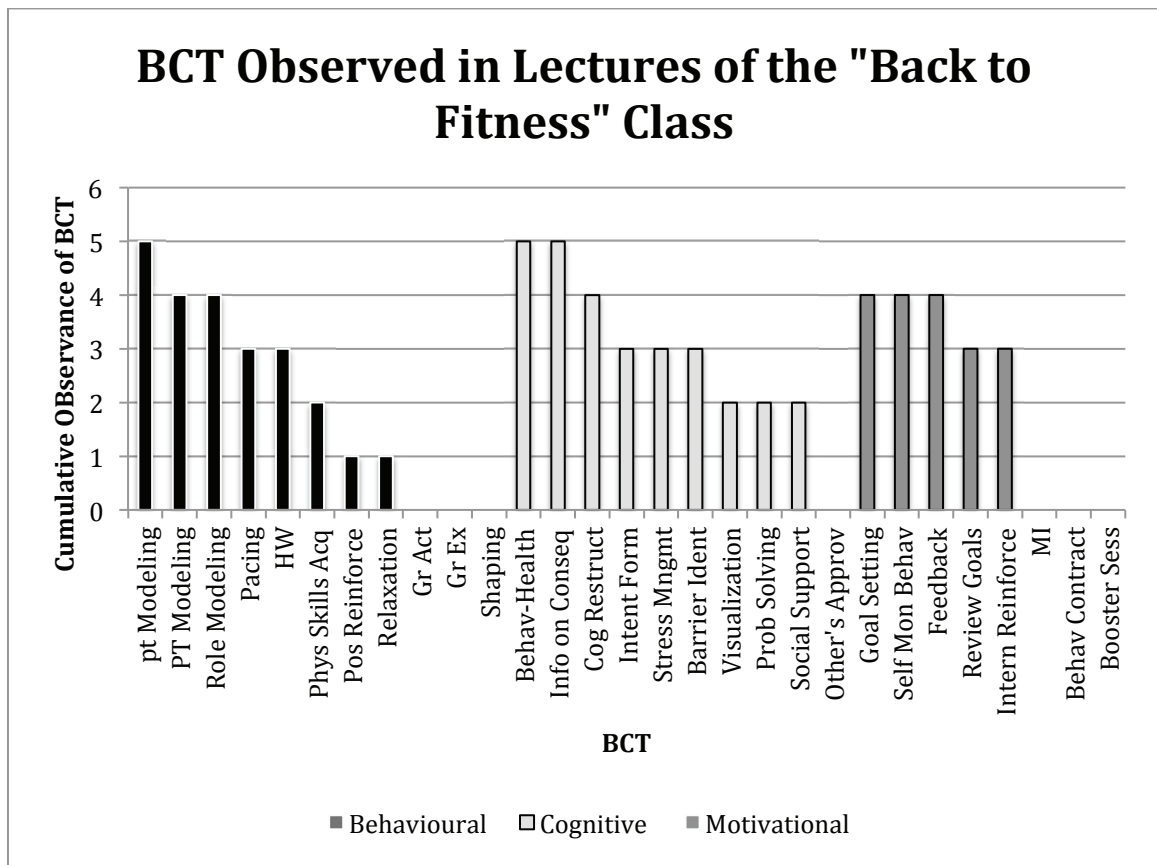
### ***Video Observation***

The PI and SI viewed and scored the entire set of video recordings for the “Back to Fitness” class. This included 2 hours and 40 minutes of lectures, 4 hours and 25 minutes of Tuesday and 6 hours and 24 minutes of Thursday exercise sessions that were viewed and scored for a total of 13 hours and 29 minutes of video recordings. A decision was made to omit the relaxation sessions, on the Thursday exercise sessions, from the field study due to the poor video quality, which resulted from room darkening (approximately 30 minutes of total video). Viewing and scoring of the remaining video took place collaboratively and to simplify the viewing, the videos for each session were divided up into 10-minute blocks of time. Those blocks with less than 7.5 minutes of recording time were cut from the data to give equal samples across the data set. This resulted in 16 blocks for lectures, 24 blocks for Tuesday exercise sessions and 32 blocks for Thursday exercise sessions or a total of 12 hours of video.

Although the video segments were divided and scored in 10-minute blocks of time, the results were reported only on the overall BCT observed in any single session of the “Back to Fitness” class. Once a single BCT was observed in a ten-minute-block, viewing and scoring continued for the observation of new BCT only. This process continued for each ten-minute-block.

The range and type of BCT observed in the “Back to Fitness” class were observed across all three settings; the lecture, Tuesday exercise session and Thursday exercise session and field notes were kept throughout the observation process. Figures 10 through 12 demonstrate the cumulative BCT in each of the three settings across the “Back to Fitness” class in each of the three types of techniques; behavioural, cognitive and motivational.

**Lectures (Study 5)**



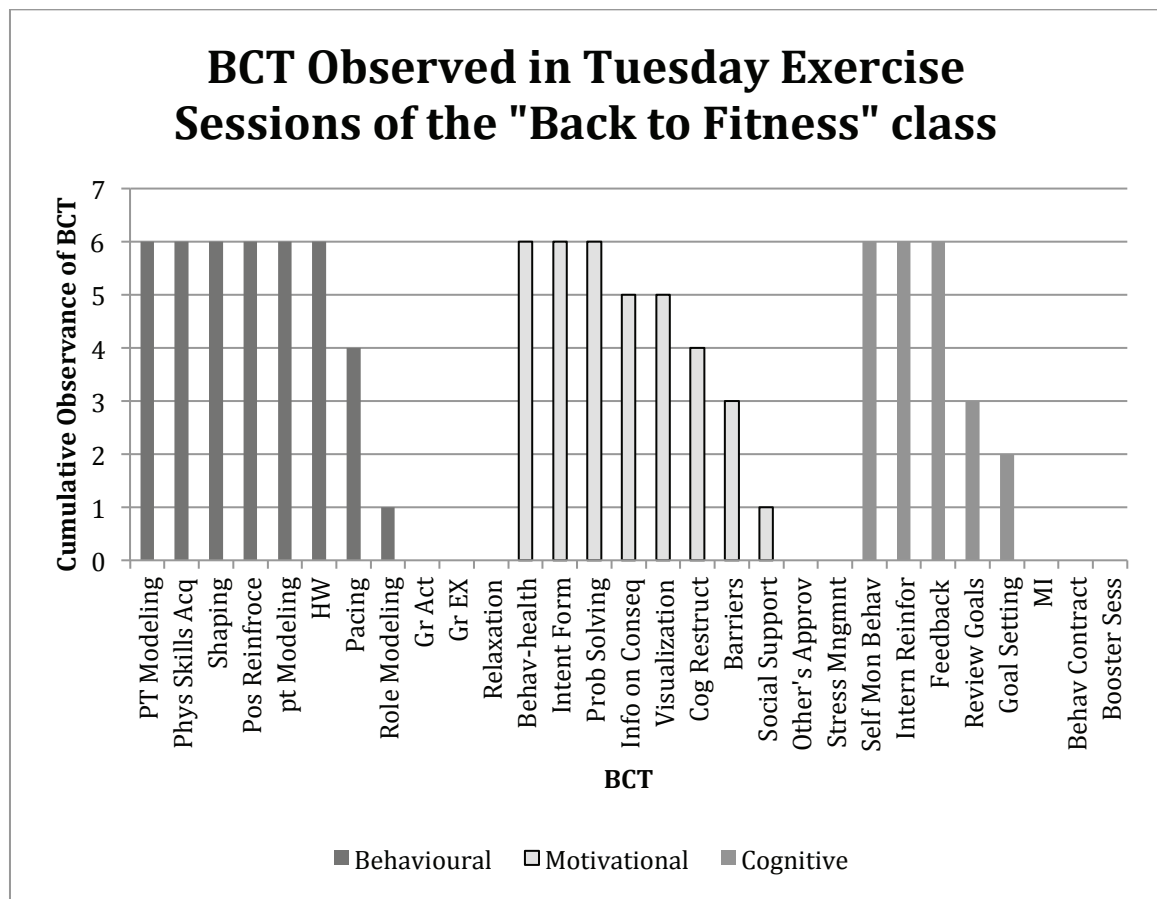
**FIGURE 10:** BCT OBSERVED IN LECTURES OF THE "BACK TO FITNESS" CLASS. ONCE A BCT WAS OBSERVED IT WAS RECORDED AS AN OBSERVANCE WITH A SCORE OF "1" FOR THE PARTICULAR LECTURE AND ANY ADDITIONAL OBSERVANCES WITHIN THE 10-MINUTE BLOCK OF TIME WERE NOT RECORDED. THE CUMULATIVE SCORES INDICATE HOW MANY OF THE LECTURES CONTAINED EACH PARTICULAR BCT (N=5).

A wide range of BCT was observed across the lectures in each of the three types as recorded in Figure 10. In the behavioural domain, three kinds of modeling techniques were observed: *prompting patient modeling* (pt modeling), *physiotherapist modeling* (PT modeling) and *prompting role modeling*. In the cognitive domain educational techniques including: *providing general information on the behaviour-health link* (behave-health), *providing information on consequences* (info on conseq) and *cognitive restructuring* (cog restruct) were observed in most lectures. In the motivational domain, *prompting specific goal setting*, *prompting self-monitoring of behaviour* (self mon behave) and *providing feedback on performance* (feedback) were observed in four out of five of the lectures.

BCT not observed in the lectures were from all three types: *setting graded activities or exercises* (Gr Act), *providing graded exposure* (Gr Ex), and *shaping* were behavioural techniques, *providing information on other's approval* (other's approval) was cognitive, and *motivational interviewing* (MI), *seeking agreement to a behavioural contract* (Behav Contract) and *providing booster sessions* were motivational techniques. Also, *providing positive reinforcement* (pos reinforce) and *relaxation training* (relaxation) each only occurred in one lecture.

## Tuesday Exercise Sessions (Study 6)

A different distribution of BCT was noted for the exercise sessions. For the Tuesday exercise sessions, which focused on individual exercises in a group setting, the results are recorded in Figure 11.



**FIGURE 11:** BCT OBSERVED IN TUESDAY EXERCISE SESSIONS OF THE "BACK TO FITNESS" CLASS IN THE TUESDAY EXERCISE SESSIONS. ONCE A BCT WAS OBSERVED IT WAS RECORDED AS AN OBSERVANCE WITH A SCORE OF "1" FOR THE PARTICULAR EXERCISE SESSION AND ANY ADDITIONAL OBSERVANCES WITHIN THE 10-MINUTE BLOCKS OF TIME WERE NOT RECORDED. THE CUMULATIVE SCORES INDICATE HOW MANY OF THE SESSIONS CONTAINED EACH PARTICULAR BCT (N=6).

As noted in Figure 11, several behavioural BCT were observed in all of the classes including *physiotherapist modeling* (PT modeling), *prompting physical skills acquisition* (phys skills acq), *shaping*, *providing positive reinforcement* (pos reinforce) *prompting patient modeling* (pt modeling) and *prompting homework* (HW). Of the cognitive techniques, the BCT observed in five or more sessions were providing *general information on the behaviour-health link* (behave-health), *prompting intention formation* (intent form), *problem solving/ dealing with flare-ups* (prob solving), *providing information on consequences* (info on conseq) and *prompting visualization*. Of the motivational techniques, *prompting self-monitoring of behaviour* (self mon behave), *facilitating internal reinforcement* (intern reinforce) and *providing feedback on performance* were observed in all six sessions.

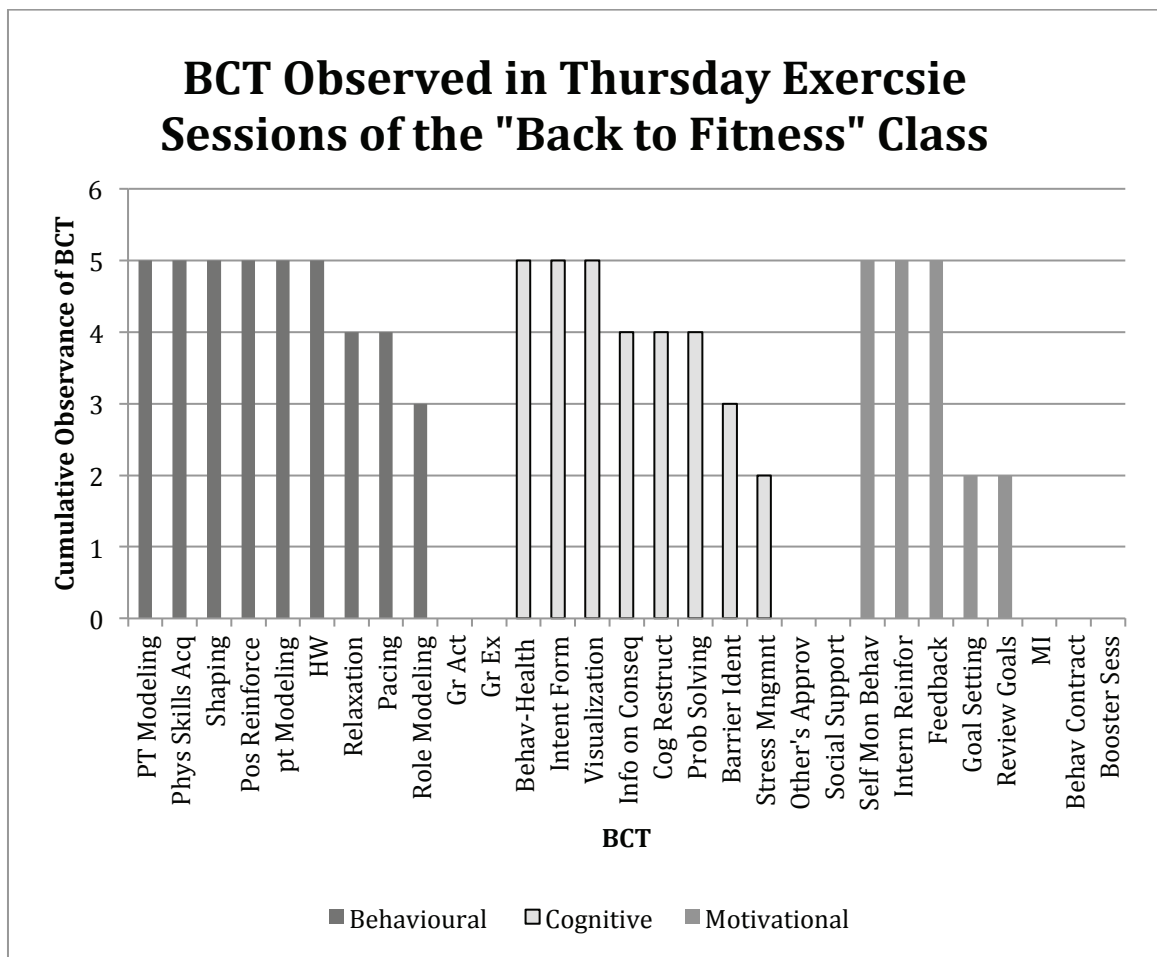
It is noted that *setting graded activities or exercises* (Gr Act), *providing graded exposure* (Gr Ex), and *relaxation training* (relaxation) from the behavioural domain were not observed and *prompting role modeling* (role modeling) was only observed in one Tuesday exercise session. Two cognitive BCT, *providing information on other's approval* (other's approv) and *providing stress management* (stress mngmt), were also not observed and *planning social support* (social support) was only observed in one Tuesday exercise session of the "Back to Fitness" class. Of the motivational type of BCT, *motivational interviewing* (MI), *seeking agreement to a behavioural contract* (behave contract)



and *providing booster sessions* (booster sess) were not observed in the Tuesday exercise sessions.

### Thursday Exercise Sessions (Study 7)

The Thursday exercise sessions, which focused on circuit training, demonstrated a wide range and type of BCT when the five sessions were observed. The results are recorded in Figure 12.



**FIGURE 12:** BCT OBSERVED IN THURSDAY EXERCISE SESSIONS OF THE "BACK TO FITNESS" CLASS. ONCE A BCT WAS OBSERVED IT WAS RECORDED AS AN OBSERVANCE WITH A SCORE OF "1" FOR THE PARTICULAR THURSDAY EXERCISE SESSION AND ANY ADDITIONAL OBSERVANCES WITHIN THE 10-MINUTE BLOCKS OF TIME WERE NOT

RECORDED. THE CUMULATIVE SCORES INDICATE HOW MANY OF THE SESSIONS CONTAINED EACH PARTICULAR BCT (N=5).

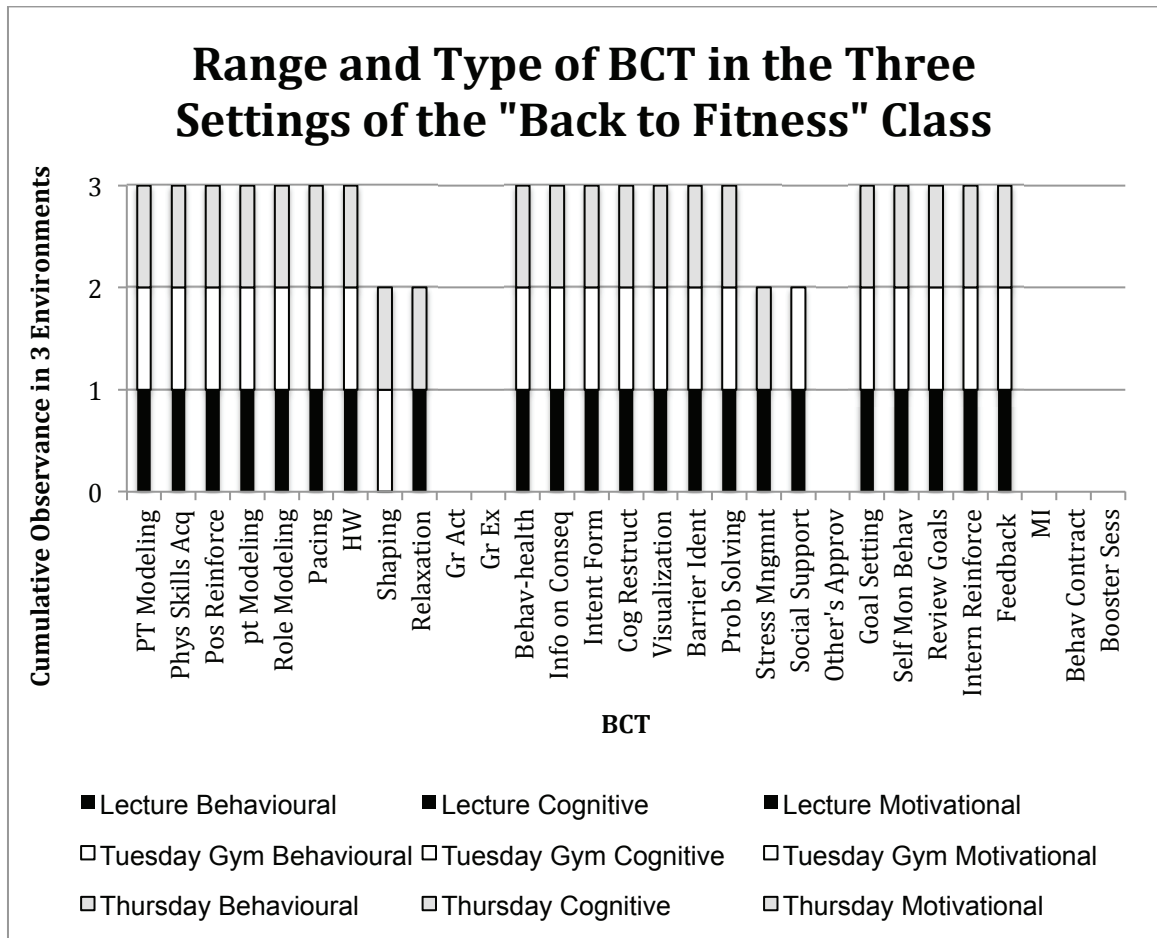
The same six behavioural techniques were observed in all five of the Thursday exercise sessions as were seen in the Tuesday exercise sessions. Two other techniques were also observed in four out of the five sessions, *relaxation training* and *pacing*. Of the cognitive techniques, *providing general information on the behaviour–health link* (behave-health), *prompting intention formation* (intent form) and *prompting visualization* were observed in all five Thursday exercise sessions. Three other BCT of the cognitive type were observed in four out of the five classes: *providing information on consequences* (info on conseq), *cognitive restructuring* (cog restruct) and *problem solving/ dealing with flare-ups* (prob solving). Motivational techniques observed in all of the classes were the same as those in all of the Tuesday exercise sessions: *prompting self-monitoring of behaviour* (self mon behave), *facilitating internal reinforcement* (intern reinforce) and *providing feedback on performance*.

From Figure 12 it can be seen that the behavioural techniques *setting graded activities or exercises* (Gr Act) and *providing graded exposure* (Gr Ex), were not observed in the Thursday exercise sessions. Of the cognitive techniques: *providing information on other’s approval* (other’s approv) and *planning social support* (social support) were not observed. Of the motivational techniques: *motivational interviewing* (MI), *seeking agreement to a behavioural contract* (Behav contract), and *providing booster sessions* (booster sess) were not

observed. The remaining BCT were observed in two or more of the five Thursday classes.

**Range And Type Of BCT In Three Settings**

To answer the research question: “What are the range and type of BCT used in the “Back to Fitness” class?” the results from the three settings (lecture, Tuesday and Thursday exercise classes) were combined. The results, whether or not each BCT occurred in the given session, are displayed by type in Figure 13.



**FIGURE 13:** RANGE AND TYPE OF BCT IN THE THREE SETTINGS OF THE "BACK TO FITNESS" CLASS CUMULATIVE OBSERVANCE OF BCT ACROSS THE THREE SESSIONS (LECTURE, TUESDAY OR THURSDAY EXERCISE CLASS) GROUPED ACCORDING TO TYPE OF

BCT (BEHAVIOURAL, COGNITIVE OR MOTIVATIONAL). THE CUMULATIVE SCORES INDICATE THE NUMBER AND SETTINGS THAT EACH PARTICULAR BCT WAS OBSERVED IN. THOSE OCCURRING IN ALL THREE SETTINGS (LECTURE, TUESDAY AND THURSDAY EXERCISE) HAVE A SCORE OF THREE (N=3).

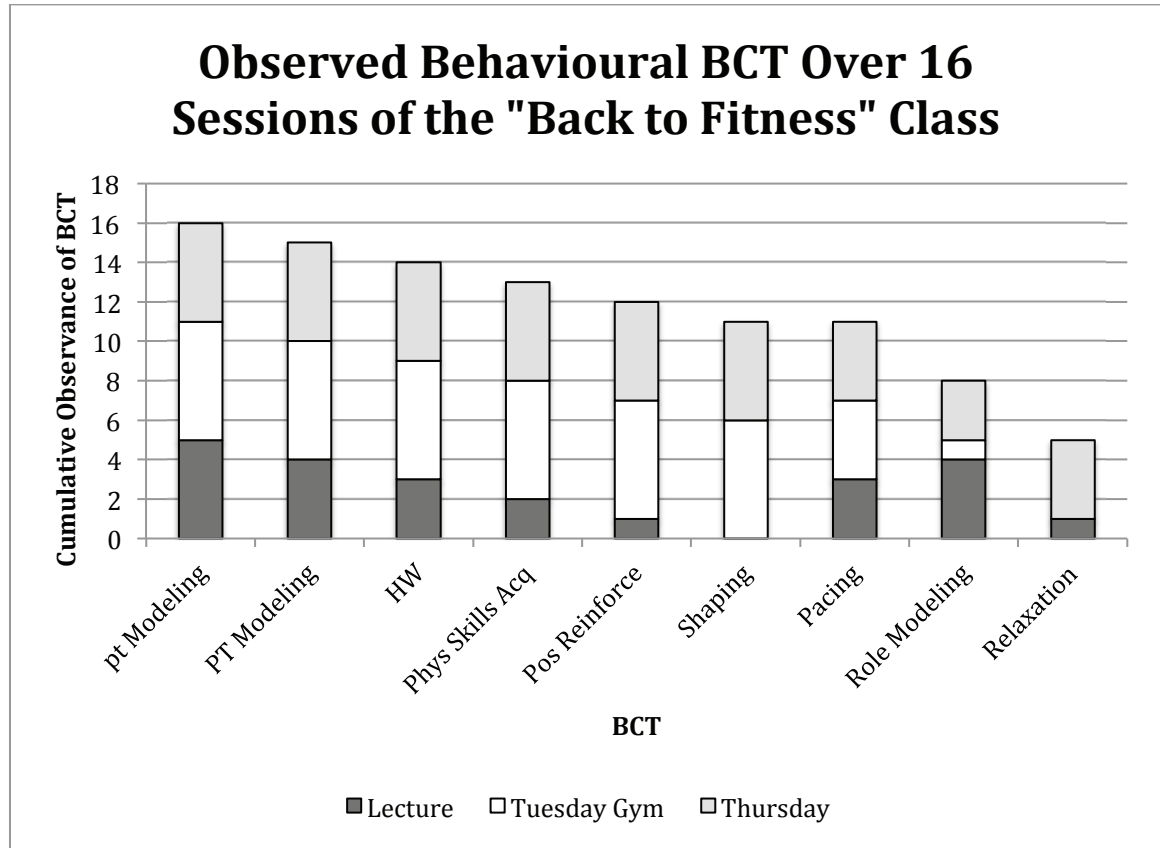
The results in Figure 13 illustrate that a wide range of behavioural techniques were observed in all three sessions. *Shaping* was only noted in Tuesday and Thursday sessions while *relaxation training* only occurred in the lecture and Thursday sessions.

For the cognitive BCT, all except three occurred in all sessions. The exceptions were: *providing stress management* which was observed in only the lecture and Thursday session, *planning social support* which occurred in only the lecture and Tuesday session and *providing information on other's approval* which was not observed at all. All of the motivational techniques that were observed occurred in all three settings of the "Back to Fitness" class. There were only three that did not occur in any of the sessions: *motivational interviewing* (MI), *agreeing to a behavioural contract* (behave contract) and *providing booster sessions* (booster sess).

Next the range and type of the BCT were examined over the 16 sessions (5 lectures, 6 Tuesday and 5 Thursday sessions). In Figures 14 to 16 below are the cumulative observances for each type of BCT, those that were not observed are not graphed.

## Behavioural

Results recorded in Figure 14 reflect the cumulative observance of all behavioural type BCT across the 16 sessions.



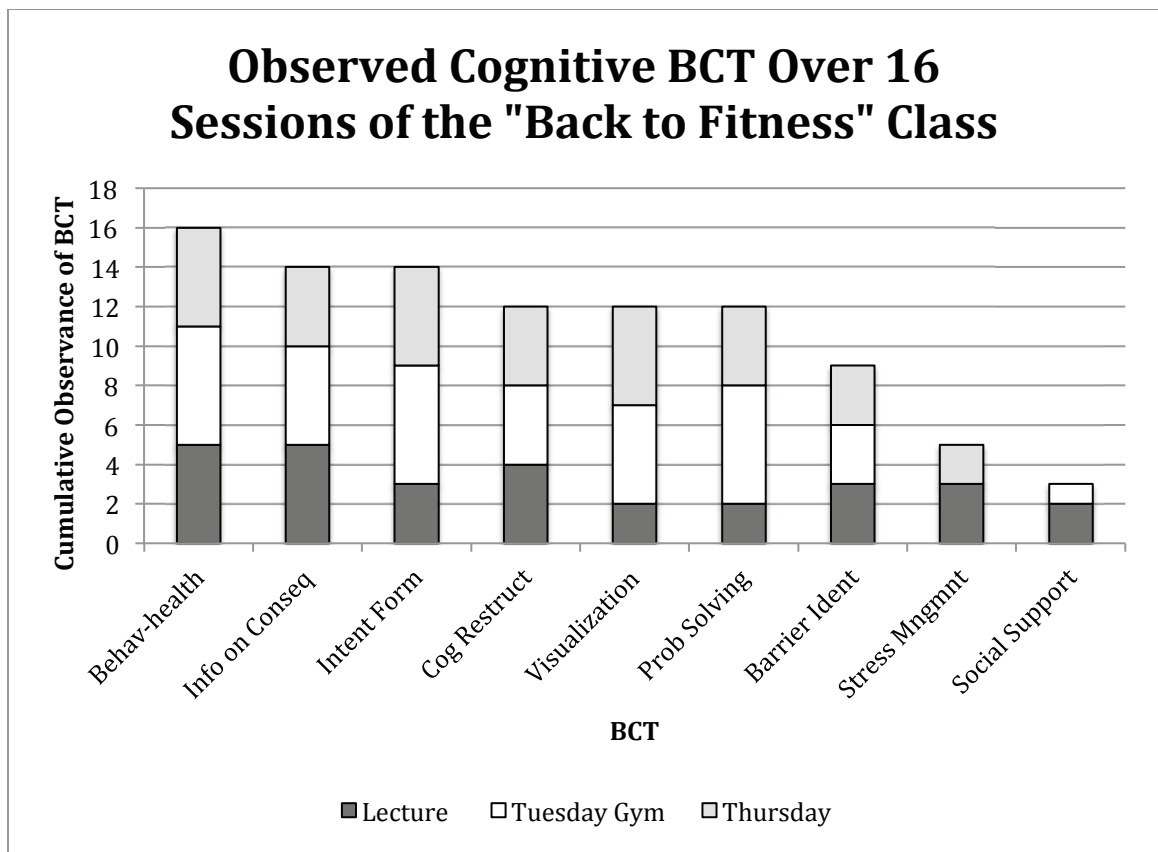
**FIGURE 14:** OBSERVED BEHAVIOURAL BCT OVER 16 SESSIONS OF THE "BACK TO FITNESS" CLASS. THE OBSERVED BEHAVIOURAL BCT ARE DISPLAYED FOR EACH OF THE THREE SETTINGS, LECTURE (5 SESSIONS), TUESDAY (6 SESSIONS) AND THURSDAY EXERCISE (5 SESSIONS) (N=16).

When the behavioural BCT are examined, *prompting patient modeling* (pt modeling) is observed consistently in all settings and sessions. *Physiotherapist modeling* (PT modeling), *prompting homework* (HW), *prompting physical skills acquisition* (phys skills acq), *providing positive reinforcement* and *shaping* occur in all Tuesday and Thursday exercise sessions but their observance in the

lectures is less common, with *shaping* not occurring at all. *Pacing* appeared in three lectures, four Tuesday and four Thursday exercise sessions. *Prompting role modeling* was observed in a greater number of lectures than either the Tuesday (n=1) or Thursday (n=4) exercise sessions. Relaxation was only observed in one lecture and four Thursday exercise sessions.

### Cognitive

Figure 15 presents the range of cognitive BCT that were observed across all 16 sessions, lectures (n=5), Tuesday (n=6), and Thursday (n=5).

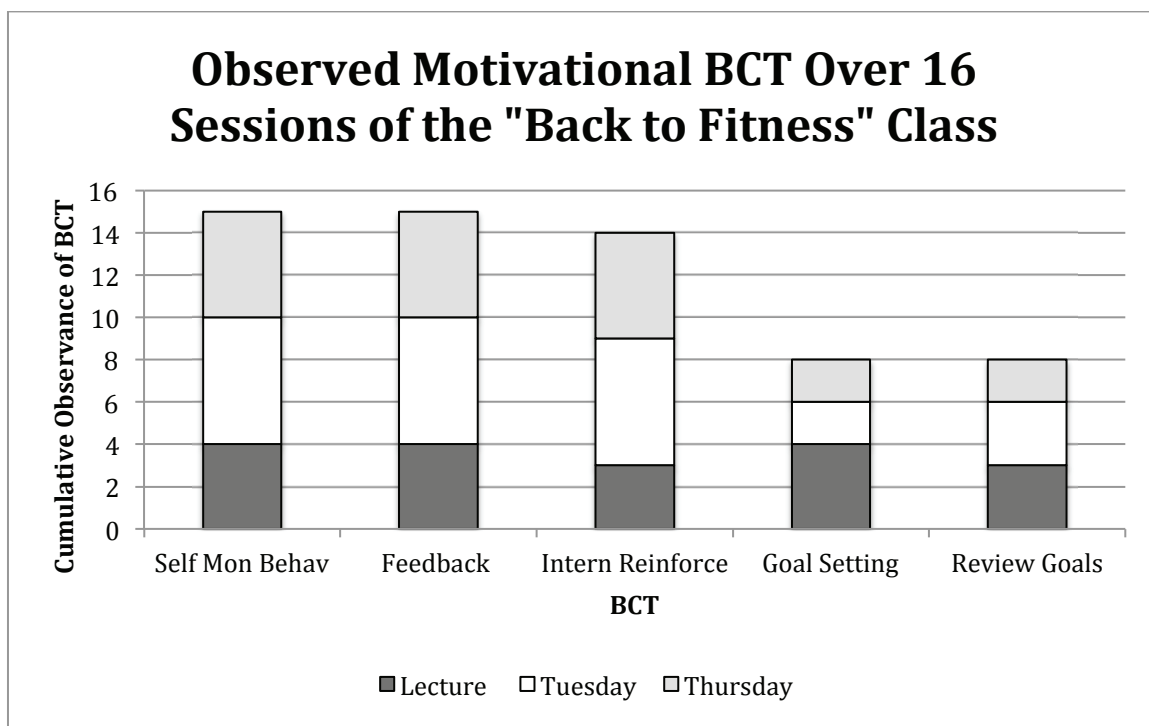


**FIGURE 15:** OBSERVED COGNITIVE BCT OVER 16 SESSIONS OF THE "BACK TO FITNESS" CLASS FROM EACH OF THE THREE SETTINGS, LECTURE (5 SESSIONS), TUESDAY (6 SESSIONS) AND THURSDAY EXERCISE (5 SESSIONS) (N=16).

When the cognitive BCT are examined it is noted that *providing general information on the behaviour-health link* (behav-health) was observed in all 16 sessions. The BCT, *providing information on consequences* (Info on Conseq) was observed in all lectures, 5 of the Tuesday exercise sessions and 4 of the Thursday exercise sessions. *Prompting intention formation* (intent form) was observed in all of the Tuesday and Thursday exercise sessions but noted in only three of the lectures. *Cognitive restructuring* (cog restruct) was observed equally in each session type. *Prompting visualization* was observed in only two lectures and 5 each of the Tuesday and Thursday exercise sessions. *Problem solving/ dealing with flare-ups* was observed in two of the lectures, all of the Tuesday sessions and 4 of the Thursday exercise sessions. *Prompting barrier identification* was observed in three sessions for each setting. *Providing stress management* was observed in 3 lectures and 2 Thursday sessions. *Planning social support* (social support) was observed in two lectures and one Tuesday exercise session.

### **Motivational**

Figure 16 provides the results for the motivational BCT over the 16 sessions.



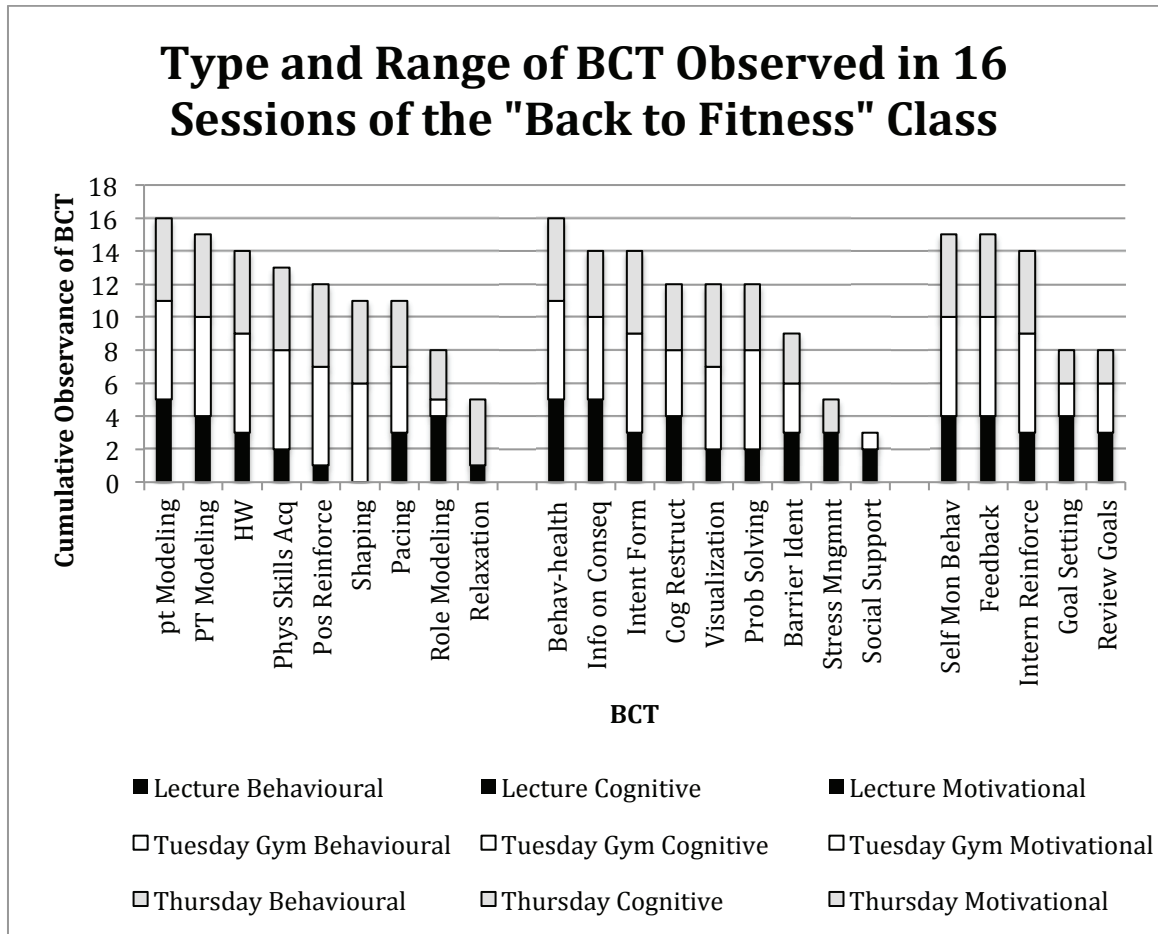
**FIGURE 16:** OBSERVED MOTIVATIONAL BCT OVER 16 SESSIONS OF THE "BACK TO FITNESS" CLASS FROM EACH OF THE THREE SETTINGS, LECTURE (5 SESSIONS), TUESDAY (6 SESSIONS) AND THURSDAY EXERCISE (5 SESSIONS) (N=16).

A total of five BCT were observed from the motivational category. Of these, *prompting self-monitoring of behaviour* (self mon behave) and *providing feedback on performance* (feedback) both were observed in 15 sessions (four lectures, and all of the Tuesday and Thursday exercise sessions). *Facilitating internal reinforcement* (intern reinforce) was also observed in all of the Tuesday and Thursday sessions but only three of the lectures. The remaining two BCT, *prompting specific goal setting* (goal setting) and *prompting a review of behavioural goals* (review goals) were both observed in eight sessions, two of which were Thursday sessions, but in different levels in the lectures and Tuesday exercise sessions.



## Cumulative Observance Across All Settings

The three types of BCT (from Figures 14 – 16) are combined in Figure 17 for visual comparison.



**FIGURE 17:** TYPE AND RANGE OF BCT OBSERVED IN 16 SESSIONS OF THE "BACK TO FITNESS" CLASS CUMULATIVE OBSERVANCE OF BCT FOR ALL SESSIONS (5 LECTURES, 6 TUESDAY AND 5 THURSDAY EXERCISE SESSIONS) OVER THE SIX WEEKS. AN OBSERVANCE OF A BCT AT ANY TIME IN A GIVEN SESSION WAS RECORDED AS AN OBSERVANCE WITH A SCORE OF "1" FOR THE PARTICULAR SESSION. ADDITIONAL OBSERVANCES FOR THE SAME BCT WITHIN A SESSION WERE NOT RECORDED. THE CUMULATIVE SCORES INDICATE THE TOTAL NUMBER OF SESSIONS IN WHICH EACH PARTICULAR BCT WAS OBSERVED ONCE WITH THE MAXIMUM SCORE OF 16. NON-OCCURRENCES ARE NOT GRAPHED (N=16).

As indicated in Figure 17, there was a broad range of techniques used across all sessions and settings in all three types of techniques. Specifically, there were 20 of the 29 BCT that were observed  $\geq 50\%$  of the sessions. It is also noted that there are a few techniques in each type that were more commonly observed, appearing in 14 or more of the sessions: *physiotherapist modeling* and *prompting patient modeling* along with *prompting homework* in the behavioural type; *providing general information on the behaviour-health link*, *providing information on consequences* and *prompting intention formation* in the cognitive type; and *prompting self-monitoring of behaviour*, *providing feedback on performance* and *facilitating internal reinforcement* in the motivational type.

### ***Final Component***

Throughout this study of the *modified* PT BCT checklist was changed continuously. The final version is presented in Table 5 and its companion document is presented in Appendix Q. The *final* PT BCT checklist is composed of the same 29 BCT and the definitions reflect the results of this study.

**TABLE 5: FINAL PT BCT CHECKLIST AS RECOMMENDED AFTER COMPLETION OF ALL PHASES OF THE STUDY.**

#	BCT name	O	Comment
	<b>Behavioural</b>		
1	Setting graded activities or exercises		
2	Physiotherapist modeling		
3	Prompting physical skills acquisition		
4	Providing graded exposure		
5	Shaping		
6	Providing positive reinforcement		
7	Prompting patient modeling/ social comparison		
8	Role modeling		
9	Relaxation training		
10	Pacing		
11	Prompting homework		
	<b>Cognitive</b>		
12	Providing general information on behaviour-health link		
13	Providing information on consequences		
14	Providing information on other's approval		
15	Prompting intention formation		
16	Cognitive restructuring		
17	Prompting visualization		
18	Providing stress management		
19	Prompting barrier identification		
20	Problem solving/ maintenance /dealing with flare ups		
21	Planning social support		
	<b>Motivational</b>		
22	Motivational interviewing		
23	Prompting specific goal setting		
24	Seeking agreement to a behavioural contract		
25	Prompting self-monitoring of behaviour		
26	Prompting review of behavioural goals		
27	Facilitating internal reinforcement		
28	Providing feedback on performance		
29	Providing booster sessions		

In the *final* PT BCT checklist, 72% (21/ 29) of the BCT come directly from the BCT checklist for psychologists<sup>1</sup>. The remaining eight techniques (29%) are unique to the PT BCT checklist. The techniques unique to the PT BCT checklist are: *providing graded exposure, shaping, relaxation training, pacing, prompting homework, cognitive restructuring, prompting visualization, and facilitating internal reinforcement*. Three BCT from the psychology checklist are represented in some techniques but named differently in the PT BCT checklist. The techniques from Abraham and Michie's checklist for psychologists<sup>1</sup> that are not included are: provide general encouragement and prompt self-talk.

## Chapter 5 Discussion

Physiotherapists work to help rehabilitate patients from injury. One aspect of that rehabilitation along with the physical treatment of the impairment or disability is the requirement for patients to modify behaviours that may lead to recurrence or prolong their injury. Physiotherapist-led CB approaches are being explored for effectiveness in various settings and with a variety of populations<sup>18, 20, 23, 24, 89, 118, 119</sup>. However, this area of research is at such an early stage that at this point, there is no consistent means of describing how physiotherapists encourage behaviour change in patients. Furthermore, problems in the methods used such as: the variability of the study populations and outcome measures; the lack of standardization in nomenclature and the inconsistent characterization of programs being studied challenge the ability to make direct comparisons among studies of CB programs or with other forms of treatment<sup>18-21, 23, 102</sup>.

This is the first known study to observe lecture and exercise sessions in physiotherapy practice for the use of BCT and the first study that has addressed the need for a common behavioural change technique nomenclature for physiotherapy. This study began with the creation of a checklist of behavioural change techniques (with definitions) likely to be observed in the field study. The checklist was developed from a similar one used in psychology clinical research<sup>1</sup> as well as a comprehensive literature review. It was then evaluated for validity and reliability, and used to observe an example of a physiotherapy-led combined CB and exercise program. The “Back to Fitness” class (with lectures, Tuesday

and Thursday exercise settings) was observed and the physiotherapist instructing the program was found to have used 24 separate BCT with the patients who were military members with CNSLBP. It was also noted that these observed BCT encompassed three types of change techniques: behavioural, cognitive and motivational. The nomenclature developed and tested in this study will contribute to this emerging field of study. A standard nomenclature is necessary for treatment comparisons, competency development and treatment replication and is an important foundational step for understanding and the use of a behaviour change approach in physiotherapy.

#### **STUDY PARTICIPANTS**

Two physiotherapists experienced in the application of CB approaches to chronic pain instructed the “Back to Fitness” class. The CFB Halifax Physiotherapy Team Leader considered both physiotherapists specialists in CB approaches. This level of experience may not be common within the physiotherapy profession so it is recognized that the findings of this study may not be typical of physiotherapists in orthopedic settings, although they may be more typical of physiotherapists that work with a chronic pain population. As stated, there is a paucity of research on the use of BCT in the physiotherapy literature so direct comparisons cannot be drawn.

The patients that participated in the “Back to Fitness” class had, on average, low levels of pain, moderate disability and high fear of movement, were primarily

male military members and half were on modified duties during the class (Table 2).

## **STUDY DESIGN OUTCOMES**

The four phases that led to answering the research question involved the expert input from the PI and SI, both physiotherapists, a behavioural expert and input from a wide range of clinical and research experts (Figure 6). This diversity of experts greatly assisted the tool development and validation portion of the study. The diversity of the input into this tool and the associated nomenclature should assist with the interpretation and the confidence of the results obtained.

### ***1. Tool Development***

This study resulted in a new tool, the PT-BCT checklist and corresponding nomenclature that can be used to study CB approaches in physiotherapy. The development process used in this study parallels the development of the rather recent creation of a psychology nomenclature and BCT checklist for psychologists<sup>1</sup>. It started with a comprehensive examination of the physiotherapy literature, used BCT from the psychology checklist and then through an iterative, discussion-based process, the PT-BCT checklist was created, tested for reliability and was also considered by clinical and research experts. In the process, a deeper understanding of the physiotherapist's role in behavioural change has emerged. In particular, in the terms that are used to describe what happens when a physiotherapist attempts to stimulate someone to consider and then act on his or her decision to change his or her behaviour. It was also interesting to

learn that there is a considerable overlap between the techniques used by physiotherapists and those by psychologists. Some of these aspects of the development of the tool will now be discussed.

A broad range of literature was examined, the search resulted in a comprehensive range of sources (Figure 7) including: experimental studies of physiotherapy practice, interdisciplinary and multidisciplinary programs where physiotherapist applied BCT use could be clearly defined, reviews of physiotherapy-led approaches, and surveys of physiotherapy practice. The inclusion of chronic, sub acute and acute MSK conditions also served to make the resulting PT BCT nomenclature and checklist possibly relevant to a broader range of practice settings and patient populations. This inclusive strategy was intended to create a more robust and applicable tool for physiotherapy practice.

The combination of the BCT derived from a comprehensive literature search and techniques from the only other existing BCT checklist, from the psychology literature<sup>1</sup>, maximized the inclusive nature of the modified PT BCT checklist. The incorporation of these two groups of BCT allowed commonalities between the practices to be identified. It has been suggested that BCT use in the practice of CB approaches may be underreported in psychology literature<sup>1</sup>, given the findings in this study, this also likely applies to physiotherapy practice where a comprehensive understanding of behaviour change may be lacking.



Tool development for the *modified* PT BCT checklist initially followed a structured process. In contrast, the shaping of the checklist was an iterative, and in many ways a more creative and unscripted process. This iterative process involved discussions between the PI, SI and the behavioural expert to ensure concepts were inclusive and reflective of both physiotherapy practice and behavioural change theory. It also revealed the overlapping scope of practice between physiotherapy and psychology in regards to techniques used in behaviour change.

At the end of the decision process, a final PT-BCT checklist was created that had 29 items. From an initial list of 63 (Appendix I), sixteen items from the physiotherapy literature were found to duplicate those in the psychology BCT checklist (see Appendix J). The research team decided to change the wording for some items to reflect physiotherapy language (six techniques, see Appendix M) and for other items it was decided that the psychology language was better suited. An additional five items not identified in the physiotherapy literature were added from the psychology checklist (see Appendix K). There were also eight BCT included in the checklist that were drawn directly from the physiotherapy literature. The techniques were: *providing graded exposure*<sup>24, 120-122</sup>, *shaping*<sup>2, 21, 88, 121, 123</sup>, *relaxation training*<sup>123-126</sup>, *pacing*<sup>22, 98, 102, 119</sup>, *prompting homework*<sup>88, 90, 123, 127</sup>, *cognitive restructuring*<sup>18, 124, 126, 128, 129</sup>, *prompting visualization*<sup>110, 112, 125</sup>, and *facilitating internal reinforcement*<sup>24, 98, 112, 130</sup>. The first five techniques are all of the behavioural type and common to physiotherapy practice while the second

two are cognitive and the final one is a motivational type (definitions are listed in Appendix O). For three BCT from the psychology checklist, it was decided that the technique they represented was also incorporated in the PT BCT. These were: 'providing instruction' which was considered as *prompting physical skills acquisition*, 'teach to use prompts and cues' which was considered as *prompting homework*, and 'time management' which was considered as *problem solving/ dealing with flare-ups* (Appendix L). Also, two techniques from the psychology checklist were omitted, 'provide general encouragement' and 'prompt self-talk' (Appendix L). Neither of these techniques was reflected in the physiotherapy literature and in the opinion of the PI and SI, 'provide general encouragement to patients' is an example of good practice and emphasized in all aspects of care, not just behaviour change. The psychology technique 'prompt self-talk', was excluded because it isn't generally encountered in physiotherapy practice. The final results were a modified PT BCT checklist with a surprising 72% (21 techniques) (Figure 9) of its BCT overlapping with the established psychology BCT checklist and a similar number of BCT within each checklist (26 psychology BCT checklist and 29 PT BCT in the checklist).

The results of this exercise illustrate that the behavioural change techniques used in the practice of physiotherapy are very similar to that of psychology in language and approach, and yet there are professionally distinct aspects as well.

This overlap allows for a strong grounding of the identified PT BCT in psychology literature. This is critical not only for validation considerations of the checklist but

also for the identification of areas of potential professional practice overlap. There is a considerable overlap in BCT use across physiotherapy and psychology practice boundaries in the application of CB approaches despite the differences in practice and training, which could suggest a greater role for physiotherapists in the application of CB approaches.

### ***Terminology***

As items were selected and discussed the specific wording for each BCT was of particular interest. In particular, the term 'prompt' was found throughout the psychology BCT checklist but was absent from the physiotherapy literature. Another term that was also used in the development of the modified PT BCT checklist was 'facilitating'. Both words relate to very different roles in behaviour change performed by the physiotherapist that require examination.

### **Prompting**

Prompting describes the action, by the treating therapist, to have the patient think about and implement an action or behaviour <sup>1</sup>. This is very different than *telling* the patient, "instructing" the patient or "asking" the patient. Prompting is a unique skill that is related to intention. By prompting a patient, the physiotherapist is triggering a process in the patient towards gaining control over their decisions and actions, stimulating the patient to consider and decide on a course of action for themselves. In the final PT BCT checklist, 9 of the 29 BCT are described with the action, 'prompting'.

Techniques that used prompt ranked highly in the “Back to Fitness” class, which is aimed at encouraging self-management. For the patient to be able to self-manage they must learn to think and interpret for themselves. When prompting, a physiotherapist encourages the patient to consider the situation, evaluate and take action. This does not mean that the patient cannot consult an expert, a friend, or a colleague; rather, it encourages the individual to take leadership in his or her own care. This understanding of the concept of prompting and the desire to create a common language therefore led to its incorporation throughout the modified PT BCT checklist.

### **Facilitating**

Facilitating is a word that was found in the physiotherapy literature and is understood as being distinct from “prompting” (patient guided) and “instructing” patients (therapist guided) to perform. The BCT *facilitating internal reinforcement* involved the physiotherapist working with a patient to decide a course of action while enhancing their self-efficacy. As an example, the physiotherapist would directly highlight an individual’s accomplishments to let them know that they were in control of their pain and that what they were doing was correct, the exercise was working and they had the ability. The patient would then be encouraged to later recount that improvement or ability to confirm that they could perform a specific behaviour. In this way the therapist facilitated the patient’s ability to

internally reinforce their capability. The result is a combination of physiotherapist guidance with patient recognition of their ability and taking ownership of it.

The modified PT BCT checklist is a compilation of techniques and terms from both the physiotherapy and psychology literature. Specific examination and discussion of terms and definitions were intended to produce a robust and adaptable nomenclature and tool to help improve the understanding of physiotherapists' application of techniques for the purpose of encouraging behaviour change. Despite the close attention to the wording and the attempt to be inclusive, it is expected that this proposed nomenclature is only a beginning. It is hoped that this tool and this initial classification of BCT may inspire increased attention to the development of a nomenclature and a consistent means of discussing the practice of behaviour change within the profession of physiotherapy.

## ***2. Expert Opinion***

Another part of the validation process of the modified PT BCT checklist was through the expert survey. These clinicians and researchers were selected from the initial literature review conducted at the beginning of this project. They were asked to consider the importance of each BCT in physiotherapy in the context of treating patients with CNSLBP with modifiable psychological risk factors. There was strong support for the majority of BCT and only one BCT received less than

50% support (*prompting role modeling*) (Figure 8). This strong support for the BCT in the modified PT BCT checklist adds to the content validity of the checklist.

### **3. Tool Testing**

Extensive video footage was obtained for analysis within all three settings of the “Back to Fitness” class. The use of video observation as compared to live observation had advantages and disadvantages. The advantages of using video clips in this study were the ability to discuss findings throughout the observation process and the ability to replay sections of the video clips when conflicts in scoring occurred, allowing the chance to improve validity and reliability testing. Additionally, although the process of video taping the patients was intrusive, it may have been less intrusive than the appearance of two raters observing all sessions of the “Back to Fitness” class. Also, in a military setting it is not uncommon to video tape training sessions and video recording has been used previously to examine classes within the CFB Halifax physiotherapy section so some patients may have more easily accepted this type of intrusion. In viewing the videos for analysis it was noted that, on occasion, patients did note the presence of the video recorder but in most cases it was because they had inadvertently walked in front of the camera. The disadvantages of using a video recording include reactivity. Participants may not have initially behaved normally knowing that they were being videotaped. However in viewing the videos this reactivity was not noted and indeed it may have been less than having two

observers present. Other limitations of using video recording as compared to live observation include: poor audio and video quality, data lost in transferring from one format to another, when tapes were switched, or when the room was periodically darkened in the case of relaxation training. Overall, the benefits for using video recording outweighed the disadvantages. This is supported by other studies that have successfully used video analysis with checklists in the examination of clinical practice<sup>131, 132</sup> to identify practice trends.

The four phases of the tool testing involved video clips from across the six weeks and all three settings. This allowed the PI, SI and behavioural expert exposure to the widest possible range and type of techniques for each study.

### ***Validity And Reliability Testing***

Prior to using the checklist in the field study, it was essential that the PI, SI and behavioural expert establish a shared understanding and proper use of the language used in the checklist and how it related to the observation of physiotherapy practice. The initial training was collaborative and consensus based.

On viewing the video clips, 24/29 BCT were identified. This confirmed, in the presence of the behavioural expert, that the techniques being viewed were behavioural change techniques and allowed for any definition modification prior to the field study.

An important aspect of the tool testing portions of this study was the time spent training. Although several hours were used for consensus training between the PI and the SI, considerable training had also been experienced throughout the development of the tool. The fact that the training was performed on video clips from the classes used for the field study may have artificially increased the observations of BCT. In future studies, training of raters is extremely important and likely should occur using a variety of materials.

The reliability testing with the two observers illustrated that, with training, the tool could be used reliably between and within raters to observe and identify the use of BCT within a physiotherapy-led CB approach (Tables 3 and 4). There is however some caution recommended in the use of this tool based on the results of the reliability testing. The use of Portney and Watkins' <sup>117</sup> analysis of total levels of agreement does not take into account the occurrence of chance agreements and therefore alternative testing using a kappa score may more accurately reflect chance agreements. Additionally with low numbers of observances, it would take only one or two disagreements on the observance of BCT to decrease the reliability of the agreement of observances using this method of reliability analysis. On occasion the reliability of agreement of occurrences was not strong. This suggests that there may have been poor reliability with certain BCT despite the overall total levels of agreement being strong. It is therefore recommended that future applications with this tool take



this information into consideration and examine the reliability of individual BCT, also accounting for chance agreements.

As a result of this study however, this tool, with training, may be used for one of several purposes: in research it may be employed to monitor physiotherapy practice to determine adherence; to characterize practices to enable the development of training guidelines or to reproduce successfully designed and implemented clinical programs in other environments or settings. The PT-BCT checklist provides a vocabulary with definitions based in the treatment of chronic pain, but might be applicable to other conditions and settings.

#### ***4. Field Study***

The results from the field study suggest that BCT are commonly used in all sessions and settings of the “Back to Fitness” class. Many of the BCT observed reflect well-known facets of physiotherapy practice and Psychomotor Learning Theory<sup>79</sup>, these techniques are: pacing, prompting homework, physical skills acquisition, positive reinforcement, relaxation, stress management, barrier identification, visualization, self-monitoring, goal setting, providing feedback on performance and promoting review of behavioural goals, and will only be briefly discussed. Those BCT that were observed in each setting and that are less well described within the physiotherapy literature will be explored by setting and technique type. These are: the three types of modeling (behavioural), prompting intention formation (cognitive) and facilitating internal reinforcement

(motivational). There were some BCT not observed in any setting, and they will be discussed together.

### ***Lectures***

It might be expected that in the “Back to Fitness” lectures one would observe BCT that were predominantly cognitive, specifically the educational type of BCT, with perhaps the inclusion of some motivational techniques. This is not only due to the environment, but also in the context of Psychomotor Learning Theory that describes the need for the patient to develop necessary knowledge prior to initiating movement<sup>79</sup>. However, a wide range of all BCT including behavioural techniques was observed during the lectures (Figure 10).

Eight behavioural BCT were noted in the lecture session (Figures 10, 14). In some cases the behavioural technique scored was the education component of that technique, such as explaining the biomechanics of movement which is the first step in *prompting physical skills acquisition*<sup>79</sup>, the importance of relaxation and breathing to the overall health of an individual which needs to be understood prior to initiating *relaxation training* or the benefits and role of *pacing* which is required to fully understand the technique. Homework was prompted as it related to achieving goals, improving fitness and long-term maintenance of behaviour change. *Positive reinforcement* in the lecture setting often accompanied *prompting patient modeling* where a patient’s description of an activity, or goal achievement was individually reinforced in front of the class. Three other

techniques: *prompting patient modeling, physiotherapist modeling and prompting role modeling*, which were observed in almost the same number of sessions as the educational techniques was an unexpected finding. These various forms of modeling will be discussed in more detail.

Interestingly, the three behavioural techniques most consistently observed in this setting were all forms of modeling (Figure 10). Modeling is described in the psychology literature<sup>100, 133</sup>, Psychomotor Learning Theory<sup>79</sup> and Social Cognitive Theory (SCT)<sup>81, 82</sup>. Modeling is referred to as an “observational learning” technique, where knowledge is gained by an individual while watching a task being performed by another<sup>84</sup>. Despite the presence of this technique throughout the theoretical literature, there were only a few descriptions noted in the examined physiotherapy practice literature<sup>2, 97, 119, 134, 135</sup> and the phenomenon is not well described. Because of the paucity of this technique in the relevant literature, the recurrent observation of modeling was not anticipated in this study.

Although modeling was commonly observed in the lectures, it was not the physical modeling or “observational learning” as described above<sup>84, 97, 134</sup>, instead a descriptive based modeling was observed. This descriptive modeling allowed the physiotherapist and patients to demonstrate, in words, how their actions led to improvements or, just as valuably, increases in their pain or disability.

Although different from other definitions of modeling noted in the physiotherapy literature<sup>84, 97, 134</sup>, this descriptive type of modeling appeared to play a key role in

knowledge transference and prompting behaviour change. It was observed in three forms in the lecture setting: *physiotherapist modeling*, *prompting patient modeling* and *prompting role modeling*.

*Physiotherapist modeling* in the lecture setting was used to highlight educational points and to prompt patients to consider behaviour change. It involved the physiotherapist's description of personal scenarios, thereby helping the patients to more effectively relate to a defined concept. This form of modeling seemed to provide an atmosphere that encouraged patients to share their stories to benefit others in the learning process. Although instructor modeling may be considered by SCT to be the least effective of the modeling techniques<sup>81, 100</sup>, primarily because patients and physiotherapists have little in common, in its descriptive form it was a notable technique, and appeared to enhance the development of a trusting and sharing environment.

Prompting patient modeling was observed in all lecture sessions. *Prompting patient modeling* is similar to *physiotherapist modeling*, allowing concepts, exercises, and situations to be explored, and allowing an opportunity for learning that is perhaps more relatable than the physiotherapist personal examples. As supported by SCT, the use of modeling by another patient in this group setting, one that has pain and disability just like the other participants within the group, seemed to have an even greater potential to effect or prompt consideration of a behaviour change<sup>81, 100, 136</sup>. It was observed that initially, the physiotherapist

prompted the patients to talk of personal situations and, as the sessions continued, there was a greater number of patients who would spontaneously volunteer their stories.

In a similar fashion the physiotherapist used *prompting role modeling*. In Abraham and Michie's work<sup>1</sup>, role modeling was described as prompting the patient to act as a role model to others such as the other patients, coworkers or family. Role modeling in the lectures had a few different forms. The physiotherapist used past "Back to Fitness" class participants as role models, relating their stories or providing written statements, via PowerPoint, describing their experience with the class. The physiotherapist also used other individuals to model behaviours through descriptive scenarios and pictures where they demonstrated for instance, what normal movement looked like. For example, the physiotherapist used pictures of young children, who presumably had not yet been influenced by technology or sedentary lives, squatting, sitting and in various lifting positions. She then built on this message by looking at pictures of others at various ages performing tasks with good body mechanics, including a mother teaching her son to ride a bike and an older gentleman brushing his teeth. All of these role models were used to help patients understand that these are normal movement patterns that people perform every day. To build on this concept, famous athletes (Sydney Crosby, Tiger Woods) were also shown and patients were asked to examine and comment on their postures. The physiotherapist created a story using role models to make the point that the particular movement

she was talking about is normal for young kids, everyday people, and famous athletes, and that this is the way the patients in the class should also move. To highlight this point even further, the physiotherapist, in later sessions, prompted patients to be role models. Patients related their stories about how their abilities had improved since the beginning of the class to their current abilities. The understanding from SCT and is that the more that a patient can identify with the model the more effective the modeling is at stimulating behaviour change<sup>81, 82, 100</sup>. This last step in role modeling, *prompting role modeling*, appeared to be a powerful means of role modeling and prompting behaviour change.

In summary, descriptive modeling appeared in three forms and was observed throughout the lectures. Using this descriptive approach, the physiotherapist presented behaviours that patients could model, and also established relations between the physiotherapist and patients within the class. Through shared personal stories and experiences and interactive discussion that inevitably followed, patients appeared to improve their ability to relate to both the physiotherapist and the other patients. The concept that modeling becomes more powerful as the patient is more able to identify with the model, as described by SCT, also appears to be supported. The observance of all three types of this descriptive modeling (physiotherapist, patient and role modeling) suggests that further research into the use of these techniques is necessary.

As anticipated, several cognitive educational techniques including *providing general information on the behaviour-health link*, *providing information on consequences* and *cognitive restructuring* were observed in most of the lecture settings (Figures 10, 15). *Providing general information on the behaviour- health link* established the facts about low back pain and health. This technique is a necessary foundational piece that aims at putting all of the other educational messages into context. As an example, being taught about the facts concerning the benefits of activity (cardiovascular, strength, endurance) allows the patient to link the behaviour of activity to their decision-making about their health. Building on this theme, informing the patients that starting an exercise program may result in some soreness in their low back the next day, informs patients of the consequences of that action. Then informing patients that pain is experienced when starting an exercise program is normal and does not mean that harm is being done to the back is an example of *cognitive restructuring*. All three of these techniques were commonly reported in the PT BCT database.

Other cognitive techniques frequently observed were: *providing stress management*, *prompting barrier identification* and *prompting intention formation*. *Prompting barrier identification*<sup>97, 137</sup> and *providing stress management*<sup>2, 112, 125, 138</sup> are techniques commonly described in the physiotherapy literature. In the lecture setting barriers related to behaviour change were discussed and often incorporated with problem solving techniques. In the lecture setting cognitive and physical factors of stress were linked and their management was discussed,

often in a problem-solving format or through *prompting intention formation*. *Prompting intention formation* involves having the patient consider making healthy behaviour changes<sup>1</sup> and was not a technique noted in the examined physiotherapy literature. In the lecture sessions this technique seemed to occur with other techniques including: *providing information on the behaviour-health link*, *cognitive restructuring* and *providing stress management*. In the use of this technique the physiotherapist would ask them how they could make healthy behavioural choices in the light of new information.

Five motivational techniques were observed: *goal setting*, *self-monitoring of behaviour*, *providing feedback on performance*, *prompting review of behavioural goals* and *facilitating internal reinforcement* (Figure 10, 16). All of these techniques are common to physiotherapy<sup>18, 21, 24, 89, 94, 98, 112, 123, 130, 139, 140</sup> although *facilitating internal reinforcement* or self-reinforcing<sup>110, 123</sup>, as it is sometimes referred to, is not well described. In the lecture sessions *facilitating internal reinforcement* was observed to accompany *goal setting*, *patient modeling* and *role modeling* where a patient's achievements were highlighted and the therapist acknowledged the role that the patient played in achieving goals and successfully performing new or previously avoided activities. This technique will be discussed in more detail in the section on Tuesday sessions. In regards to the motivational BCT observed in the lectures, they were the techniques commonly referred to in the physiotherapy literature.



## ***Tuesday Exercise Sessions***

In the Tuesday exercise sessions, as expected from the literature<sup>2, 21, 22, 88, 102, 119, 121, 123</sup> and the physical nature of physiotherapy practice, many behavioural BCT were observed, and they focused on the physical components of skill acquisition supported by reinforcement with educational information (Figure 11). An interesting discovery, although perhaps not unexpected, was that *physiotherapist* and *patient modeling* featured prominently, similar to the lectures. Another interesting finding was the observance of the cognitive technique, *prompting intention formation*, in every session. This technique is derived from SCT<sup>82</sup> and identified as a key BCT for psychologists<sup>1</sup> but it was not found in the literature review conducted for this study. Motivational techniques were also anticipated and several were observed in every session. Overall, similar to the lectures, a wide range of techniques was used across all types.

Six behavioural techniques were observed in the Tuesday exercise session. The majority of these techniques were focused on skills acquisition (Figure 14). Physical and verbal *shaping of skills*<sup>2, 21, 88, 121, 123</sup> in addition to *positive reinforcement*<sup>21, 141, 142</sup> were used to encourage skill development and motor patterns, this approach is consistent with Psychomotor Learning Theory<sup>79</sup>. Homework was prompted and patients were encouraged to use cues such as the time of day to perform selected activities and movement patterns. Discussion of the use of *pacing*, practicing the new skills within the class and encouraging their

practice outside of class was prominently featured. The remaining behavioural techniques centered on modeling techniques.

In contrast to the lecture setting, the modeling on Tuesday was consistent with what is described in SCT and motor learning research as “observational learning”<sup>79, 81, 82, 84</sup>. *Physiotherapist modeling* involved the demonstration of physical movements by the physiotherapist for the purpose of patient instruction and movement replication. The physiotherapist also continued to use a descriptive type of modeling in this setting where personal examples were relayed to the patients through words, to enhance patient learning. In both styles of *physiotherapist modeling*, physical and descriptive means were used to reinforce knowledge or to introduce a problem solving method of thinking that the patients were prompted to follow.

*Prompting patient modeling* was also observed in every Tuesday exercise session. Patients were prompted to perform exercises in front of the group for demonstration and problem solving purposes. It has been noted that observation of an unskilled individual can be as beneficial to learning as watching a skilled individual, especially in the presence of someone such as a physiotherapist who can provide comments on the performance<sup>84</sup>. Through *prompting patient modeling*, the physiotherapist tested and confirmed patient knowledge on education and skills acquisition, monitored behavioural performance, *provided feedback on performance, and facilitated internal reinforcement* of patients who

had made significant improvements from the initiation of the class. Prompting *patient modeling* also seemed to prompt patients both to monitor their own behaviour and to consider making positive behavioural changes. As in the case of *physiotherapist modeling*, descriptive modeling was also observed throughout the sessions.

*Prompting role modeling* did not seem to play as prominent of a role, as it was only observed in one Tuesday exercise class. This may have been because the majority of these Tuesday sessions were spent on new skill acquisition and patients may not have had the necessary skills to be used as role models. Alternatively this may have been a conscious practice choice by the physiotherapist in this setting but this has not been confirmed.

The three cognitive, educationally based techniques: *providing general information on the behaviour-health link*, *providing information on consequences* and *cognitive restructuring* were observed in most of the sessions (Figure 15). Since knowledge and understanding is required before behavioural changes can be made<sup>79</sup>, observing these techniques in the Tuesday sessions makes sense. Problem solving techniques were also woven through the Tuesday exercise sessions and combined with other techniques to challenge patients, confirm their knowledge and allow for a discussion of potential solutions with their peers. *Prompting visualization* was observed in five of the six sessions and involved the combination of individual physical practice with the envisioning of an

environment, such as being on board a naval ship. This type of visualization was also performed in common group tasks, such as storing the ship, where in class, patients lined up as if storing a ship, passing balls of different weights along while being asked to think about the actual task. This allowed the patients to more accurately tie the acquired skills to their environment and real life. Discussions on barriers and the role that social support could play were also observed in these group settings. One interesting observation again was that *prompting intention formation* was used in every session.

As discussed above, in the realm of cognitive techniques, *prompting intention formation* is one that is new to the physiotherapy literature so identifying this as a prominent technique in the exercise session was a surprise and the observation in each class was also unexpected. This technique is related to the physiotherapist's role in encouraging the patient to consider making general, positive behavioural changes<sup>1</sup>. This technique has its theoretical background in SCT<sup>82</sup> and, as noted in the observation of the lectures and Tuesday sessions, is often combined with modeling to encourage behaviour change.

The use of this technique within all of the Tuesday sessions, is understandable as in these sessions, the physiotherapist engages patients in learning and performing new physical movements. In this process, patients are encouraged to think about initiating positive behavioural changes to improve exercise performance outside of the clinical setting. By having the patient make decisions

about changing their behaviour, the chance of that patient continuing with the activity is enhanced<sup>98</sup>.

*Prompting intention formation* appeared to be closely integrated with other techniques including *cognitive restructuring* in both the lecture and exercise settings. As an example, the physiotherapist would discuss how pain does not equal harm, the concept of pain being a message, the fact that the back is very strong and that it is not easily damaged, and the concept of tissue tolerance were all used to lay an educational foundation for behaviour change. After reminding patients of these facts the physiotherapist would often prompt the patients to think about the meaning of this information and what physical changes they could make in light of this information. The idea was to have the patient consider that they can still move in the presence of pain, and that increasing activity is a good thing.

Motivational techniques most commonly observed in the Tuesday exercise session were *prompting self-monitoring of behaviour*, *facilitating internal reinforcement* and *providing feedback* (Figures 11, 16). In this context, the physiotherapist had the patients monitor their behaviour in both written records and in a self check in format, a common practice in physiotherapy. Patients were asked frequently how the exercises were going, if they had any comments or questions. The physiotherapist used responses to these questions and answers as *prompting patient modeling* and problem solving opportunities that benefited

others within the class. *Providing feedback on performance* also allowed the therapist to provide summarized feedback after reviewing either written records, listening to the responses from the self-monitoring or just as a summary of the group performance from earlier in the class or in comparison to previous sessions. The feedback given was always realistic, not over inflated, and given in a positive manner to encourage learning and motivation. When someone had made positive behavioural changes, such as getting up early three mornings a week to do their exercises, and noted benefits, such as having less pain and being able to do more household chores, the individual's achievements were highlighted to the class sometimes through modeling or on an individual basis where past behaviour and outcome was contrasted to current behaviour and outcome. *Facilitating internal reinforcement* as a technique requires closer examination.

*Facilitating internal reinforcement* is found within the physiotherapy literature under a variety of terms including encouraging self-efficacy<sup>97</sup>, self-efficacy reinforced by mastery of activity<sup>21</sup>, transitioning to internal reinforcement<sup>89</sup> and having the patient take credit<sup>98</sup>. This technique is focused on promoting patient self-efficacy and is key to preparing the patient for self-management<sup>98</sup>. This technique was observed in every Tuesday exercise session and in many of the lecture sessions. As described by Harding, it is critical to a patient's post treatment success that external forms of reinforcement be gradually withdrawn over the course of treatment and be replaced by self-reinforcement<sup>89, 98</sup>.

It has been recognized that the patient's ability to acknowledge their own goal achievements and accomplishments, and attribute those performance gains to their own effort, promotes both self-efficacy and control<sup>82, 143</sup>. *Facilitating internal reinforcement* results in patients learning to identify and rely on their own cues and reminders rather than from an external source. They learn to use the skills of problem solving to deal with flare-ups and the process results in the confirmation of new knowledge and ability, thus building feelings of self-efficacy. This was a key technique and is a very powerful means of reinforcing the patients' knowledge, abilities and skills as described in the literature<sup>98</sup>.

In the observed sessions of the "Back to Fitness" class, *facilitating internal reinforcement* was often presented in conjunction with *problem solving/ dealing with flare-ups* and *prompting intention formation*. The decisions made by patients in response to presented scenarios, and in response to flare-ups were individually acknowledged and sound reasoning supported, thereby confirming patient knowledge. Prompting *patient modeling* in a variety of scenarios also achieved this. In one instance the physiotherapist asked a number of patients to pick a ball off of the floor. The physiotherapist and the patients evaluated each demonstration as a group process. Patient responses confirmed their knowledge in this observational learning format (SCT<sup>82</sup>, Psychomotor Learning Theory<sup>79</sup>) thereby reinforcing their capabilities. This was also the case when a patient properly modeled a technique. When the physiotherapist acknowledged an

appropriate performance, this was a confirmation of skills acquisition. Highlighting goal achievements through patient role modeling was also an effective way for the physiotherapist to facilitate internal reinforcement.

In summary there was once again a wide range and type of BCT observed in the Tuesday exercise sessions. The occurrence of modeling in both descriptive and physical forms persisted in the exercise sessions. Two other techniques, one cognitive (*prompting intention formation*) and one motivational (*facilitating internal reinforcement*) were also observed in all of the Tuesday exercise sessions. The importance of these techniques to the overall goal of the program, improving patient self-management, was highlighted. From these findings it is recommended that modeling, *prompting intention formation* and *facilitating internal reinforcement* be clearly characterized within physiotherapy-led CB approaches.

### ***Thursday Exercise Sessions***

The Thursday exercise classes focused on cardio vascular and strength training in a circuit-training format with a short individual exercise and relaxation session towards the end of the class. Due to the similar active nature of the Thursday session to the Tuesday sessions, it was suspected that they would also be similar in the distribution of BCT. The only exceptions were more observations of *relaxation training* techniques and less of modeling and cognitive techniques; this



was not a surprise since this is a much more active, group setting. The two different exercise sessions were very similar in both the range and type and the number of sessions in which each BCT were observed.

The same behavioural techniques from the Tuesday session were observed in the Thursday sessions. The only difference was the addition of *relaxation training* to the Thursday sessions to teach patients how to monitor their breathing and practice relaxation skills that could be used to decrease anxiety, muscle tension or be applied during “at-risk” situations (Figure 14). Again modeling was observed in most sessions in all three forms, lending support to the importance of these techniques in both descriptive and physical forms within the class.

The cognitive technique, *prompting visualization* was observed in five sessions for both the Thursday and Tuesday sessions (Figure 15). This technique requires clarification as the observed approach varied slightly from the visualization described in the psychology literature<sup>1</sup>. In the Thursday sessions patients were often asked to practice an activity while visualizing an “at risk” behaviour or environment. This is different to that described in the psychology checklist where patients are asked to visualize the successful performance of a behaviour without actually performing the behaviour<sup>1</sup>. This may be a more powerful means of using visualization since the physical movement is actually performed, perhaps leading to better carry over.

The motivational techniques were the same as those observed with the Tuesday and the same reasoning applies (Figure 16).

In summary, a wide range and type of BCT were observed within the Thursday exercise sessions (Figure 12). *Prompting visualization*, a technique observed in each Thursday session was performed differently in this study than described in the psychology literature. It is suspected that this is a common application of visualization within physiotherapy due to the physical nature of the practice but there was very little description of this technique noted in the physiotherapy literature to confirm these suspicions.

### ***Techniques Not Observed Across The Sessions***

There were five techniques that were not observed in any session of the “Back to Fitness” class and only slight differences were observed between settings (Figure 13). The only technique not observed in the lecture that was observed in the other sessions was *shaping* which was not a surprise due to the physical nature of this BCT. *Relaxation training* and *providing stress management* were not observed the Tuesday exercise session. This was expected, as there is a specific relaxation component to each Thursday session. In the same manner, *providing stress management*, which often accompanies *relaxation* training, was also not observed in these sessions, but one lecture session was specifically devoted to *providing stress management*. *Prompting social support* was the only

technique not observed on Thursdays, this might have been due to the more active nature of the exercise class and fewer opportunities to discuss these issues although *problem solving and dealing with flare-ups* was still observed in most sessions. The remaining non-observances were common across all settings and are discussed below.

Neither *setting graded activities or exercises* nor *providing graded exposure* were observed in any of the sessions, although it was expected that the more physical environments on the Tuesday and Thursday would have provided the opportunity. This non-observance might be explained in part because of restrictive definition of both techniques. Both required very specific identification and progression of activities that needed to be established in the pre assessment, and would be difficult to determine within a group based setting. However, a step-wise progression of activity with patients being prompted to problem solve and identify the exercises best suited for them, either due to fear of movement or decreased ability, was observed. The stepwise exercise/activity progression occurred more through varying levels of the exercise and encouraging of *pacing* than due to quota based systems.

The remaining BCT not observed were motivational techniques that were not recorded in any session. They were: *motivational interviewing*, *seeking agreement to a behavioural contract* and *providing booster sessions*. These techniques were likely not observed because the initial and final individual

assessment portions of the “Back to Fitness” class were not observed where these techniques would be more appropriately used. *Motivational interviewing* was not a BCT observed in any of the 82 articles examined in PT practice and as a result it was not a surprise that it was not observed in the “Back to Fitness” class. *Motivational interviewing* is a theory-based process composed of multiple steps that often takes place in a one on one format such as during an initial assessment<sup>1</sup>. *Motivational interviewing* was not performed by the instructors of the “Back to Fitness” class primarily due to the group like setting even on the initial assessment for the program. Behavioural contracts were obtained and signed by both the individual and the individual’s supervisor during the initial assessment for the “Back to Fitness” class. In the past, booster sessions were offered to all patients however they are no longer offered.

The only cognitive BCT not observed was *providing information on others approval*. The reason was more due to the decision to incorporate this technique under *prompting barrier identification*. It was noted that all discussions in the “Back to Fitness” class on *information on others approval* that were used with negative connotations were scored as a *barrier to performance* whereas any indications around positive connotations of others approval were captured under *planning social support*.

In summary a wide range and type of techniques, 19 BCT total, were identified regardless of setting. Only four techniques existed in only two settings (Figures

13, 17). A total of 24 of the 29 BCT identified in the PT BCT were identified across the 16 sessions of the “Back to Fitness” class (Figure 17). This suggests that the provision of CB approaches by this physiotherapist is more than just the application of techniques, but rather it is a process that involves reinforcing concepts and messages from one setting to another and across a treatment program. This may also suggest that physiotherapists may be under reporting or under recognizing the role that they play or have the potential to play in behaviour change.

### ***Other Observations***

From the field study analysis it was shown that a wide range and type of BCT were used in an attempt to change behaviour and improve patient self-management abilities. Field notes were used to expand on some of the BCT observed in the “Back to Fitness” class to give a better understanding of how these BCT were applied to effect behaviour change. The observations recorded in this study indicate that the use of BCT is a dynamic process.

One of the key observations made during the field study was that no technique, regardless of setting, was applied in isolation. The majority of BCT types were used in all settings to some extent and the interplay of these techniques, as indicated from the field notes, appear extensive. The chaining of techniques such as *providing general information on the behaviour-health link, providing information on consequences, cognitive restructuring, prompting patient*

*modeling*, and *prompting intention formation* is just one example that was noted in this study. The use of techniques was a dynamic process that seemed to depend on a variety of factors including: patient responses, performance, knowledge, examples and the patient's physical state. In a sense what was observed was not the application of single techniques but a process, a clinical practice. This process seemed to be underlined by other themes including: a hierarchical use of techniques, the positive and humorous tone, the role of managing expectations and the focus on active learning.

There appeared to be a hierarchy of "power" to the techniques observed within the "Back to Fitness" class. Modeling which was commonly used throughout the sessions appeared to be an important technique used to lay the foundation for understanding behaviour change and acquiring the physical skills needed.

*Prompting intention formation*, also prominently observed throughout the sessions allowed the patients to consider making positive behaviour change.

*Facilitating internal reinforcement*, observed in most sessions, showed the patients that they could make a behaviour change. Taken together the combination of these techniques, were central to the development of new and healthy behaviours in this environment.

The tone of the "Back to Fitness" class was also an important consideration within the process of behaviour change. It was noted that throughout all three settings a light hearted, positive, trusting and activity-focused environment was

used. This tone of the class seemed particularly important to involving the group within the behaviour change process. The benefit of providing a group program is the key role that the patients play in the education and learning from each other<sup>84</sup>. This appeared to be influenced by the use of modeling, particularly *prompting patient modeling*, and the problem-solving environment that was recurrent throughout the “Back to Fitness” class. Another point that we observed was the way that these techniques could be used to individualize the experience of the patient within that group setting.

There was also another common practice noted throughout the “Back to Fitness” class. Physiotherapists tended to manage patient expectations to *facilitate internal reinforcement* and this process was observed throughout the exercise and lecture sessions. As an example, the physiotherapist reminded patients regularly that it takes time to get better and that in many cases it could take months to see change. Another means used to manage expectations was *prompting role modeling* where former patients’ situations or comments were shown or relayed to patients to indicate that it took a long time but, for example, after six months they noticed a substantial improvement in what they were able to do. This concept is closely tied to “outcome expectancies” as described in SCT and in more detail in Self-Efficacy Theory<sup>81</sup>. Self-efficacy as described in SCT<sup>82</sup> and SET<sup>81</sup> is the belief by the individual that they can perform a behaviour; “outcome expectancy” is tied to whether or not that behaviour will lead to the desired outcome<sup>81</sup>. The consistent message sent within the observed sessions

was that the patient has the capability to perform the behaviour and achieve the desired outcome or goals but that these changes take time.

One last common theme alluded to throughout the discussion was the use of a problem solving approach. Patients were encouraged to be active learners always being challenged to think about how and when they would implement certain behaviours, how to apply the knowledge they had learned. This active learning process is intended to prepare the patient to think for themselves, without the assistance of a physiotherapist<sup>83</sup>. Having a patient learn to independently deal with problems or flare-ups is the “ultimate goal” of self-management programs, one that was reflected in the “Back to Fitness” class<sup>83</sup>.

#### **FINAL PT BCT CHECKLIST**

Throughout the tool development, testing and field study portions of the study the definitions were modified to more clearly describe the identified BCT. These are presented in final form in Appendix Q. The final BCT checklist was comprised of 29 BCT separated into the same three types of techniques. Only two modifications were made to the checklist. The BCT, *prompting role modeling* was renamed *role modeling* to reflect its more broadly applied use. In the case of *problem solving and dealing with flare-ups*, it was renamed *problem solving, maintenance and dealing with flare-ups*. The reason that maintenance was added was the common reference to this issue during observation in addition to the reflection of this terminology in both the physiotherapy and psychology literature. There was, however, one special case that requires discussion.



One BCT adapted from the psychology checklist, *providing information on other's approval*, provided considerable challenges when trying to characterize it on video observation. During inter rater reliability testing both the PI and SI noted a tendency to record this technique under one of two other categories due to the notable and persistent overlap with *prompting barrier identification* and *prompting social support* as described earlier. This technique was left within the checklist because it did receive support from 88% of the experts surveyed and it was derived from the psychology checklist<sup>1</sup>. Also this technique may be more easily recognizable in other physiotherapists' practices or in other practice settings or environments. Caution is however, recommended in the identification of this technique.

The final PT BCT checklist contained 21 (72%) of the same techniques identified within the psychology BCT checklist<sup>1</sup> and eight that uniquely described physiotherapy applications of CB approaches. This considerable overlap in BCT techniques between the two practices supports an intersection in scope of practice for these approaches between the practice of physiotherapy and psychology while still maintaining unique features in both professions. These findings support statements by other authors who have suggested that other HCP might have the knowledge and abilities to provide CB approaches<sup>105</sup>.

This overlap in BCT however, must be viewed in light of the patient populations that the two professions treat. Physiotherapists may address behaviour change through the application of BCT, but psychologists, in addition to BCT, use cognitive behavioural therapy in their treatment interventions. This is an important distinction. The two professions have roles that are complimentary and indeed may allow improved patient access to these valuable services and provide overall improved patient care.

#### **CLINICAL IMPLICATIONS FOR PHYSIOTHERAPY**

This study was conducted in a military environment, but with sampling from three settings (lecture, and two different types of exercise classes) commonly used in physiotherapy practice. Results from this study suggest that physiotherapists can play a significant role in behaviour change through the application of a wide range and type of BCT within a CB approach. These findings lend support for physiotherapists' abilities in the provision of CB approaches in broader clinical applications in relation to the treatment of chronic MSK conditions where psychology support may be restricted. Additionally, the proposed nomenclature allows physiotherapists to use a common language in the application of BCT within CB approaches specifically within the context of CNSLBP in the presence of modifiable psychological risk factors. This checklist may be applied, with training, to assist in characterizing and monitoring physiotherapy-led CB approaches for both clinical and research purposes. This study also forms the

basis for future studies on nomenclature development for physiotherapy-led CB approaches.

### **INTERPROFESSIONAL IMPLICATIONS**

From the beginning of this study, a considerable overlap of BCT has been noted between physiotherapy and psychology. Both during the testing phase in the presence of a behavioural expert and on field testing, 24 of the 29 BCT were observed within one sample of physiotherapy practice. These findings demonstrate that there is an overlap in the application of BCT in both the written literature and practice. This study supports knowledge translation across physiotherapy and psychology practice boundaries with respect to the application of BCT and lends support for a greater role for physiotherapists in the provision of CB approaches.

### **LIMITATIONS**

First, the nomenclature and final PT BCT checklist are presented as a summary from the physiotherapy literature for CB approaches in a MSK population and a single BCT checklist for psychologists. This may limit the usability of the checklist and nomenclature, however, there is currently no common standard for physiotherapy and the psychology BCT checklist is also the only attempt to standardize the nomenclature for psychology approaches making the best use of available evidence.

Second, this is an observational analysis of one physiotherapist's practice in the application BCT for military patients with CNSLBP in the presence of high levels of fear of movement. The physiotherapist observed in this practice is considered to be an expert in the application of BCT and the wide range and type of BCT observed may be due to her level of experience. It is suggested that the way an expert uses these BCT may not be representative of a novice's practice.

Third the use of a military population may have also influenced the findings. The commonality of culture, language, training and expectations may have created a more cohesive group. This may have influenced the BCT used by the physiotherapist and the willingness of members to participate.

The findings do suggest a wide range and type of BCT used within this approach but the practice of other physiotherapists, direct references to other MSK conditions, the general population or alternate settings may not apply.

Additionally this study only monitored for the presence of BCT. There was no consideration given to the quality or the effectiveness of the BCT applied and so clinical inferences on the role that physiotherapists may take in CB approaches should be interpreted with caution.

## **FUTURE STUDIES**

Although initial results from the field study are promising, the developed nomenclature and definitions require further testing in varied practice

environments and with a robust sample size to ensure that it is reflective of physiotherapy-led CB approaches. Once this is confirmed, competency identifications and training standards need to be developed to add the necessary consistency and credibility to this continually evolving practice. The application of BCT is briefly discussed in this study but the topic of behaviour change in physiotherapy would greatly benefit from a qualitative evaluation of this process. Only after these steps are completed can physiotherapy-led CB approaches be appropriately characterized and effectively compared or reproduced for either clinical or research purposes.

## Chapter 6 Conclusion

Little is known about the use of BCT in the application of physiotherapy-led CB approaches. Establishing a common nomenclature, especially one that is strongly based in psychology in addition to physiotherapy research is a valuable foundational step in improving our understanding of physiotherapy-led CB approaches and how physiotherapists influence behaviour change. This study addressed this gap in research through the development of a nomenclature and BCT checklist tool that was used to monitor physiotherapy practice.

The identified nomenclature that resulted in both the modified and *final PT BCT checklist* versions demonstrated considerable overlap (72% of techniques) between physiotherapy and psychology checklists<sup>1</sup>. It was determined that this PT BCT checklist was a valid and reliable tool that may be used, with training, to identify BCT applied in a physiotherapy-led CB approach. Utilization of this checklist revealed a broad range of techniques, used throughout the “Back to Fitness” class. The observance of all types (cognitive, behavioural and motivational) of techniques across all settings suggests the continuity of the behaviour change approach in practice. In other words, these findings support the idea that the applications of BCT are combined into a process of behaviour change in physiotherapy instead of merely the straightforward application of a set of techniques.

In summary, the convergence of BCT nomenclature within the professions of physiotherapy and psychology, supported by the observation of a broad range of these techniques, emphasizes the role that physiotherapists can play in changing behaviour, specifically in the presence of CNSLBP and modifiable psychological risk factors. This considerable overlap in identified BCT suggests a combined area of professional scope that requires further investigation. This study sets the stage for the exploration of other roles that physiotherapists may be able to fill in the provision of chronic MSK and related conditions and informs the practice on the use of physiotherapy-led CB approaches.

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## **Appendix A: The Back To Fitness Class**

One of the most prominent chronic MSK conditions in the Canadian Forces is LBP. A recent health and lifestyle survey found that nearly 20% of regular force military members and 9% of reserve force personnel indicated LBP as their primary chronic complaint<sup>144, 145</sup>. These rates are considerably higher than the 9% reported by a Canadian survey study of 118,000 residents<sup>5</sup>. A 2004 study performed across Canadian military bases found that LBP was the primary MSK injury at CFB Halifax physiotherapy section, and at 19%, the level of LBP at CFB Halifax was higher than any other base across the country<sup>146</sup>.

To address this issue at CFB Halifax, the physiotherapy section implemented a physiotherapy-led combined CB and exercise therapy program in 2006 for patients with CNSLBP, the “Back to Fitness” class.

The “Back to Fitness” class at CFB Halifax is a six-week, twelve-session program that occurs several times a year. The program is targeted towards military patients who have CNSLBP and low to moderate levels of modifiable psychological risk factors, specifically fear avoidance. The program was originally based on the “Back to Fitness” program described by Klaber – Moffett<sup>2</sup>. This program combines aspects of behaviour change with exercise with the end goal of improving patient self-management. The program has been ongoing for five years and has continued to be modified according to patient

## **Appendix A: The Back To Fitness Class (Con't)**

feedback, therapist experience and training and task requirements of the military members.

Staff physiotherapists at either CFB Halifax or 4 Wing Shearwater select patients for the “Back to Fitness” class. The selection is based on the presence of CNSLBP and low to moderate levels of fear of movement as measured by the Tampa Scale of Kinesiophobia (TSK)<sup>116</sup>. In some instances additional patients may be referred if, in the opinion of their treating physiotherapist, the patient requires a defined program in a group setting to address cognitions, behaviour or patient self-management strategies.

After referral to the program, one of two physiotherapists instructing the “Back to Fitness” class assesses a maximum of twenty participants approximately one week prior to the start of the program. The pre-assessment commences with the completion of questionnaires covering: the duration of symptoms, their aggravating and easing factors, and their current medical category. At the same time patients are asked to complete a battery of self-assessment forms including the, Quadruple Visual Analogue Scale (Quad VAS)<sup>113</sup>, Oswestry Disability Index (ODI)<sup>114, 115</sup>, and the Tampa Scale of Kinesiophobia (TSK)<sup>116</sup>. One of the two instructing physiotherapists then sits down with each patient for a brief discussion of their history and to explain to them the next phase of testing. In a group environment the patients are then evaluated using a variety of functional tests.

## **Appendix A: The Back To Fitness Class (Con't)**

Following completion of the functional testing the physiotherapist then meets again with the patient to establish their program goals. At the end of that process, the patient signs a behavioural contract to attend all the sessions and this is also signed by their superior so that the chain of command is in the loop and can support the member in their participation in the program. Patients cannot take part in the program until the contract has been signed by both parties and witnessed by a member of the physiotherapy team. The patients are then advised of the start date and time for the initial class and they are instructed to come in civilian attire for the program.

The program has three different aspects, a lecture component, an individual exercise component and a cardio and strength component all administered in a group setting. The lecture session occurs once a week and varies in time from 15 minutes to 50 minutes depending on the topic and questions. The lecture series addresses: the concept of pain, anatomy and biomechanics, the role of stress, the patient's role in managing low back pain and a final session to revisit pain and tie in the first five lectures. These sessions are given on Tuesday afternoons just before the individual exercise portion.

The individual exercise portion is meant to teach patients about muscle activation, core strengthening, flexibility, neural mobility and proper movement techniques. The class, offered on Tuesday afternoons following the lecture,

## **Appendix A: The Back To Fitness Class (Con't)**

incorporates specific muscle activation for the gluteus maximus, core strengthening through the use of exercises such as the plank and side plank, flexibility in the thoracic spine, hip and neural flossing techniques and a great deal of time is spent on disassociating the hip from the back. The class varies in time, depending on the length of the lecture but usually lasts for approximately one hour. The patients perform the exercises in a multipurpose gym located one floor below the lecture classroom in the dockyard gym facility at CFB Halifax. In this group setting the physiotherapists model each exercise and explain the purpose before having the patients perform the exercises. Patients are checked for his or her performance and recommendations made on how to improve and whether or not this particular exercise will be one they need to focus on in the future. For the first three Tuesday sessions patient exercises are increased in variety. By the fourth week no new exercises are added but the expected exercise quota continues to climb until the sixth and final week.

In the Thursday gym sessions, the entire one and a half hours is dedicated to exercise. The first five minutes are reserved for a warm up and the remaining is dedicated to combined cardio and strengthening or flexibility training. In this exercise session, music plays in the background as groups of 3- 4 patients rotate between one of five stations. Each station contains a cardio activity for 2 minutes and two strengthening or flexibility stations. For instance one station involves a shuttle run combined with a hip dissociation and squatting exercise. Following

## **Appendix A: The Back To Fitness Class (Con't)**

the exercise session, patients have a five-minute break as needed and then proceed to a physiotherapist-led review of the exercises taught on Tuesday sessions. The last 8 minutes of each class is used initially for a physiotherapist-guided relaxation that is progressed to an individual relaxation by the end of the six weeks.

At the end of the last class all participants receive a certificate of completion. Patients are then also scheduled for their post assessment that occurs within one week of completion. The post assessment requires the patient to complete the same self- assessment questionnaires, retesting the functional performance indicators and revisiting the goals. A final component to the post assessment is giving the patient their program as determined from the class and consolidating the techniques used to help them self manage any future occurrences of their back pain. All participants are encouraged to continue with their exercises, are invited to return to any session they wish as a refresher and to contact the physiotherapist if they have any questions in the future.

**Appendix B: Physiotherapist Work Experience Form**

Previous Physiotherapy Experience

Name: \_\_\_\_\_

1. How long have you been practicing as a licensed physiotherapist?  
\_\_\_\_\_ Years

2. During that time have you ever been trained in the use of psychological approaches such as cognitive behavioural therapy in a rehabilitation setting? (Circle the one that applies, if no then go to #6).

Yes                  No                  Not Sure

3. If you answered yes to question two, what type of training did you receive?

Course                  On the Job                  Self taught through books & articles

4. Can you expand on this education including where the education was received (hospital, private practice, multidisciplinary clinic), who taught it (psychologist, physiotherapist) and what duration of training was (1 day, 12 hours) or an estimate of how many articles you may have reviewed?

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5. In what type of setting(s) have you used psychological approaches in rehabilitation?

Multidisciplinary      Physiotherapy- lead                  Primary Care      Other

6. How many times or years have you taught the "Back to Fitness" class?

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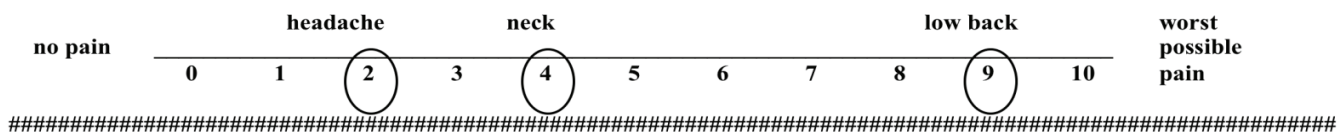
## Appendix C: Quadruple Visual Analogue Scale (Quad Vas)

(Reprinted from Spine, 18, Von Korff M, Deyo RA, Cherkin D, Barlow SF, Back pain in primary care: Outcomes at 1 year, 855-862, 1993)<sup>113</sup>

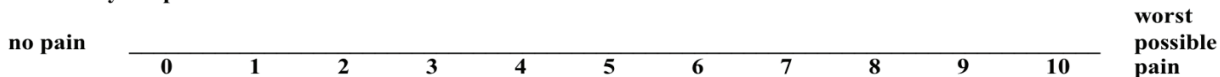
### QUADRUPLE VISUAL ANALOGUE SCALE

**INSTRUCTIONS:** Please circle the number that best describes the question being asked.  
**NOTE:** If you have more than one complaint, please answer each question for each individual complaint and indicate the score for each complaint. Please indicate your average pain levels and pain at minimum / maximum using the last 3 months as your reference. If you have completed this form before, indicate you average pain level since the last time you completed this form.

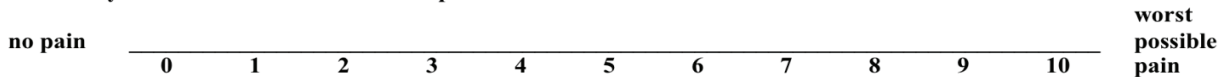
**EXAMPLE:**



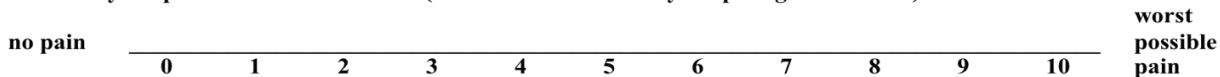
1. What is your pain **RIGHT NOW**?



2. What is your **TYPICAL** or **AVERAGE** pain?

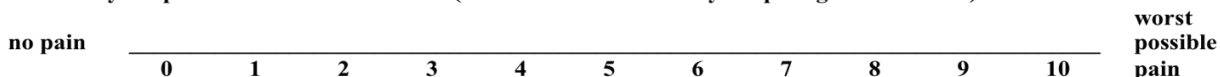


3. What is your pain level **AT ITS BEST** (How close to "0" does your pain get at its best)?



What percentage of your awake hours is your pain at its best? \_\_\_\_\_%

4. What is your pain level **AT ITS WORST** (How close to "10" does your pain get at its worst)?



What percentage of your awake hours is your pain at its worst? \_\_\_\_\_%

NAME \_\_\_\_\_ AGE \_\_\_\_\_ DATE \_\_\_\_\_ SCORE \_\_\_\_\_

SCORE: #1 \_\_\_\_\_ + #2 \_\_\_\_\_ + #4 \_\_\_\_\_ = \_\_\_\_\_ / 3 x 10 = \_\_\_\_\_ (Low intensity = <50; High intensity = >50)

## Appendix D: Oswestry Disability Index (ODI)

### Oswestry Disability Questionnaire

This questionnaire has been designed to give us information as to how your back or leg pain is affecting your ability to manage in everyday life. Please answer by checking **one box in each section** for the statement which best applies to you. We realise you may consider that two or more statements in any one section apply but please just shade out the spot that indicates the statement **which most clearly describes your problem**.

#### Section 1: Pain Intensity

- I have no pain at the moment
- The pain is very mild at the moment
- The pain is moderate at the moment
- The pain is fairly severe at the moment
- The pain is very severe at the moment
- The pain is the worst imaginable at the moment

#### Section 2: Personal Care (eg. washing, dressing)

- I can look after myself normally without causing extra pain
- I can look after myself normally but it causes extra pain
- It is painful to look after myself and I am slow and careful
- I need some help but can manage most of my personal care
- I need help every day in most aspects of self-care
- I do not get dressed, wash with difficulty and stay in bed

#### Section 3: Lifting

- I can lift heavy weights without extra pain
- I can lift heavy weights but it gives me extra pain
- Pain prevents me lifting heavy weights off the floor but I can manage if they are conveniently placed eg. on a table
- Pain prevents me lifting heavy weights but I can manage light to medium weights if they are conveniently positioned
- I can only lift very light weights
- I cannot lift or carry anything

#### Section 4: Walking\*

- Pain does not prevent me walking any distance
- Pain prevents me from walking more than 2 kilometres
- Pain prevents me from walking more than 1 kilometre
- Pain prevents me from walking more than 500 metres
- I can only walk using a stick or crutches
- I am in bed most of the time

#### Section 5: Sitting

- I can sit in any chair as long as I like
- I can only sit in my favourite chair as long as I like
- Pain prevents me sitting more than one hour
- Pain prevents me from sitting more than 30 minutes
- Pain prevents me from sitting more than 10 minutes
- Pain prevents me from sitting at all

#### Section 6: Standing

- I can stand as long as I want without extra pain
- I can stand as long as I want but it gives me extra pain
- Pain prevents me from standing for more than 1 hour
- Pain prevents me from standing for more than 30 minutes
- Pain prevents me from standing for more than 10 minutes
- Pain prevents me from standing at all

#### Section 7: Sleeping

- My sleep is never disturbed by pain
- My sleep is occasionally disturbed by pain
- Because of pain I have less than 6 hours sleep
- Because of pain I have less than 4 hours sleep
- Because of pain I have less than 2 hours sleep
- Pain prevents me from sleeping at all

#### Section 8: Sex Life (if applicable)

- My sex life is normal and causes no extra pain
- My sex life is normal but causes some extra pain
- My sex life is nearly normal but is very painful
- My sex life is severely restricted by pain
- My sex life is nearly absent because of pain
- Pain prevents any sex life at all

#### Section 9: Social Life

- My social life is normal and gives me no extra pain
- My social life is normal but increases the degree of pain
- Pain has no significant effect on my social life apart from limiting my more energetic interests e.g. sport
- Pain has restricted my social life and I do not go out as often
- Pain has restricted my social life to my home
- I have no social life because of pain

#### Section 10: Travelling

- I can travel anywhere without pain
- I can travel anywhere but it gives me extra pain
- Pain is bad but I manage journeys over two hours
- Pain restricts me to journeys of less than one hour
- Pain restricts me to short necessary journeys under 30 minutes
- Pain prevents me from travelling except to receive treatment



## Appendix D: Oswestry Disability Index (Con't)

### Oswestry Disability Index Scoring

**Score:** / x 100 = %

**Scoring:** For each section the total possible score is 5: if the first statement is marked the section score = 0, if the last statement is marked it = 5. If all ten sections are completed the score is calculated as follows:

Example:

16 (total scored) of a total possibility of 50 (total possible score) x 100 = 32%

If one section is missed or not applicable the score is calculated: 16 (total scored)

45 (total possible score) x 100 = 35.5%

Minimum Detectable Change (90% confidence): 10% points (Change of less than this may be attributable to error in the measurement)<sup>14</sup>.

## Appendix E: Tampa Scale Of Kinesiophobia (TSK)

### Tampa Scale for Kinesiophobia

(Miller , Kori and Todd 1991)

1 = strongly disagree

2 = disagree

3 = agree

4 = strongly agree

1. I'm afraid that I might injury myself if I exercise	1	2	3	4
2. If I were to try to overcome it, my pain would increase	1	2	3	4
3. My body is telling me I have something dangerously wrong	1	2	3	4
4. My pain would probably be relieved if I were to exercise	1	2	3	4
5. People aren't taking my medical condition seriously enough	1	2	3	4
6. My accident has put my body at risk for the rest of my life	1	2	3	4
7. Pain always means I have injured my body	1	2	3	4
8. Just because something aggravates my pain does not mean it is dangerous	1	2	3	4
9. I am afraid that I might injure myself accidentally	1	2	3	4
10. Simply being careful that I do not make any unnecessary movements is the safest thing I can do to prevent my pain from worsening	1	2	3	4
11. I wouldn't have this much pain if there weren't something potentially dangerous going on in my body	1	2	3	4
12. Although my condition is painful, I would be better off if I were physically active	1	2	3	4
13. Pain lets me know when to stop exercising so that I don't injure myself	1	2	3	4
14. It's really not safe for a person with a condition like mine to be physically active	1	2	3	4
15. I can't do all the things normal people do because it's too easy for me to get injured	1	2	3	4
16. Even though something is causing me a lot of pain, I don't think it's actually dangerous	1	2	3	4
17. No one should have to exercise when he/she is in pain	1	2	3	4

Reprinted from: *Pain*, Fear of movement/(re) injury in chronic low back pain and its relation to behavioural performance, 62, Vlaeyen, J., Kole-Snijders A., Boeren R., van Eek H., 371. Copyright (1995).<sup>116, 147</sup>

## **Appendix E: Tampa Scale of Kinesiophobia (Con't)**

Note that a total score is tabulated after the inversion of individual scores of items 4, 8, 12 and 16.

The Tampa Scale of Kinesiophobia (TSK) <sup>116</sup> is used to assess the subjects' fear of movement. The questionnaire has been validated in chronic low back pain and has sufficient reliability and validity <sup>12, 70, 148, 149</sup>.

<sup>37</sup>.

## Appendix F: Patient Participant Data Sheet

**Participant** information sheet.

**Participant** number: \_\_\_\_\_ Test Date: \_\_\_\_\_

Gender: M          F

Age: \_\_\_\_\_

Duration of Symptoms: \_\_\_\_\_

Please list any other medical conditions or concerns:

---

---

### **Current Work Restrictions:**

None, full duties    ***Permanent Category*** (PCAT)    ***Temporary Category*** (TCAT)

If on a category, please indicate for what (back, neck, foot): \_\_\_\_\_

### **Remainder to be completed by the physiotherapist.**

QUAD VAS: \_\_\_\_\_

ODI: \_\_\_\_\_

TSK: \_\_\_\_\_

## Appendix G: Literature Search Strategy

### Pub Med Search

("cognitive therapy" AND (Therapy/Narrow[filter]) OR ("graded exercises" OR exposure OR "positive reinforcement" OR relaxation OR coping OR pacing OR "goal setting" OR "self-efficacy" OR "operant conditioning" OR "classical conditioning" OR advice OR "cognitive therapy" OR motivation) and (physiotherapy) and ("chronic pain")) NOT stroke NOT cardiac NOT pulmonary NOT respiratory NOT cancer NOT "spinal cord" NOT psychiatric NOT traumatic NOT paralysis NOT facial NOT spirituality NOT "cerebral palsy" NOT ethics NOT economy NOT "rheumatoid arthritis" NOT fracture NOT "complex regional pain" NOT pelvic NOT headache NOT Medicare NOT stress NOT "multiple sclerosis" NOT analgesic NOT fibromyalgia NOT massage NOT shortwave NOT hemianopia NOT vertigo NOT professionalism NOT neurological NOT vulvodynia NOT "chronic fatigue" NOT myalgic NOT "stiff-person" NOT "post-polio" NOT ultrasound NOT medications NOT "tai chi" NOT yoga NOT physician NOT nutrition NOT laser NOT radiation NOT death

**Limits Activated:** Humans, English, from 1992-2011

### CINAHL Search

((“Cognitive Therapy” AND “Physical Therapy”) NOT (“chronic fatigue” OR ptsd OR cancer OR “blood pressure” OR cardiopulmonary OR “brain injury” OR fibromyalgia OR drugs OR nurses OR “motion sickness” OR falls OR dementia OR spiritual OR “cerebral palsy” OR biofeedback OR overweight OR obese OR stroke OR sex OR “sexual arousal” OR anxiety OR palliative OR sleep OR me OR alcohol OR nursing OR ulcer OR “post traumatic stress disorder” OR “wound care” OR ocd OR “obsessive compulsive disorder” OR opioids OR analgesic OR pharmacological OR hypnotherapy OR depression OR music OR “mental health” OR csp OR Alzheimer OR Parkinson’s OR burnout OR “complex regional pain syndrome” OR smoking OR “alternative therapies” OR “alternative medical therapies” OR “complimentary therapies” OR “premenstrual syndrome” )

**Limits Activated:** English from 1992- 2011

## **Appendix H: Video Sampling Procedure**

For the four studies in the Tool Testing phase, unique sets of video clips from the previously recorded combined CB and exercise program, the “Back to Fitness” class from CFB Halifax physiotherapy section, were used. For each of the four studies: Training and Validation (Study 1), Consensus Training (Study 2), Intra Rater Reliability (Study 3) and Inter Rater Reliability (Study 4) the data set consisted of video clips from across the six weeks and in all settings.

Approximately 15 hours of video was divided up into equal portions for each lecture, Tuesday and Thursday exercise session to allow for equal viewing of the different portions of the class, the length of the video clip was dependent on the length of the given session. For example a lecture that was 40 minutes long was divided into four equal video clips of 10 minutes each. As an example, “1.1 A” would reflect a video clip from the first quarter of the week one lecture session. The video clip segments are demonstrated in Table 1.

## Appendix H: Video Sampling Procedure (Con't)

Table 1: Demonstrates the segmenting of the video clips across the six weeks each lecture, Tuesday and Thursday exercise session. The number within the sampling boxes refers to the week of the program (“1” through “6”), the portion of the video sample for that session (times “1” through “4”) and the letter refers to the setting, lectures (A) or Tuesday exercise sessions (B), Thursday exercise session (C).

<b>Session</b>	<b>Week 1</b>	<b>Week 2</b>	<b>Week 3</b>	<b>Week 4</b>	<b>Week 5</b>	<b>Week 6</b>
<b>Lecture (Time 1)</b>	1.1 A	2.1 A	3.1 A	4.1 A	5.1 A	6.1 A
<b>Lecture (Time 2)</b>	1.2 A	2.2 A	3.2 A	4.2 A	5.2 A	6.2 A
<b>Lecture (Time 3)</b>	1.3 A	2.3 A	3.3 A	4.3 A	5.3 A	6.3 A
<b>Lecture (Time 4)</b>	1.4 A	2.4 A	3.4 A	4.4 A	5.4 A	6.4 A
<b>Tuesday (Time 1)</b>	1.1 B	2.1 B	3.1 B	4.1 B	5.1 B	6.1 B
<b>Tuesday (Time 2)</b>	1.2 B	2.2 B	3.2 B	4.2 B	5.2 B	6.2 B
<b>Tuesday (Time 3)</b>	1.3 B	2.3 B	3.3 B	4.3 B	5.3 B	6.3 B
<b>Tuesday (Time 4)</b>	1.4 B	2.4 B	3.4 B	4.4 B	5.4 B	6.4 B
<b>Thursday (Time 1)</b>	1.1 C	2.1 C	3.1 C	4.1 C	5.1 C	6.1 C
<b>Thursday (Time 2)</b>	1.2 C	2.2 C	3.2 C	4.2 C	5.2 C	6.2 C
<b>Thursday (Time 3)</b>	1.3 C	2.3 C	3.3 C	4.3 C	5.3 C	6.3 C
<b>Thursday (Time 4)</b>	1.4 C	2.4 C	3.4 C	4.4 C	5.4 C	6.4 C

Once the video segments were identified for each week and by setting (Lecture, Tuesday or Thursday exercise session), video clips were allocated to each study

## **Appendix H: Video Sampling Procedure (Con't)**

using block randomization. This approach allowed for equal sampling from all settings across sessions for the six weeks.

To do this, the video clips (four for each session from each setting) were recorded on equal sized pieces of paper denoting the two-digit number and letter code (1.1 A). The pieces of paper with the four corresponding video clips for the same session were placed in a bag and, one at a time, they were drawn by an independent third party one at a time and assigned, in the order they were drawn, to each of the studies: Training and Validation (Study 1), Consensus Training (Study 2), Intra Rater Reliability (Study 3) and Inter Rater Reliability (Study 4). This video clip for each session was recorded under the appropriate study and then the same process continued for each of the sessions and settings across the six weeks. The collection of video clips for each study is recorded in Table 2. It was also anticipated that not all video clips would be used for each study so, to ensure an equal viewing across studies, these clips were randomized using a random number generator to determine the order of viewing.



## Appendix H: Video Sampling Procedure (Con't)

Table 2: The block random sample draw of video clips across all weeks for lecture, Tuesday and Thursday exercise sessions for each of the four studies in the Tool Testing Phase.

<b>Session</b>	<b>Study 1 Training &amp; Validation</b>	<b>Study 2 Consensus Training</b>	<b>Study 3 Intra Rater Reliability</b>	<b>Study 4 Inter Rater Reliability</b>
Lecture (week 1)	1.3 A	1.1 A	1.4 A	1.2 A
Tuesday (week 1)	1.3 B	1.4 B	1.1 B	1.2 B
Thursday (week 1)	1.3 C	1.4 C	1.1 C	1.3 C
Lecture (week 2)	2.2 A	2.4 A	2.1 A	2.3 A
Tuesday (week 2)	2.2 B	2.2 B	2.1 B	2.3 B
Thursday (week 2)	2.3 C	2.4 C	2.1 C	2.2 C
Lecture (week 3)	3.3 A	3.4 A	3.2 A	3.1 A
Tuesday (week 3)	3.4 B	3.3 B	3.2 B	3.1 B
Thursday (week 3)	3.4 C	3.2 C	3.1 C	3.3 C
Lecture (week 4)	4.2 A	4.3 A	4.1 A	4.4 A
Tuesday (week 4)	4.3 B	4.1 B	4.4 B	4.2 B
Thursday (week 4)	4.2 C	4.4 C	4.3 C	4.1 B
Lecture (week 5)	5.2 A	5.4 A	5.3 A	5.1 A
Tuesday (week 5)	5.1 B	5.3 B	5.2 B	5.4 B
Thursday (week 5)	5.4 C	5.2 C	5.3 C	5.1 C
Lecture (week 6)	6.4 A	6.2 A	6.1 A	6.3 A
Tuesday (week 6)	6.4 B	6.2 B	6.1 B	6.3 B
Thursday (week 6)	6.4 C	6.2 C	6.1 C	6.3 C

### **Appendix H: Video Sampling Procedure (Con't)**

As demonstrated in Table 2, the video clips for each study consisted of a video clip from the lecture, Tuesday and Thursday exercise sessions across all six weeks, with no repeat video clips. The video clips were separated into unique groups for each study in the tool testing phase, but the entire video sample for each of the lectures, Tuesday and Thursday exercise sessions was used for the Field Study phase of this research project.

### Appendix I: Initial *Combined* PT BCT List For Item Reduction

#	PT BCT from Literature
1	Education
2	Advice
3	Distraction
4	Pacing
5	Coping Strategies
6	Graded Exercise
7	Graded Exposure
8	Visualization
9	Goal setting
10	Positive Reinforcement
11	Stress Management
12	Relaxation
13	Cognitive Restructuring
14	Body Mechanics
15	Basic Skills Training
16	Advanced Skills Acquisition
17	Functional Skills Acquisition
18	Homework
19	Diary Maintenance
20	Maintenance and Relapse Prevention
21	Motivation
22	Problem Solving Strategies
23	Provision of Written Materials
24	Modeling
25	Self-reinforcing
26	Physiotherapist Monitoring
27	Social Management
28	Booster sessions
29	Transition to Internal Reinforcement
30	Activities
31	Shaping
32	A behavioural contract
33	Barriers
34	Information on consequences
35	Functional behavioural analysis
36	Behaviour health link
37	Review goals
#	BCT from Psychology Checklist <sup>1</sup>
38	Provide general information linking behaviour to health
39	Provide information on consequences
40	Provide information about others' approval
41	Prompt intention formation

## Appendix I: Initial Combined PT BCT List for Item Reduction

#	BCT from Psychology Checklist <sup>1</sup>
42	Prompt barrier identification
43	Provide general encouragement
44	Set graded tasks
45	Provide Instruction
46	Model/ demonstrate the behaviour
47	Prompt specific goal setting
48	Prompt review of behavioural goals
49	Prompt self-monitoring of behaviour
50	Provide feedback on performance
51	Provide contingent rewards
52	Teach to use prompts/ cues
53	Agree behavioural contract
54	Prompt practice
55	Use follow up prompts
56	Provide opportunities for social comparison
57	Plan social support/ social change
58	Prompt identification as role model
59	Prompt self talk
60	Relapse prevention
61	Stress management
62	Motivational interviewing
63	Time Management

**Appendix J: Decision Process (1): For The *Modified* PT BCT Checklist.**

<b>#</b>	<b>PT BCT from Literature</b>	<b>Duplicate with Psychology BCT (Abraham and Michie)?</b>	<b>Action</b>	<b>Discussion</b>
<b>1</b>	Education	No	Deleted	Too general, should be incorporated with relevant BCT
<b>2</b>	Advice	No	Combined	Part of cognitive restructuring
<b>3</b>	Distraction	No	Combined	A coping strategy to deal with pain, incorporated under problem solving/ dealing with flare-ups
<b>4</b>	Pacing	No	Maintained	Commonly identified in physiotherapy literature
<b>5</b>	Coping Strategies	No	Deleted	Ways of coping, not a specific technique, incorporated under problem solving / dealing with Flare-ups
<b>6</b>	Graded Exercise	Yes, Set Graded Tasks	Maintained/ <b>Duplicate</b>	Used a combination of wording, <i>setting graded activities or exercises</i>
<b>7</b>	Graded Exposure	No	Maintained	Increasingly prevalent in PT literature
<b>8</b>	Visualization	No	Maintained	Notable presence in PT literature
<b>9</b>	Goal setting	Yes, Prompt specific goal setting	Maintained/ <b>Duplicate</b>	Used Abraham and Michie's wording, encourages patient ownership
<b>10</b>	Positive Reinforcement	Yes, Provide Contingent Rewards	Maintained/ <b>Duplicate</b>	Used a combination of the wording, <i>providing positive reinforcement</i> but positive reinforcement was more reflective of physiotherapy terminology
<b>11</b>	Stress Management	Yes, Stress Management	Maintained/ <b>Duplicate</b>	No change

Psychology Checklist<sup>1</sup>

**Appendix J: Decision Process(1): For The *Modified* PT BCT Checklist**

<b>#</b>	<b>PT BCT from Literature</b>	<b>Duplicate with Psychology BCT (Abraham and Michie)?</b>	<b>Action</b>	<b>Discussion</b>
<b>12</b>	Relaxation	No	Maintained	Common in PT literature and not just for dealing with flare-ups
<b>13</b>	Cognitive Restructuring	No	Maintained	Addresses fear issues and found commonly in the PT literature
<b>14</b>	Body Mechanics	No	Combined	Included as part of <i>prompting physical skills acquisition</i>
<b>15</b>	Basic Skills Training	Yes, Prompt Practice	Modified/ <b>Duplicate</b>	Modified to reflect physical practice under <i>prompting physical skills acquisition</i>
<b>16</b>	Advanced Skills Acquisition	No	Collapsed	Physical Skills Acquisition
<b>17</b>	Functional Skills Acquisition	No	Collapsed	Physical Skills Acquisition
<b>18</b>	Homework	No	Maintained	Found throughout physiotherapy literature
<b>19</b>	Diary Maintenance	Yes, Prompt Self-monitoring of Behaviour	Maintained/ Duplicate	Abraham and Michie wording kept, more inclusive
<b>20</b>	Maintenance and Relapse Prevention	Yes, Relapse Prevention	Modified/ <b>Duplicate</b>	Modified to <i>problem solving/ dealing with flare-ups</i> to be more inclusive
<b>21</b>	Motivation	No	Deleted	Does not describe how to motivate and was therefore not helpful
<b>22</b>	Problem Solving Strategies	Yes, Maintenance and Relapse Prevention	Combined (already included above with maintenance and relapse prevention)	Incorporated under <i>problem solving dealing with flare-ups</i> which appeared frequently in the physiotherapy literature

Psychology Checklist<sup>1</sup>

**Appendix J: Decision Process(1): For The *Modified* PT BCT Checklist**

<b>#</b>	<b>PT BCT from Literature</b>	<b>Duplicate with Psychology BCT (Abraham and Michie)?</b>	<b>Action</b>	<b>Discussion</b>
<b>23</b>	Provision of Written Materials	No	Combined	Combined with <i>Prompting Intention formation</i> and <i>Prompting Homework</i> . Written materials for homework or for general reading to prompt intentions to change behaviours
<b>24</b>	Modeling	Yes, Provide Opportunities for Social Comparison	Modified/ <b>Duplicate</b>	Modified to Physiotherapy language – <i>prompting patient modeling/ social comparison</i>
<b>25</b>	Self-reinforcing	No	Modified	Changed to reflect the intent, <i>facilitating internal reinforcement</i>
<b>26</b>	Physiotherapist Monitoring	Yes, Provide Feedback on Performance	Modified/ <b>Duplicate</b>	Kept <i>Provide Feedback on Performance</i> , broader term, more encompassing
<b>27</b>	Social Management	Yes, Plan Social Support/ Social Change	Modified/ <b>Duplicate</b>	<i>Planning Social Support</i> maintained since the physiotherapist does not actually manage it, the patient must manage it
<b>28</b>	Booster sessions	Yes, Use of follow up prompts	Modified/ <b>Duplicate</b>	Physiotherapy language maintained
<b>29</b>	Transition to Internal Reinforcement	No	Collapsed	Facilitating internal Reinforcement reflects this concept
<b>30</b>	Activities	No	Combined	Advice to remain active was combined under cognitive restructuring as it is defined here

Psychology Checklist <sup>1</sup>

**Appendix J: Decision Process(1): For The *Modified* PT BCT Checklist**

<b>#</b>	<b>PT BCT from Literature</b>	<b>Duplicate with Psychology BCT (Abraham and Michie)?</b>	<b>Action</b>	<b>Discussion</b>
<b>31</b>	Shaping	No	Maintained	Physical shaping occurs within the physiotherapy literature
<b>32</b>	A behavioural contract	Yes, Agree to a behavioural contract	Maintained/ <b>Duplicate</b>	Abraham and Michie's wording is clearer and therefore maintained
<b>33</b>	Barriers	Yes, Prompt Barrier Identification	Maintained/ <b>Duplicate</b>	Abraham and Michie's wording is clearer and therefore maintained
<b>34</b>	Information on consequences	Yes, Provide Information on Consequences	Maintained/ <b>Duplicate</b>	Abraham and Michie's wording is clearer and therefore maintained
<b>35</b>	Functional behavioural analysis	No	Deleted	Analysis not a BCT
<b>36</b>	Behaviour health link	Yes, Provide General Information linking behaviour to health	Maintained/ <b>Duplicate</b>	Combination of wording maintained
<b>37</b>	Review goals	Yes, Prompt review of behavioural goals	Maintained/ <b>Duplicate</b>	Kept Abraham and Michie's wording, it is clearer

Psychology Checklist <sup>1</sup>



**Appendix K: Decision Process (2): Items Added To The *Modified* PT BCT Checklist From The Psychology Checklist**

<b>#</b>	<b>Abraham and Michie</b>	<b>Action</b>	<b>Reason</b>
<b>1</b>	Provide Information about others approval	Added to PT BCT	Unique to psychology checklist
<b>2</b>	Prompt Intention Formation	Added to PT BCT	Unique to psychology checklist
<b>3</b>	Model or Demonstrate the Behaviour	Added to PT BCT	Unique to psychology checklist (renamed Physiotherapist Modeling)
<b>4</b>	Prompt Identification as a Role Model	Added to PT BCT	Unique to psychology checklist (Role modeling)
<b>5</b>	Motivational Interviewing	Added to PT BCT	Unique to psychology checklist (Not mentioned in current literature but becoming more prevalent in PT practice)

Psychology Checklist<sup>1</sup>

**Appendix L: Decision Process (3): Items From Psychology Checklist Either Deleted Or Considered As Part Of Another Technique Within The *Modified* PT BCT Checklist**

<b>#</b>	<b>Abraham and Michie</b>	<b>Action</b>	<b>Reason</b>
<b>1</b>	Provide General Encouragement	Deleted	Decided this was good practice
<b>2</b>	Prompt Self-talk	Deleted	Not reflective of PT practice
<b>3</b>	Provide Instruction	Considered as part of another technique	Incorporated under <i>prompting physical skills acquisition</i>
<b>4</b>	Teach to Use prompts and Cues	Considered as part of another technique	Incorporated under <i>prompting homework</i>
<b>5</b>	Time management	Considered as part of another technique	Incorporated under <i>Problem Solving/ dealing with flare-ups</i>

Psychology checklist <sup>1</sup>

**Appendix M: Decision Process (4): BCT From Psychology Checklist Whose Wording Was Modified For The *Modified* PT BCT Checklist.**

<b>#</b>	<b>Modified (Abraham and Michie)</b>	<b>Action</b>	<b>New PT BCT (PT language)</b>
<b>1</b>	Model Demonstrate the Behaviour	Modified	<i>Physiotherapist Modeling</i>
<b>2</b>	Provide Contingent Rewards	Modified	<i>Providing Positive Reinforcement</i>
<b>3</b>	Provide Opportunities for social Comparison	Modified	<i>Prompting Patient Modeling/ social comparison</i>
<b>4</b>	Plan Social Support/ Social Change	Modified	<i>Planning Social Support</i>
<b>5</b>	Relapse Prevention	Modified	<i>Problem Solving/ Dealing with Flare-ups</i>
<b>6</b>	Prompt Practice	Modified	<i>Prompting Physical Skills acquisition</i>

**Appendix N: Modified PT BCT Checklist**

<b>#</b>	<b>BCT name</b>	<b>O</b>	<b>Comment</b>
1	<i>Setting <b>graded activities or exercises</b></i>		
2	<b>Modeling by PT</b>		
3	<i>Prompting <b>physical skills acquisition</b></i>		
4	<i>Providing <b>graded exposure</b></i>		
5	<b>Shaping</b>		
6	<i>Providing <b>positive reinforcement</b></i>		
7	<i>Prompting <b>patient modeling/ social comparison</b></i>		
8	<i>Prompting <b>role modeling</b></i>		
9	<b>Relaxation training</b>		
10	<b>Pacing</b>		
11	<i>Prompting <b>homework</b></i>		
12	<i>Providing general information on the <b>behaviour-health link</b></i>		
13	<i>Providing <b>info on consequences</b></i>		
14	<i>Providing <b>info on other's approval</b></i>		
15	<i>Prompting <b>intention formation</b></i>		
16	<b>Cognitive Restructuring</b>		
17	<i>Prompting <b>Visualization</b></i>		
18	<i>Providing <b>Stress Management</b></i>		
19	<i>Prompting <b>barrier identification</b></i>		
20	<i><b>Problem solving/ dealing with flare ups</b></i>		
21	<i>Planning <b>social support</b></i>		
22	<b>Motivational interviewing</b>		
23	<i>Prompting <b>specific goal setting</b></i>		
24	<i>Seeking agreement to a <b>behavioural contract</b></i>		
25	<i>Prompting <b>self- monitoring of behaviour</b></i>		
26	<i>Prompting <b>review of behavioural goals</b></i>		
27	<i>Facilitating <b>internal reinforcement</b></i>		
28	<i>Providing <b>feedback on performance</b></i>		
29	<i>Providing <b>booster sessions</b></i>		

# Appendix O: Summary Of Expert Survey Results

## Summary report

*Lists all the questions in the survey and displays a summary with chart for each question. Text input is not included.*

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## Appendix O: Summary Of Expert Survey Results (Con't)

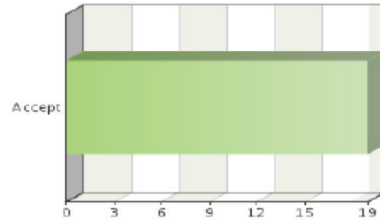
### Report info

<b>Report date:</b>	Monday, June 13, 2011 2:56:01 PM ADT
<b>Start date:</b>	Wednesday, April 20, 2011 4:14:00 PM ADT
<b>Stop date:</b>	Saturday, July 30, 2011 4:14:00 PM ADT
<b>Stored responses:</b>	19
<b>Number of completed responses:</b>	15
<b>Number of invitees:</b>	32
<b>Invitees that responded:</b>	19
<b>Invitee response rate:</b>	59%

## Appendix O: Summary Of Expert Survey Results (Con't)

### Question 1

Do you wish to continue with this survey?



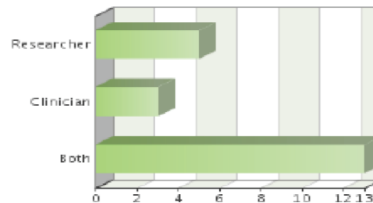
Frequency table

Items	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Accept	19	19	100%	100%	100%	100%
Not answered:	0	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	<b>-</b>	<b>100%</b>	<b>-</b>	<b>100%</b>	<b>-</b>
<b>Average:</b>	<b>1</b>	<b>Minimum:</b>	<b>1</b>	<b>Variance:</b>	<b>0</b>	
<b>Median:</b>	<b>1</b>	<b>Maximum:</b>	<b>1</b>	<b>Std. deviation:</b>	<b>0</b>	

Total answered: 19

### Question 2

Please indicate your area of expertise.



Frequency table

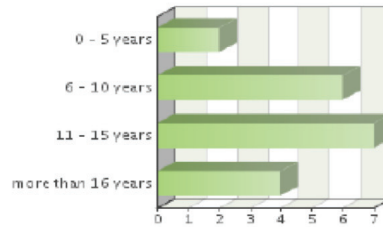
Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Researcher	5	5	23.81%	23.81%	26.32%	26.32%
Clinician	3	8	14.29%	38.1%	15.79%	42.11%
Both	13	21	61.9%	100%	68.42%	110.53%
<b>Sum:</b>	<b>21</b>	<b>-</b>	<b>100%</b>	<b>-</b>	<b>100%</b>	<b>-</b>
<b>Average:</b>	<b>2.63</b>	<b>Minimum:</b>	<b>1</b>	<b>Variance:</b>	<b>0.9</b>	
<b>Median:</b>	<b>3</b>	<b>Maximum:</b>	<b>3</b>	<b>Std. deviation:</b>	<b>0.95</b>	

Total answered: 19

## Appendix O: Summary Of Expert Survey Results (Con't)

### Question 3

Please indicate the number of years you have been practicing in the above role and using or examining the use of cognitive behavioural therapy techniques in physiotherapy practice.



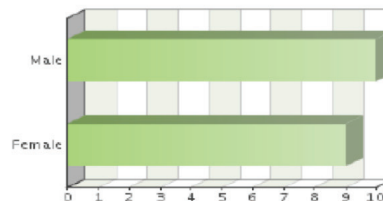
Frequency table

Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
0 - 5 years	2	2	10.53%	10.53%	10.53%	10.53%
6 - 10 years	6	8	31.58%	42.11%	31.58%	42.11%
11 - 15 years	7	15	36.84%	78.95%	36.84%	78.95%
more than 16 years	4	19	21.05%	100%	21.05%	100%
Not answered:	0	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	-	<b>100%</b>	-	<b>100%</b>	-
<b>Average:</b>	2.68	<b>Minimum:</b>	1	<b>Variance:</b>	0.89	
<b>Median:</b>	3	<b>Maximum:</b>	4	<b>Std. deviation:</b>	0.95	

Total answered: 19

### Question 4

Please indicate your gender.



Frequency table

Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Male	10	10	52.63%	52.63%	52.63%	52.63%
Female	9	19	47.37%	100%	47.37%	100%
Not answered:	0	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	-	<b>100%</b>	-	<b>100%</b>	-
<b>Average:</b>	1.47	<b>Minimum:</b>	1	<b>Variance:</b>	0.26	
<b>Median:</b>	1	<b>Maximum:</b>	2	<b>Std. deviation:</b>	0.51	

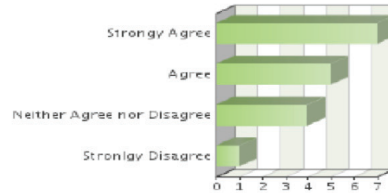
Total answered: 19



## Appendix O: Summary Of Expert Survey Results (Con't)

### Question 5

Shaping Prompting the practice of movements, activities and behaviours with immediate feedback on performance through visual, auditory, sensory /tactile or proprioceptive means 1,8 . This feedback is not directly related to goal oriented activities or behaviours.



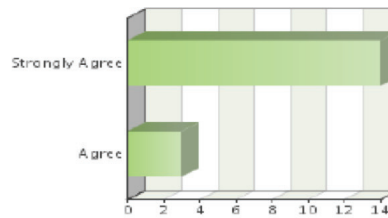
**Frequency table**

Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	7	7	36.84%	36.84%	41.18%	41.18%
Agree	5	12	26.32%	63.16%	29.41%	70.59%
Neither Agree nor Disagree	4	16	21.05%	84.21%	23.53%	94.12%
Strongly Disagree	1	17	5.26%	89.47%	5.88%	100%
Not answered:	2	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	<b>-</b>	<b>100%</b>	<b>-</b>	<b>100%</b>	<b>-</b>
<b>Average:</b>	<b>2</b>	<b>Minimum:</b>	<b>1</b>	<b>Variance:</b>	<b>1.25</b>	
<b>Median:</b>	<b>2</b>	<b>Maximum:</b>	<b>5</b>	<b>Std. deviation:</b>	<b>1.12</b>	

Total answered: 17

### Question 6

Problem Solving / Dealing With Flare-Ups - Providing education on the normalcy of flare-ups, the importance of activity resumption following flare-ups and the significance of having a plan in place to deal with flare-ups. This will also involve the collaborative development of strategies to cope with identified barriers and flare-ups and the patient- selected preferred course of action to deal with future obstacles as recorded in a personal maintenance plan 3, 9-11 .



**Frequency table**

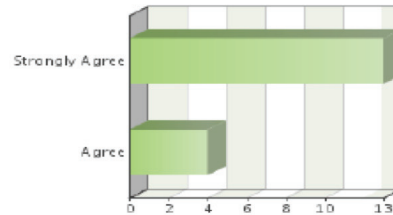
Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	14	14	73.68%	73.68%	82.35%	82.35%
Agree	3	17	15.79%	89.47%	17.65%	100%
Not answered:	2	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	<b>-</b>	<b>100%</b>	<b>-</b>	<b>100%</b>	<b>-</b>
<b>Average:</b>	<b>1.18</b>	<b>Minimum:</b>	<b>1</b>	<b>Variance:</b>	<b>0.15</b>	
<b>Median:</b>	<b>1</b>	<b>Maximum:</b>	<b>2</b>	<b>Std. deviation:</b>	<b>0.39</b>	

Total answered: 17

## Appendix O: Summary Of Expert Survey Results (Con't)

### Question 7

**Providing Feedback on Performance** Reviewing goal achievement through observation, tracking outcome measures or through patient-recorded data on activities, movements, exercises, behaviours or cognitions. This also involves identifying discrepancies between set goals and achieved performance, collaboratively discussing performance and making recommendations for future performance and goal setting 1 .



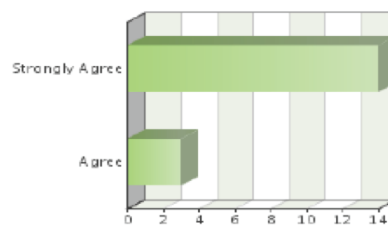
**Frequency table**

Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	13	13	68.42%	68.42%	76.47%	76.47%
Agree	4	17	21.05%	89.47%	23.53%	100%
Not answered:	2	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	-	<b>100%</b>	-	<b>100%</b>	-
<b>Average:</b>	1.24	<b>Minimum:</b>	1	<b>Variance:</b>	0.19	
<b>Median:</b>	1	<b>Maximum:</b>	2	<b>Std. deviation:</b>	0.44	

Total answered: 17

### Question 8

**Providing Graded Exposure** Giving information on and and performing measurement of fear avoidance, establishing an individual hierarchy of feared activities and the gradual and systemic exposure of patients in a graded fashion to the activities in their individual fear hierarchy. With this technique, physical movement or activity is used to directly challenge and disconfirm catastrophic expectations and fear of movement or reinjury resulting in reductions in the perceived threat value of the originally feared activity 5, 10, 12 .



**Frequency table**

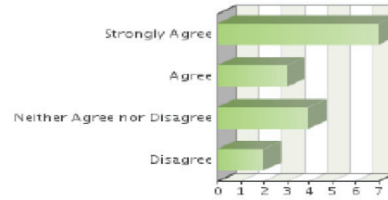
Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	14	14	73.68%	73.68%	82.35%	82.35%
Agree	3	17	15.79%	89.47%	17.65%	100%
Not answered:	2	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	-	<b>100%</b>	-	<b>100%</b>	-
<b>Average:</b>	1.18	<b>Minimum:</b>	1	<b>Variance:</b>	0.15	
<b>Median:</b>	1	<b>Maximum:</b>	2	<b>Std. deviation:</b>	0.39	

Total answered: 17

## Appendix O: Summary Of Expert Survey Results (Con't)

### Question 9

Prompting Intention Formation - Encouraging the patient to think generally about making positive behavioural changes and having them consider what that might physically look like 1 . This does not involve goal setting.



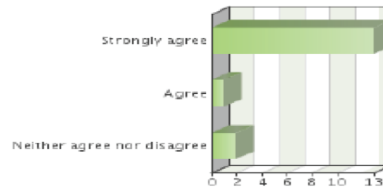
Frequency table

Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	7	7	36.84%	36.84%	43.75%	43.75%
Agree	3	10	15.79%	52.63%	18.75%	62.5%
Neither Agree nor Disagree	4	14	21.05%	73.68%	25%	87.5%
Disagree	2	16	10.53%	84.21%	12.5%	100%
Not answered:	3	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	<b>-</b>	<b>100%</b>	<b>-</b>	<b>100%</b>	<b>-</b>
<b>Average:</b>	2.06	<b>Minimum:</b>	1	<b>Variance:</b>	1.26	
<b>Median:</b>	2	<b>Maximum:</b>	4	<b>Std. deviation:</b>	1.12	

Total answered: 16

### Question 10

Providing Positive Reinforcement - Identifying and applying reinforcers (praise, visual feedback, physical encouragement) to correctly performed movements, activities or behaviours that are associated with short-term goals 7 .



Frequency table

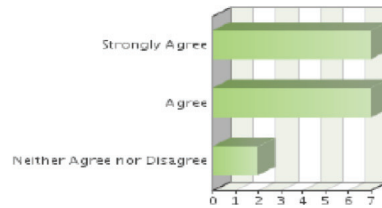
Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly agree	13	13	68.42%	68.42%	81.25%	81.25%
Agree	1	14	5.26%	73.68%	6.25%	87.5%
Neither agree nor disagree	2	16	10.53%	84.21%	12.5%	100%
Not answered:	3	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	<b>-</b>	<b>100%</b>	<b>-</b>	<b>100%</b>	<b>-</b>
<b>Average:</b>	1.31	<b>Minimum:</b>	1	<b>Variance:</b>	0.5	
<b>Median:</b>	1	<b>Maximum:</b>	3	<b>Std. deviation:</b>	0.7	

Total answered: 16

## Appendix O: Summary Of Expert Survey Results (Con't)

### Question 11

**Motivational Interviewing** Applying a specific set of steps involving "prompting the person to provide self-motivating statements and evaluations of own behavior to minimize resistance to change (includes motivational counseling)" 1 .



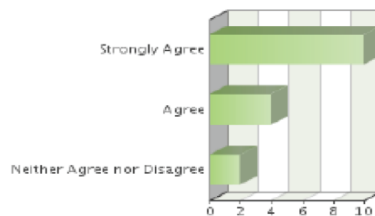
**Frequency table**

Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	7	7	36.84%	36.84%	43.75%	43.75%
Agree	7	14	36.84%	73.68%	43.75%	87.5%
Neither Agree nor Disagree	2	16	10.53%	84.21%	12.5%	100%
Not answered:	3	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	<b>-</b>	<b>100%</b>	<b>-</b>	<b>100%</b>	<b>-</b>
<b>Average:</b>	<b>1.69</b>	<b>Minimum:</b>	<b>1</b>	<b>Variance:</b>	<b>0.5</b>	
<b>Median:</b>	<b>2</b>	<b>Maximum:</b>	<b>3</b>	<b>Std. deviation:</b>	<b>0.7</b>	

Total answered: 16

### Question 12

**Stress Management** Providing information on the impact of stress on physical movements, function and pain perception and on ways of dealing with stress. This technique also prompts patients to consider the use of alternate techniques to deal with stress (relaxation, cognitive restructuring, skills acquisition, goal setting or pacing).



**Frequency table**

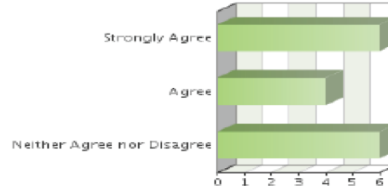
Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	10	10	52.63%	52.63%	62.5%	62.5%
Agree	4	14	21.05%	73.68%	25%	87.5%
Neither Agree nor Disagree	2	16	10.53%	84.21%	12.5%	100%
Not answered:	3	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	<b>-</b>	<b>100%</b>	<b>-</b>	<b>100%</b>	<b>-</b>
<b>Average:</b>	<b>1.5</b>	<b>Minimum:</b>	<b>1</b>	<b>Variance:</b>	<b>0.53</b>	
<b>Median:</b>	<b>1</b>	<b>Maximum:</b>	<b>3</b>	<b>Std. deviation:</b>	<b>0.73</b>	

Total answered: 16

## Appendix O: Summary Of Expert Survey Results (Con't)

### Question 13

Modeling by the Physiotherapist Using physical or video demonstration by the physiotherapist to illustrate properly performed movements, activities, behaviours or cognitions intended for the patient replication 7 .



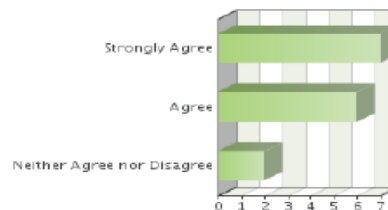
**Frequency table**

Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	6	6	31.58%	31.58%	37.5%	37.5%
Agree	4	10	21.05%	52.63%	25%	62.5%
Neither Agree nor Disagree	6	16	31.58%	84.21%	37.5%	100%
Not answered:	3	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	<b>-</b>	<b>100%</b>	<b>-</b>	<b>100%</b>	<b>-</b>
<b>Average:</b>	<b>2</b>	<b>Minimum:</b>	<b>1</b>	<b>Variance:</b>	<b>0.8</b>	
<b>Median:</b>	<b>2</b>	<b>Maximum:</b>	<b>3</b>	<b>Std. deviation:</b>	<b>0.89</b>	

Total answered: 16

### Question 14

Prompting Self-Monitoring of Behaviour Encouraging the patient to maintain a record of completed activities, exercises, behaviours or challenging of maladaptive cognitions through either diary maintenance or through questionnaire completion 1,3 .



**Frequency table**

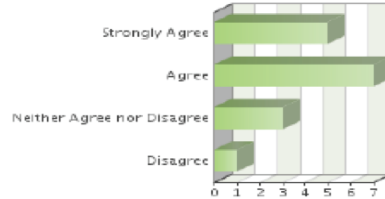
Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	7	7	36.84%	36.84%	46.67%	46.67%
Agree	6	13	31.58%	68.42%	40%	86.67%
Neither Agree nor Disagree	2	15	10.53%	78.95%	13.33%	100%
Not answered:	4	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	<b>-</b>	<b>100%</b>	<b>-</b>	<b>100%</b>	<b>-</b>
<b>Average:</b>	<b>1.67</b>	<b>Minimum:</b>	<b>1</b>	<b>Variance:</b>	<b>0.52</b>	
<b>Median:</b>	<b>2</b>	<b>Maximum:</b>	<b>3</b>	<b>Std. deviation:</b>	<b>0.72</b>	

Total answered: 15

## Appendix O: Summary Of Expert Survey Results (Con't)

### Question 15

Relaxation Training Providing information focusing on the role of relaxation in behaviour modification and health, in addition to the assessing and practicing of relaxation in the clinic and in "risk situations" 6 .



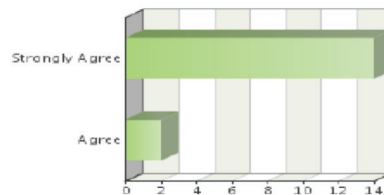
Frequency table

Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	5	5	26.32%	26.32%	31.25%	31.25%
Agree	7	12	36.84%	63.16%	43.75%	75%
Neither Agree nor Disagree	3	15	15.79%	78.95%	18.75%	93.75%
Disagree	1	16	5.26%	84.21%	6.25%	100%
Not answered:	3	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	-	<b>100%</b>	-	<b>100%</b>	-
<b>Average:</b>	<b>2</b>	<b>Minimum:</b>	<b>1</b>	<b>Variance:</b>	<b>0.8</b>	
<b>Median:</b>	<b>2</b>	<b>Maximum:</b>	<b>4</b>	<b>Std. deviation:</b>	<b>0.89</b>	

Total answered: 16

### Question 16

Prompting Specific Goal Setting - Collaboratively setting relevant, specific, measurable, achievable, realistic and timely goals to address identified activities that have either been decreased, discontinued or avoided by the patient due to their chronic pain.



Frequency table

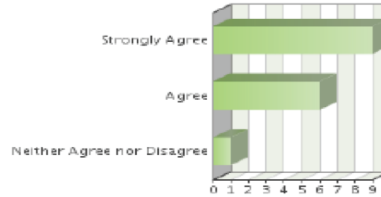
Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	14	14	73.68%	73.68%	87.5%	87.5%
Agree	2	16	10.53%	84.21%	12.5%	100%
Not answered:	3	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	-	<b>100%</b>	-	<b>100%</b>	-
<b>Average:</b>	<b>1.12</b>	<b>Minimum:</b>	<b>1</b>	<b>Variance:</b>	<b>0.12</b>	
<b>Median:</b>	<b>1</b>	<b>Maximum:</b>	<b>2</b>	<b>Std. deviation:</b>	<b>0.34</b>	

Total answered: 16

## Appendix O: Summary Of Expert Survey Results (Con't)

### Question 17

Providing General Information on the Behaviour Health Link Giving information on the neurophysiology of pain 2 and on the relationship between behaviour and health (importance of maintaining or increasing activity) 1 .



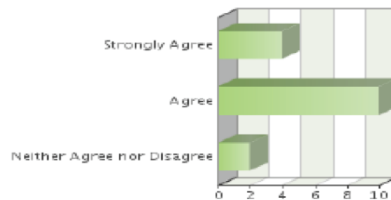
Frequency table

Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	9	9	47.37%	47.37%	56.25%	56.25%
Agree	6	15	31.58%	78.95%	37.5%	93.75%
Neither Agree nor Disagree	1	16	5.26%	84.21%	6.25%	100%
Not answered:	3	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	-	<b>100%</b>	-	<b>100%</b>	-
<b>Average:</b>	<b>1.5</b>	<b>Minimum:</b>	<b>1</b>	<b>Variance:</b>	<b>0.4</b>	
<b>Median:</b>	<b>1</b>	<b>Maximum:</b>	<b>3</b>	<b>Std. deviation:</b>	<b>0.63</b>	

Total answered: 16

### Question 18

Providing Information About Others Approval Giving information focused on the affect of others approval or disapproval of their behaviour, including the influences of family, coworkers, friends and society in general. This technique also involves providing guidance on how to maintain behaviour, such as performing exercises, despite the disapproval of others 1 .



Frequency table

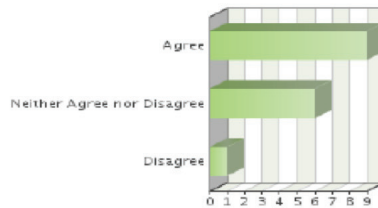
Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	4	4	21.05%	21.05%	25%	25%
Agree	10	14	52.63%	73.68%	62.5%	87.5%
Neither Agree nor Disagree	2	16	10.53%	84.21%	12.5%	100%
Not answered:	3	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	-	<b>100%</b>	-	<b>100%</b>	-
<b>Average:</b>	<b>1.88</b>	<b>Minimum:</b>	<b>1</b>	<b>Variance:</b>	<b>0.38</b>	
<b>Median:</b>	<b>2</b>	<b>Maximum:</b>	<b>3</b>	<b>Std. deviation:</b>	<b>0.62</b>	

Total answered: 16

## Appendix O: Summary Of Expert Survey Results (Con't)

### Question 19

Seeking Agreement to a Behavioural Contract Encouraging the patient to sign a contract that outlines the expected behaviour so that there is a written record of their "behavioural resolution witnessed by another" 1 .



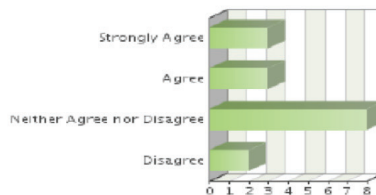
Frequency table

Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Agree	9	9	47.37%	47.37%	56.25%	56.25%
Neither Agree nor Disagree	6	15	31.58%	78.95%	37.5%	93.75%
Disagree	1	16	5.26%	84.21%	6.25%	100%
Not answered:	3	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	-	<b>100%</b>	-	<b>100%</b>	-
<b>Average:</b>	2.5	<b>Minimum:</b>	2	<b>Variance:</b>	0.4	
<b>Median:</b>	2	<b>Maximum:</b>	4	<b>Std. deviation:</b>	0.63	

Total answered: 16

### Question 20

Prompting Patient Role Modeling - Providing information focused on the importance of being an example to others with chronic pain in work or social settings and encouraging discussion about this activity. This technique also incorporates the provision of opportunities for patients to persuade others of the importance of adopting or changing behaviours 1 .



Frequency table

Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	3	3	15.79%	15.79%	18.75%	18.75%
Agree	3	6	15.79%	31.58%	18.75%	37.5%
Neither Agree nor Disagree	8	14	42.11%	73.68%	50%	87.5%
Disagree	2	16	10.53%	84.21%	12.5%	100%
Not answered:	3	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	-	<b>100%</b>	-	<b>100%</b>	-
<b>Average:</b>	2.56	<b>Minimum:</b>	1	<b>Variance:</b>	0.93	
<b>Median:</b>	3	<b>Maximum:</b>	4	<b>Std. deviation:</b>	0.96	

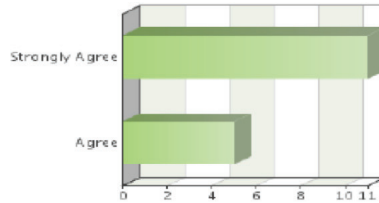
Total answered: 16



## Appendix O: Summary Of Expert Survey Results (Con't)

### Question 21

Setting Graded Activities or Exercises Collaboratively identifying relevant functional activities, and establishing a regulated, quota-based progression of those activities toward a predetermined level. This technique aims to increase functional ability while shifting attention from pain to activity and healthy behaviours 10,12 . This technique is often used with goal setting, positive reinforcement, and/or shaping.



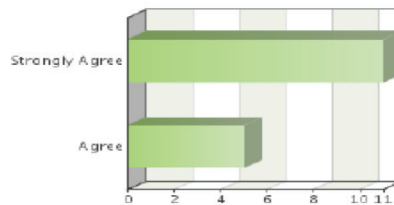
Frequency table

Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	11	11	57.89%	57.89%	68.75%	68.75%
Agree	5	16	26.32%	84.21%	31.25%	100%
Not answered:	3	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	<b>-</b>	<b>100%</b>	<b>-</b>	<b>100%</b>	<b>-</b>
<b>Average:</b>	<b>1.31</b>	<b>Minimum:</b>	<b>1</b>	<b>Variance:</b>	<b>0.23</b>	
<b>Median:</b>	<b>1</b>	<b>Maximum:</b>	<b>2</b>	<b>Std. deviation:</b>	<b>0.48</b>	

Total answered: 16

### Question 22

Prompting Homework Encouraging the practice of activities, movements, behaviours or monitoring and challenging of cognitions through the provision of written materials, verbal encouragement, use of cues or the creation of a patient-directed homework plan. This homework is to be performed outside the clinical setting 9 .



Frequency table

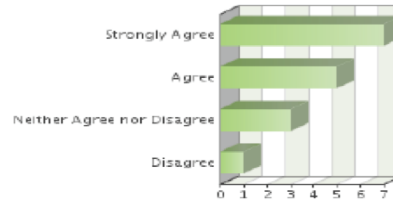
Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	11	11	57.89%	57.89%	68.75%	68.75%
Agree	5	16	26.32%	84.21%	31.25%	100%
Not answered:	3	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	<b>-</b>	<b>100%</b>	<b>-</b>	<b>100%</b>	<b>-</b>
<b>Average:</b>	<b>1.31</b>	<b>Minimum:</b>	<b>1</b>	<b>Variance:</b>	<b>0.23</b>	
<b>Median:</b>	<b>1</b>	<b>Maximum:</b>	<b>2</b>	<b>Std. deviation:</b>	<b>0.48</b>	

Total answered: 16

## Appendix O: Summary Of Expert Survey Results (Con't)

### Question 23

Providing Booster Sessions Planning and performing patient follow-up sessions beyond the period of direct patient care through phone calls, one-on-one or group sessions at short, medium or long-term time frames.



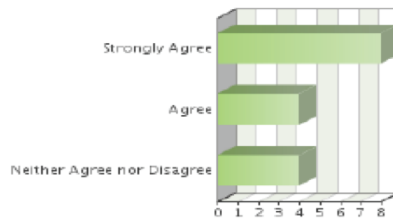
Frequency table

Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	7	7	36.84%	36.84%	43.75%	43.75%
Agree	5	12	26.32%	63.16%	31.25%	75%
Neither Agree nor Disagree	3	15	15.79%	78.95%	18.75%	93.75%
Disagree	1	16	5.26%	84.21%	6.25%	100%
Not answered:	3	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	-	<b>100%</b>	-	<b>100%</b>	-
<b>Average:</b>	1.88	<b>Minimum:</b>	1	<b>Variance:</b>	0.92	
<b>Median:</b>	2	<b>Maximum:</b>	4	<b>Std. deviation:</b>	0.96	

Total answered: 16

### Question 24

Providing Information on Consequences Giving information focusing on benefits and costs of performing or not performing the behaviour 1.



Frequency table

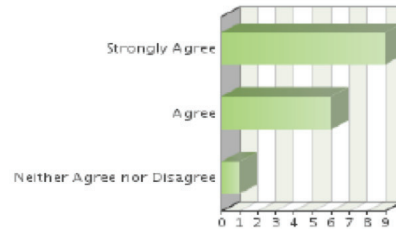
Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	8	8	42.11%	42.11%	50%	50%
Agree	4	12	21.05%	63.16%	25%	75%
Neither Agree nor Disagree	4	16	21.05%	84.21%	25%	100%
Not answered:	3	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	-	<b>100%</b>	-	<b>100%</b>	-
<b>Average:</b>	1.75	<b>Minimum:</b>	1	<b>Variance:</b>	0.73	
<b>Median:</b>	1.5	<b>Maximum:</b>	3	<b>Std. deviation:</b>	0.86	

Total answered: 16

## Appendix O: Summary Of Expert Survey Results (Con't)

### Question 25

Prompting Barrier Identification Encouraging the identification of future problems or specific obstacles (in writing) that may prevent goal attainment such as a lack of time, increased pain (flare-ups), and decreased social support 1 .



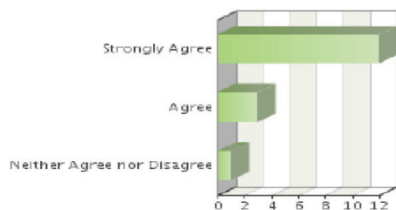
Frequency table

Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	9	9	47.37%	47.37%	56.25%	56.25%
Agree	6	15	31.58%	78.95%	37.5%	93.75%
Neither Agree nor Disagree	1	16	5.26%	84.21%	6.25%	100%
Not answered:	3	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	-	<b>100%</b>	-	<b>100%</b>	-
<b>Average:</b>	1.5	<b>Minimum:</b>	1	<b>Variance:</b>	0.4	
<b>Median:</b>	1	<b>Maximum:</b>	3	<b>Std. deviation:</b>	0.63	

Total answered: 16

### Question 26

Prompting Review of Behavioural Goals Encouraging the patient to reconsider previously set goals and intentions at regular, predetermined intervals and collaboratively discussing the status of those goals at regular predetermined intervals 1,10 .



Frequency table

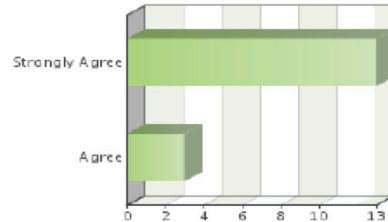
Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	12	12	63.16%	63.16%	75%	75%
Agree	3	15	15.79%	78.95%	18.75%	93.75%
Neither Agree nor Disagree	1	16	5.26%	84.21%	6.25%	100%
Not answered:	3	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	-	<b>100%</b>	-	<b>100%</b>	-
<b>Average:</b>	1.31	<b>Minimum:</b>	1	<b>Variance:</b>	0.36	
<b>Median:</b>	1	<b>Maximum:</b>	3	<b>Std. deviation:</b>	0.6	

Total answered: 16

## Appendix O: Summary Of Expert Survey Results (Con't)

### Question 27

**Pacing** Providing information focused on the over-activity /under-activity cycle and how to prevent it ("activity scheduling, reducing the speed of activities, scheduling breaks, maintaining a constant pace, separating tasks into manageable components, or setting quotas") 9 . This technique also includes the prompting of practice in the clinical setting and in risk situations. The intent is to empower patients to gradually increase their activity level without increasing pain 9 .



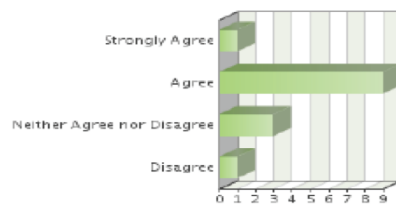
**Frequency table**

Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	13	13	68.42%	68.42%	81.25%	81.25%
Agree	3	16	15.79%	84.21%	18.75%	100%
Not answered:	3	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	<b>-</b>	<b>100%</b>	<b>-</b>	<b>100%</b>	<b>-</b>
<b>Average:</b>	1.19	<b>Minimum:</b>	1	<b>Variance:</b>	0.16	
<b>Median:</b>	1	<b>Maximum:</b>	2	<b>Std. deviation:</b>	0.4	

Total answered: 16

### Question 28

**Prompting Visualization** Prompting the patient to imagine the risk situations and to see themselves successfully completing a feared or at risk activity, movement or behaviour in a variety of settings from the clinic to the work or home environment while physically performing the activity, movement or behaviour in the clinic.



**Frequency table**

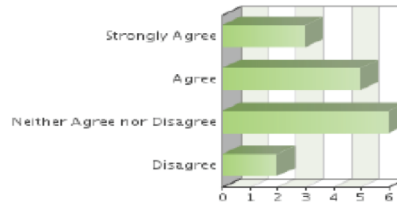
Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	1	1	5.26%	5.26%	7.14%	7.14%
Agree	9	10	47.37%	52.63%	64.29%	71.43%
Neither Agree nor Disagree	3	13	15.79%	68.42%	21.43%	92.86%
Disagree	1	14	5.26%	73.68%	7.14%	100%
Not answered:	5	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	<b>-</b>	<b>100%</b>	<b>-</b>	<b>100%</b>	<b>-</b>
<b>Average:</b>	2.29	<b>Minimum:</b>	1	<b>Variance:</b>	0.53	
<b>Median:</b>	2	<b>Maximum:</b>	4	<b>Std. deviation:</b>	0.73	

Total answered: 14

## Appendix O: Summary Of Expert Survey Results (Con't)

### Question 29

Prompting Patient Modeling/ Social Comparison - Encouraging patients to physically demonstrate an appropriately performed movement, activity or behaviour to other patients in a group setting. This may also be achieved through the use of video demonstrations of a patient modeling an appropriately performed movement, activity or behaviour 7 .



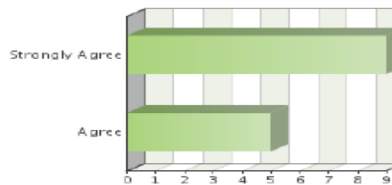
Frequency table

Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	3	3	15.79%	15.79%	18.75%	18.75%
Agree	5	8	26.32%	42.11%	31.25%	50%
Neither Agree nor Disagree	6	14	31.58%	73.68%	37.5%	87.5%
Disagree	2	16	10.53%	84.21%	12.5%	100%
Not answered:	3	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	<b>-</b>	<b>100%</b>	<b>-</b>	<b>100%</b>	<b>-</b>
<b>Average:</b>	<b>2.44</b>	<b>Minimum:</b>	<b>1</b>	<b>Variance:</b>	<b>0.93</b>	
<b>Median:</b>	<b>2.5</b>	<b>Maximum:</b>	<b>4</b>	<b>Std. deviation:</b>	<b>0.96</b>	

Total answered: 16

### Question 30

Cognitive Restructuring Providing information on pain and its meaning, reassurance that there is nothing seriously wrong, use of vignettes or videos to demonstrate how cognitions can interfere with their health and behaviours, discussion of coping strategies, encouraging the patient to challenge maladaptive cognitions and to refocus the patient on goal accomplishment instead of pain 4,7,11 .



Frequency table

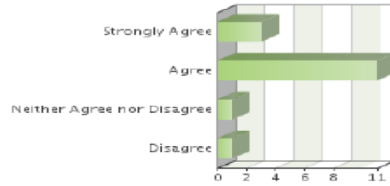
Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	9	9	47.37%	47.37%	64.29%	64.29%
Agree	5	14	26.32%	73.68%	35.71%	100%
Not answered:	5	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	<b>-</b>	<b>100%</b>	<b>-</b>	<b>100%</b>	<b>-</b>
<b>Average:</b>	<b>1.36</b>	<b>Minimum:</b>	<b>1</b>	<b>Variance:</b>	<b>0.25</b>	
<b>Median:</b>	<b>1</b>	<b>Maximum:</b>	<b>2</b>	<b>Std. deviation:</b>	<b>0.5</b>	

Total answered: 14

## Appendix O: Summary Of Expert Survey Results (Con't)

### Question 31

Planning Social Support Prompting the patient to consider and establish a buddy system or social support system for maintenance or improvement of their current activity level or behaviour. This may be recorded as part of a personal maintenance plan during problem solving 1 .



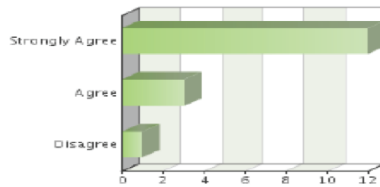
Frequency table

Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	3	3	15.79%	15.79%	18.75%	18.75%
Agree	11	14	57.89%	73.68%	68.75%	87.5%
Neither Agree nor Disagree	1	15	5.26%	78.95%	6.25%	93.75%
Disagree	1	16	5.26%	84.21%	6.25%	100%
Not answered:	3	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	-	<b>100%</b>	-	<b>100%</b>	-
<b>Average:</b>	<b>2</b>	<b>Minimum:</b>	<b>1</b>	<b>Variance:</b>	<b>0.53</b>	
<b>Median:</b>	<b>2</b>	<b>Maximum:</b>	<b>4</b>	<b>Std. deviation:</b>	<b>0.73</b>	

Total answered: 16

### Question 32

Prompting Physical Skills Acquisition - Providing information on and practicing of basic skills (such as muscle activation and motor coordination), chaining of the basic skills to perform advanced skills and the generalization of those skills to activities associated with pain and /or disability in home, social and work environments 3 .



Frequency table

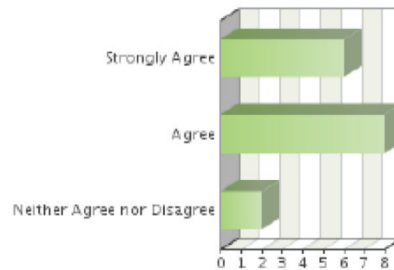
Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	12	12	63.16%	63.16%	75%	75%
Agree	3	15	15.79%	78.95%	18.75%	93.75%
Disagree	1	16	5.26%	84.21%	6.25%	100%
Not answered:	3	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	-	<b>100%</b>	-	<b>100%</b>	-
<b>Average:</b>	<b>1.38</b>	<b>Minimum:</b>	<b>1</b>	<b>Variance:</b>	<b>0.65</b>	
<b>Median:</b>	<b>1</b>	<b>Maximum:</b>	<b>4</b>	<b>Std. deviation:</b>	<b>0.81</b>	

Total answered: 16

## Appendix O: Summary Of Expert Survey Results (Con't)

### Question 33

Facilitating Internal Reinforcement - Prompting the patient to take credit for their achievements though the identification and use of internal reinforcers (self-praise, small treats, recording and recognizing progress, a night out, a new pair of shoes). This technique also involves highlighting goal achievements, performance improvement, and increases in function or duration of activities all while decreasing the frequency of positive reinforcement from consistent, to occasional to withdrawal 8 .



Frequency table

Choices	Absolute frequency	Cum. absolute frequency	Relative frequency	Cum. relative frequency	Adjusted relative frequency	Cum. adjusted relative frequency
Strongly Agree	6	6	31.58%	31.58%	37.5%	37.5%
Agree	8	14	42.11%	73.68%	50%	87.5%
Neither Agree nor Disagree	2	16	10.53%	84.21%	12.5%	100%
Not answered:	3	19	0%	100%	-	-
<b>Sum:</b>	<b>19</b>	-	<b>100%</b>	-	<b>100%</b>	-
<b>Average:</b>	1.75	<b>Minimum:</b>	1	<b>Variance:</b>	0.47	
<b>Median:</b>	2	<b>Maximum:</b>	3	<b>Std. deviation:</b>	0.68	
Total answered: 16						

### Question 34

Thank you for taking the time to read about our survey.

**Appendix P: Comparison Of Psychology Checklist<sup>1</sup> To The Proposed PT  
BCT Checklist**

<b>BCT #</b>	<b>Abraham and Michie</b>	<b>PT BCT Checklist</b>
<b>1</b>	Set graded tasks	Setting <b>graded activities</b> or exercises
<b>2</b>	Model/ demonstrate the behaviour	<i>Physiotherapist Modeling</i>
<b>3</b>	Prompt Practice	<i>Prompting <b>physical skills</b> acquisition</i>
<b>4</b>	No Overlap	<i>Providing <b>graded exposure</b></i>
<b>5</b>	No Overlap	<b>Shaping</b>
<b>6</b>	Provide contingent rewards	<i>Providing <b>positive reinforcement</b></i>
<b>7</b>	Provide opportunities for social comparison	<i>Prompting <b>patient modeling/</b> social comparison</i>
<b>8</b>	Prompt identification as role model	<i>Prompting <b>role modeling</b></i>
<b>9</b>	No Overlap	<b>Relaxation training</b>
<b>10</b>	No Overlap	<b>Pacing</b>
<b>11</b>	No Overlap	<i>Prompting <b>homework</b></i>
<b>12</b>	Provide general information linking behaviour to health	<i>Providing general information on the <b>behaviour-health link</b></i>
<b>13</b>	Provide information on consequences	<i>Providing <b>information on consequences</b></i>
<b>14</b>	Provide information about others' approval	<i>Providing <b>information on other's approval</b></i>
<b>15</b>	Prompt intention formation	<i>Prompting <b>intention formation</b></i>
<b>16</b>	No Overlap	<b>Cognitive Restructuring</b>
<b>17</b>	No Overlap	<i>Prompting <b>Visualization</b></i>
<b>18</b>	Stress management	<i>Providing <b>Stress Management</b></i>
<b>19</b>	Prompt barrier identification	<i>Prompting <b>barrier identification</b></i>
<b>20</b>	Relapse prevention	<i><b>Problem solving/ dealing with flare ups</b></i>



**Appendix P: Comparison of Psychology Checklist<sup>1</sup> To The Proposed PT BCT Checklist (Con't)**

<b>BCT #</b>	<b>Abraham and Michie</b>	<b>PT BCT Checklist</b>
<b>21</b>	Plan social support/ social change	<i>Planning <b>social support</b></i>
<b>22</b>	Motivational interviewing	<i><b>Motivational interviewing</b></i>
<b>23</b>	Prompt specific goal setting	<i>Prompting <b>specific goal setting</b></i>
<b>24</b>	Agree behavioural contract	<i>Seeking agreement to a <b>behavioural contract</b></i>
<b>25</b>	Prompt self-monitoring of behaviour	<i>Prompting <b>self-monitoring</b> of behaviour</i>
<b>26</b>	Prompt review of behavioural goals	<i>Prompting <b>review of behavioural goals</b></i>
<b>27</b>	No Overlap	<i>Facilitating <b>internal reinforcement</b></i>
<b>28</b>	Provide feedback on performance	<i>Providing <b>feedback on performance</b></i>
<b>29</b>	Use follow up prompts	<i>Providing <b>booster sessions</b></i>
<b>Overlap in PT BCT (%)</b>	21/ 29*100 = 72%	(BCT A&M=BCT PT BCT)/ (BCT in PT BCT) * 100 = overlap (%)
<b>Considered as part of another technique</b>	Time Management	<i>Problem solving/ dealing with flare-ups</i>
	Teach to use prompts/ cues	<i>Prompting Homework</i>
	Provide Instruction	<i>Prompting Physical Skills Acquisition</i>
<b>Total overlap (%)</b>	24/29*100 = 83%	(BCT A&M=BCT PT BCT + combined (BCT A&M into PT BCT))/ (BCT in PT BCT) * 100 = Total overlap (%)
<b>BCT Not Included</b>	6 Provide general encouragement	Thought of as good practice (deleted)
	22 Prompt self talk	Not noted in physiotherapy practice (deleted)

## Appendix Q: Final PT BCT Companion Document

### Behavioural Techniques

1. **Setting graded activities or exercises**<sup>1, 80, 150</sup>
    - ◇ Collaboratively identifying important / relevant, suspended/ restricted activities
    - ◇ Explaining treatment rationale
    - ◇ Establishing a baseline activity tolerance
    - ◇ Collaboratively setting quotas (approx. 80% of baseline)
    - ◇ Instructing patient to complete selected activity to predetermined quotas
    - ◇ Assessing response and collaboratively adjust quotas
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2. **Modeling by the Physiotherapist**<sup>1, 81, 82, 98</sup>

- ◇ Physically demonstrating a movement, activity or behaviour
  - ◇ Verbally describing a personal situation, experience, self assessments or movements
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## Appendix Q: Final PT BCT Companion Document (Con't)

### 3. **Prompting Physical Skills Acquisition**<sup>21, 24, 79</sup>

- ◇ Providing knowledge of back biomechanics, fitness principles
  - ◇ Encouraging practice of basic skills required to achieve a goal (voluntary activation of muscles, coordination of motor skills, strength, endurance, flexibility and aerobic fitness)
  - ◇ Encouraging the chaining of basic skills to perform advanced or applied skills
  - ◇ Encouraging generalization of advanced skills to activities associated with pain and or disability
  - ◇ Encouraging exercise progression
  - ◇ Identifying exercise cues for correct performance such as indicating where a stretch should be felt.
  - ◇ Incorporating immediate therapist monitoring, “how does it feel?”
  - ◇ Confirming knowledge, abilities and skills through physical performance and consideration of the purpose of an exercise, “What are we trying to do?”
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### 4. **Graded Exposure**<sup>151</sup>

- ◇ Measuring levels of fear avoidance
  - ◇ Collaboratively establishing a hierarchy of feared activities
  - ◇ Educating on fear avoidance, neuroplasticity, exposure therapy and or safety of the tasks
  - ◇ Prompting gradual and systematic exposure in a graded fashion to activities in the individual fear hierarchy
  - ◇ Progressing to the next feared activity when the patient’s fear avoidance concerning the previous activity has been decreased
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## Appendix Q: Final PT BCT Companion Document (Con't)

### 5. **Shaping**<sup>1, 152</sup>

- ◇ Providing immediate feedback to an individual through visual, auditory, sensory /tactile or proprioceptive means to correct physical movements, activities, behaviours and identified cognitions
  - ◇ Used closely with technique 3, prompting physical skills acquisition.
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### 6. **Providing Positive Reinforcement**<sup>1, 80, 152</sup>

- ◇ Identifying individual patient reinforcers
  - ◇ Providing immediate, positive and external reinforcement of movements, activities or behaviours that are associated with short term goals which are correctly performed (praise, visual feedback, physical encouragement)
  - ◇ Used closely with techniques 3 and 5, to create the desired movement or behaviour.
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### 7. **Prompting Patient Modeling / Social Comparison**<sup>1, 81, 82</sup>

- ◇ Encouraging patient demonstration of a movement, activity or behaviour to other patients in a group setting and critiquing those performed movement patterns for “observational learning”
  - ◇ Encouraging patients to verbally describe a personal situation, experience, self assessment or movement
  - ◇ Relating experiences, scenarios, comments from other comparable patients outside the class and using them as examples
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**Appendix Q: Final PT BCT Companion Document (Con't)**

**8. Role Modeling<sup>1, 81, 82</sup>**

- ◇ Educating patients on how to be an example of healthy behaviours to others with chronic pain in a clinical, home or work setting
  - ◇ Encouraging and/or providing opportunities for patients to persuade others of the importance of adopting or changing behaviour in a clinical, home or work setting
  - ◇ Identifying others who exemplify attitudes, behaviours and using them verbally, in pictures, real life observation or video to explain a concept (sports icons, other individuals)
  - ◇ Identifying a patient within the treatment program who exemplifies the desired beliefs, attitudes, behaviours being encouraged and then using their situation to explain a concept either through verbal description or physical demonstration
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**9. Relaxation Training<sup>99</sup>**

- ◇ Educating on the role of relaxation (break pain-tension-pain cycle, deal with stress, means of dealing with their pain)
  - ◇ Assessing and practice breathing
  - ◇ Practicing the application of relaxation (progressive relaxation, guided fantasy)
  - ◇ Educating on the application of relaxation in “risk” situations and every day settings outside the clinic
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## Appendix Q: Final PT BCT Companion Document (Con't)

### 10. **Pacing**<sup>80, 120</sup>

- ◇ Educating on the over-activity-under activity cycle
  - ◇ Educating on activity scheduling, reducing speed of activities, scheduling breaks, maintaining a constant pace or separating tasks into manageable components, setting quotas
  - ◇ Educating on gradually increasing activity levels without significant increases in pain
  - ◇ Prompting pacing practice especially during “at risk” activities (home or clinic)
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### 11. **Prompting Homework**<sup>1, 120</sup>

- ◇ Encouraging practice of activities, movements, behaviours or monitoring and challenging of cognitions outside the clinical setting, often outlining what exercise, how to determine the amount and frequency.
  - ◇ Providing written materials, verbal instruction and encouragement concerning the performance of established activities outside the clinical setting
  - ◇ Encouraging the use of cues to remind patients to practice (time of day, alarm on watch or computer)
  - ◇ Encouraging the patient to outline a plan, either verbally or in writing, to perform homework
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**Appendix Q: Final PT BCT Companion Document (Con't)**

**Cognitive Techniques**

12. **Providing General Information on the Behaviour Health Link**<sup>1, 79</sup>

- ◇ Providing education concerning the relationship between behaviour and health (importance of maintaining or increasing activity)
- ◇ Providing information on the facts about the relevant condition, such as prevalence and persistence of LBP, and what behaviours may result due to this condition

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13. **Providing Information on Consequences**<sup>1, 79</sup>

- ◇ Providing information focusing on the “benefits and costs of action or inaction”, performing or not performing the behaviour

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14. **Providing information About Other’s Approval**<sup>1</sup>

- ◇ Providing information about the affect of other’s approval or disapproval on their behaviour, influences of their society
- ◇ Providing guidance on how maintain behaviour such as performing exercises, despite the disapproval of others

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## Appendix Q: Final PT BCT Companion Document (Con't)

### 15. **Prompting Intention Formation**<sup>1</sup>

- ◇ Encouraging the patient to consider making positive behavioural changes and what that might look like.
  - ◇ Encouraging the patient to make a “behavioural resolution”
  - ◇ Giving patients the opportunity to make changes by leaving the choice up to them such as telling them they can stay and perform exercises, or go home early, let patients chose a course of action
  - ◇ Prompting the patient to consider ways of fitting exercise and activity into their lives
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### 16. **Cognitive Restructuring**<sup>37, 152, 153</sup>

- ◇ Providing education concerning pain and its meaning, hurt does not equal harm, the role of maladaptive thoughts and emotions
  - ◇ Providing education on the neurophysiology of pain
  - ◇ Reassuring patients that despite their pain, there is nothing seriously wrong
  - ◇ Prompting patients to demonstrate their understanding of pain
  - ◇ Prompting examination of thoughts concerning movement, activities, and behaviours
  - ◇ Educating on how inaccurate thoughts may interfere with improvements in their behaviours through vignettes and examples (may be used with techniques 2 and 7, modeling by the physiotherapist and prompting patient modeling/social comparison)
  - ◇ Prompting the challenging of cognitions
  - ◇ Prompting the focus on function or goal accomplishment, instead of pain
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**Appendix Q: Final PT BCT Companion Document (Con't)**

**17. Visualization<sup>1</sup>**

- ◇ Prompting the envisioning of the “risk” environment or setting when performing physical activities within the clinic.
  - ◇ Prompting the patient to “see” themselves successfully completing a feared or “risk” activity, movement or behaviour in a variety of settings from the clinic to the work or home environment
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**18. Stress Management<sup>1</sup>**

- ◇ Educating on the impact of stress on physical movements, function and pain perception
  - ◇ Educating on means of dealing with stress (this may include the use of techniques: 9, relaxation, 10, pacing and 16, cognitive restructuring)
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**19. Prompting Barrier Identification<sup>1</sup>**

- ◇ Encouraging the identification of future problems or specific obstacles to performance that may prevent goal attainment such as a lack of time, “increased pain (flare-ups), fearful thoughts and decreased social support”
  - ◇ Encouraging the identification of obstacles in writing
  - ◇ Encouraging the consideration of the home, work and social environment when developing a list of potential barriers
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## Appendix Q: Final PT BCT Companion Document (Con't)

### 20. Problem Solving / Maintenance and Dealing with Flare-ups<sup>1, 24, 120, 150, 153</sup>

- ◇ Providing education on flare-ups and indicating that they are normal and not a sign that back symptoms are worsening.
  - ◇ Providing education on coping strategies to deal with identified barriers (may include techniques 9, 10, 18: relaxation, pacing, stress management)
  - ◇ Encouraging activity resumption as soon as possible after a flare-up and stressing the importance of having a plan in place to resume activity
  - ◇ Prompting cognitive problem solving by collaboratively developing strategies to cope with identified barriers or flare-ups (setting criteria for visiting health care providers, maintenance and progression of their home exercise plan, activity modification or use of techniques 9 and 10, relaxation and pacing)
  - ◇ Prompting problem solving with focus on physical and functional activities
  - ◇ Prompting the selection of a preferred course of action and record a personal maintenance plan to deal with flare-ups or barriers
  - ◇ Reviewing the personal maintenance plan to clarify or collaboratively modify as necessary to ensure the patient is prepared to deal flare-ups or barriers
  - ◇ Relaying to the patients that physiotherapy support is available to assist with taught self-management strategies as required after discharge
  - ◇ Prompting maintenance by reminding patients of their newly acquired knowledge and problem solving skills (Techniques 21, planning social support, 23, prompting specific goal setting, 25, prompting self-monitoring of behaviour, 26, prompting review of behavioural goals and 27, facilitating internal reinforcement may also be highlighted)
  - ◇ Prompting the application of newly acquired knowledge to everyday situations
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**Appendix Q: Final PT BCT Companion Document (Con't)**

**21. Planning Social Support<sup>1</sup>**

- ◇ Prompting the consideration of how others could alter behaviour to provide help and/or instrumental social support
- ◇ Prompting the establishment of a “buddy” or social support system for maintenance or improvement of current activity levels or behaviours

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**Motivational Techniques**

**22. Motivational Interviewing<sup>1</sup>**

- ◇ Determining a patient’s readiness to change
- ◇ Discussing the decisional balance if the patient is not ready to change
- ◇ Prompting change using the decisional balance tool and discussion of replacing maladaptive behaviours
- ◇ Discussing other techniques to achieve desired behaviour (self-monitoring, shaping, recognize and reject negative stimuli, recognizing reinforcers)

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## Appendix Q: Final PT BCT Companion Document (Con't)

### 23. **Prompting Specific Goal Setting**<sup>1, 152</sup>

- ◇ Determining relevant activities that are either decreased or avoided due to pain and disability
  - ◇ Collaboratively setting specific, measureable, achievable, realistic and timely goals that will include the frequency, intensity, and duration of the outlined decreased or discontinued activities. Additionally, one of the following must be included, the where, when, how or with whom must be specified
  - ◇ Planning a time for collaborative goal review
  - ◇ Prompting the patient to consider and identify exercises that may be relevant for their specific goal setting, “You’re going to like this one... Those of you that find this one difficult...”
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### 24. **Establishing a behavioural contract**<sup>1</sup>

- ◇ Prompting the signing of a written contract witnessed by another that outlines the expected behaviour
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### 25. **Prompting self-monitoring of behaviour and cognitions**<sup>1, 24, 150</sup>

- ◇ Prompting the maintenance of a record of completed activities, exercises or behaviours through either a diary or questionnaire completion
  - ◇ Prompting the monitoring of the occurrence and challenging of maladaptive cognitions and behaviours
  - ◇ Encouraging patients to pay attention to what they are doing and should be doing in class as well as at home, a “self check in”
  - ◇ Encouraging patient monitoring through a regular check in with the physiotherapist.
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## Appendix Q: Final PT BCT Companion Document (Con't)

### 26. Prompting review of behavioural goals<sup>1, 150</sup>

- ◇ Encouraging the patient to reconsider previously set goals and intentions at regular intervals

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### 27. Facilitating Internal Reinforcement<sup>152</sup>

- ◇ Educating on the activities, movements, behaviours or cognitions to be reinforced
- ◇ Educating on the importance of taking credit for achievements, “you must be very pleased with your progress”
- ◇ Highlighting goal achievements, performance improvement, increases in function or duration of activities while decreasing the frequency of positive reinforcement from consistent, to occasional to complete withdrawal
- ◇ Prompting the identification and use of internal reinforcers (self-praise, small treats, recording and recognizing progress, a night out, a new pair of shoes)
- ◇ Confirming new knowledge and skills acquisition (may be used with technique 28, providing feedback on performance)
- ◇ Confirming skills application reasoning, “What should he do?”, “What do you do if you are asymmetrical?” “When and why should you do this exercise?”
- ◇ Managing expectations, “Some of you may not notice a change for six months but stick with it, and change will occur”
- ◇ Can be used with Technique 8, prompting role modeling

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## Appendix Q: Final PT BCT Companion Document (Con't)

### 28. Providing Feedback on Performance<sup>1, 80, 150, 154</sup>

- ◇ Providing summarized feedback on performance after reviewing goal achievements through observation, use of outcome measures, review of patient documented data on activities, movements, exercises, behaviours or cognitions
  - ◇ Identifying discrepancies between set goals and achieved performance, or discrepancies in relation to the performance of others
  - ◇ Collaboratively discussing performance and making recommendations for future performance and goal setting
  - ◇ Discussing in a group format, a summarized version of patient performance in general, “at the beginning of the class this was the most difficult exercise for all of you but now you are all performing it perfectly”
  - ◇ Often used with techniques 7, prompting patient modeling/ social comparison and 27, facilitating internal reinforcement
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### 29. Booster Sessions<sup>1</sup>

- ◇ Planning follow-up sessions beyond the period of direct patient care at short, medium or long-term follow-up time frames
  - ◇ Performing follow-up care through “phone calls, one-on-one or group sessions at short, medium or long-term follow-up time frames”
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