The Development and Testing of a Checklist to Study Behaviour Change Techniques used in a Treatment Programme for Canadian Armed Forces Members with Chronic Non-specific Low Back Pain

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ABSTRACT

Purpose: There are reports of increased use of a variety of behaviour change techniques (BCT) by physiotherapists and findings of beneficial effects of use. However, there is a lack of physiotherapy-specific definitions of these techniques, as well as a sense of how physiotherapists use them in practice. Through this study, the authors created and field tested a preliminary nomenclature and description for BCT in patients with chronic non-specific low back pain (CNSLBP). **Methods:** Items for the Physiotherapy Behaviour Change Technique (PT-BCT) checklist were derived from a nomenclature created for use in psychology and also from publications of studies using cognitive behaviour therapy-based approaches in physiotherapy. Content validity was tested via survey of clinical and research experts. Videotapes of a 6-week patient self-management rehabilitation programme were used for training, reliability testing, and field testing of the PT-BCT checklist. **Results:** Checklist items were endorsed by the majority of experts surveyed; intra- and inter-rater reliability were moderate to high. In the field study, a broad range of BCT types (behavioural, cognitive, and motivational) were observed in both classroom and gym settings. **Conclusions:** The BCT nomenclature arising from this study and the PT-BCT checklist will be useful to further explore behaviour change in physiotherapy practice. The observation in this study that BCT were integrated into physiotherapists' practice illustrates how physiotherapists can play a role in changing behaviour, specifically in the presence of CNSLBP.

Key Words: health behavior; low back pain; psychological techniques; rehabilitation.

RÉSUMÉ

Objectif : On signale une utilisation accrue, par les physiothérapeutes, de tout un éventail de techniques de modification du comportement (TMC) et l'on constate des effets bénéfiques. Il manque toutefois des définitions de ces techniques qui sont spécifiques à la physiothérapie et l'on ne sait pas trop comment nous les avons utilisées dans la pratique. Cette étude a créé une nomenclature et une description préliminaires de TMC chez les patients souffrant de lombalgie chronique non spécifique (LCNS) et l'on en a fait l'essai pratique. **Méthodes :** Les questions figurant sur la liste de contrôle des techniques de modification des comportements en physiothérapie (TMC-PT) ont été tirées d'une nomenclature créée pour la psychologie et aussi d'études publiées au cours desquelles on a utilisé des démarches basées sur la thérapie comportementale cognitive en physiothérapie. La validité du contenu a été vérifiée au moyen de sondages d'experts cliniques et de recherches. On a utilisé des enregistrements vidéo d'un programme de réadaptation de l'autoprise en charge d'un patient d'une durée de six semaines pour la formation, l'essai de fiabilité et l'essai pratique de la liste de contrôle TMC-PT. **Résultats :** La majorité des experts sondés a approuvé les éléments de la liste. La fiabilité intra et interévaluateurs a varié de modérée à élevée. Au cours de l'étude pratique, on a observé un vaste éventail de types de TMC (comportementales, cognitives et motivationnelles) à la fois en classe et au gymnase. **Conclusions :** La nomenclature des TMC découlant de cette étude et la liste de contrôle TMC-PT aideront à explorer plus à fond le changement de comportement à la pratique de la physiothérapie. L'observation selon laquelle les TMC ont été intégrées dans la pratique de la physiothérapie dans le cadre de cette étude démontre comment les physiothérapeutes peuvent jouer un rôle en modifiant le comportement, surtout en présence d'une LCNS.

The negative impact of low back pain (LBP) on a person's quality of life and work productivity can be substantial. In 2010, for example, LBP was responsible for more "years lost due to disability" than any other chronic disease.¹ Chronic LBP is a persistent, disabling, and mul-

tifactorial health problem with a high prevalence.²⁻⁴ An estimated 7-39% of people with LBP develop chronic pain and disability after their first episode,⁵⁻⁷ while 14-93% of those with previous episodes of LBP have persistent symptoms of pain and/or disability beyond one

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Contributors: All authors designed the study; collected, analyzed, and interpreted the data; drafted or critically revised the article; and approved the final draft.

Competing Interests: Michael Vallis is on the advisory board of the International Steering Committee, IBD Connect Abbvie, and is National Lead, DAWN2 study, Novo Nordisk; he has given talks on behaviour change sponsored by Sanofi, Merck, Abbvie, Pfizer, and Novo Nordisk.

Physiotherapy Canada 2014; 66(3);313-321; doi:10.3138/ptc.2013-55BC

year.⁵⁻⁷ In addition, 73% see their symptoms recur within one year.⁸ Approximately 85–90% of cases of LBP have no identifiable cause,^{9,10} leading to the diagnosis of chronic non-specific low back pain (CNSLBP). The Canadian Armed Forces also has a high prevalence of LBP; a health and lifestyle survey found that 18% of regular force and 9% of reserve force members reported LBP as their primary chronic complaint.^{11,12} These rates are comparable to and higher than the 9% who reported LBP in a survey of 118,000 Canadian residents.¹³ At Canadian Forces Base (CFB) Halifax, LBP is the primary condition reported by patients attending physiotherapy services, and one study reported that 19% of all referrals over a 7-month period were due to LBP.¹⁴

The treatment of CNSLBP has evolved from a biomedical to a primarily biopsychosocial model of care¹⁵⁻¹⁷ that considers social and/or psychological factors.¹⁸⁻²⁰ In CNSLBP, psychological and emotional factors (e.g., past experiences, beliefs, ineffective coping strategies and attention,²¹⁻²³ fear of and anxiety about experiencing pain^{24,25}) have been linked to reduced activity and are barriers to successful rehabilitation. Although their practice is anchored in the biomedical model, physiotherapists have seen a shift and now also consider psychosocial factors in their interventions.^{26,27}

Before returning to full military duties after injury, members of the Canadian military must attain a high level of fitness; therefore, exercise is an important focus of rehabilitation. Adoption of therapeutic exercise routines is a major challenge in physiotherapy practice, as these exercises can evoke fear and avoidance behaviours. However, along with its well-known physical benefits, exercise therapy can challenge maladaptive thoughts and beliefs and is associated with improvements regarding fear avoidance, pain catastrophizing, and self-efficacy in people with LBP.^{22,28-34} A better understanding of the psychological techniques used by physiotherapists to enhance uptake of exercise programmes could improve rehabilitation outcomes.

Psychologists use cognitive-behavioural therapy (CBT) to address psychosocial factors that affect physical health and behaviours.³⁵ CBT includes the use of behaviour change techniques (BCT) that prompt and reinforce positive behaviours.^{36,37} A systematic review found strong evidence for the effectiveness of integrating treatment of cognitive and behavioural factors into physiotherapy to improve function and decrease pain intensity.³⁸ Physiotherapy-led CBT interventions have been found to reduce self-perceived disability, sick leave, and modifiable psychological risk factors and to improve return-to-work outcomes.^{16,38-45} Techniques that physiotherapists used in these intervention-based studies included graded exposure, education, empowerment, goal setting, therapist monitoring, graded exercises, and home exercise programmes. Despite growing research into the use of BCT in physiotherapy,^{26,46,47} the techniques used in the con-

text of physiotherapy practice have not been adequately described in the literature.

The study reported here was aimed at developing a provisional nomenclature of BCT used by physiotherapists for CBT approaches in the CNSLBP population and to apply this nomenclature to determine the range of types of BCT used in the physiotherapy-led Back to Fitness class at CFB Halifax.

PROGRAMME

The Back to Fitness programme, developed by its physiotherapist leader and based on the programme described by Klaber-Moffett,⁴⁸ combines aspects of CBT with exercise, with the end goal being enhanced patient self-efficacy and self-management. Weekly lectures and twice-weekly exercise classes were designed to teach participants about muscle activation, core strengthening, flexibility, neural mobility, and proper movement techniques. Tuesday exercise sessions focus on mastering individual exercises; Thursdays focused on practice through circuit training.

METHODS

The project was approved by the Human Research and Ethics Board of Dalhousie University in Halifax, Canada, and was granted chain-of-command approval/endorsement by the Canadian Armed Forces' Surgeon General's Health Research Program. All participants provided written informed consent. The project involved a sequence of studies: tool development, expert review, tool testing, and a field study using the tool.

The physiotherapist participant in this study had adapted the Back to Fitness programme for the military environment and had been leading the class for 5 years. She was a full-time civilian practitioner with 15 years' experience that included formal CBT training and experience working in a multidisciplinary team that used a CBT approach; she was viewed by her peers as an expert in the use of BCT.

Phase 1: Tool development

A search of the PubMed and CINAHL databases using the combined MeSH search terms "cognitive therapy" and "physical therapy" for English articles published between 1991 and 2011 resulted in a total of 648 articles; after review, we retained 82 articles that contained detailed descriptions of the role of physiotherapy in delivering a CBT-based intervention. Items for the Physiotherapy Behaviour Change Technique (PT-BCT) checklist were derived from the Methods sections of these papers; we then compared this list of techniques with a BCT nomenclature for psychologists.⁴⁹

Phase 2: Expert review

The importance of each item to physiotherapy practice was assessed by clinical and research experts (the authors of the studies included from our literature review

and peer-identified expert practitioners), who were contacted and invited to participate in a survey using Opinio, an online survey system that contacts potential participants via email and allows for anonymous responses. For each BCT item, participants were asked to state whether they considered it “important to the practice of physiotherapy” in the context of treating CNSLBP using a 5-point Likert-type scale (1 = “strongly agree,” 5 = “strongly disagree”).

Phases 3 and 4

One 6-week Back to Fitness programme session was chosen for filming based on researcher availability. An entire set of classes was filmed at the CFB Halifax Dockyard fitness facility. The video camera and microphones* ran continuously during the classes. Military members with low back pain are routinely referred to the programme by physiotherapists at CFB Halifax when they meet standard inclusion criteria: the presence of LBP ($\leq 70\%$ on the Quadruple visual analogue scale [Quad VAS])⁵⁰ lasting >3 months; moderate to high levels of fear of movement/re-injury as measured on the Tampa Scale of Kinesiophobia (TSK; a score ≥ 37 indicates high levels of fear avoidance⁵¹); persistent issues with poor movement patterns; and a need for improved self-management skills. Level of disability is scored using the Oswestry Disability Index (ODI) as minimal (0–20%), moderate (21–40%), or severe (41–60%).^{52,53} Exclusion criteria for the programme are unstable symptoms, a positive straight leg raise test, neurological deficits, or pain radiating below the knee. Members who had been referred to enter the specific programme chosen to be filmed were asked to consent to the study.

Phase 3: Tool testing

We divided the video into 10-minute segments and used a block randomization procedure to ensure that samples from each session across the 6 weeks were used for observer training and tool testing. The observers were trained by co-investigator MV, a behavioural psychologist; their training involved reviewing the checklist, viewing samples (not used in the reliability testing), and coming to a consensus that the behaviours identified were BCT. Using the checklist, all three researchers (KH, MM, MV) scored sections of video and then reviewed the results and achieved agreement. We then tested the intra-rater reliability of the PT-BCT checklist by having each observer (KH, MM) view and score three previously unused samples from the video clips; scoring was repeated after a 1-hour break. For inter-rater reliability testing, the two observers (KH, MM) each viewed and

scored the same set of three video clips (a different set from those used to test intra-rater reliability).

Phase 4: Field study

The PT-BCT checklist was used to record the type of BCT used by the physiotherapist leading the Back to Fitness programme (described above).

The entire set of videos of the class was divided into lecture sessions and Tuesday and Thursday exercise sessions. All were viewed and scored independently in 10-minute blocks using the PT-BCT checklist. An observation of any BCT in a block was recorded. The study did not measure frequency of BCT use: after the first observation of one BCT in a block, no additional observations of that BCT in that block were recorded.

RESULTS

Phase 1

There was considerable overlap (21/29; 72%) between the two lists of techniques (physiotherapy and psychology). The PT techniques were organized into a checklist with three categories: behavioural, cognitive, and motivational. Descriptive examples were then written for each technique, specific to the context of physiotherapy practice (see Appendix online).

Phase 2

Of the 31 experts surveyed—25 first authors of articles from the literature review and 6 peer-identified experts—16 completed 90% or more of the survey questions for a 52% response rate. The sample was 63% male; 63% were researchers/clinicians, 25% researchers, and 12% clinicians; 12% had 0–5 years' experience working with CBT in physiotherapy, 25% had 6–10 years' experience, 38% had 11–15 years' experience, and 25% had >16 years' experience. The majority of experts agreed that all BCT named in the checklist are important to the practice of physiotherapy for CNSLBP.

Phase 3

Cohen's kappa coefficient⁵⁴ was calculated for both intra-rater and inter-rater reliability testing. Intra-rater reliability was found to be high ($\kappa = 0.82$) and inter-rater reliability was found to be moderate ($\kappa = 0.58$).⁵⁴

Phase 4

Participants

Of 12 participants in the class (10 male, 2 female; mean age 45 years), 6 were on full duties and 6 on modified duties. Participants' discharge notes indicated that as of programme completion, they had a mean Quad VAS of 47 (range 23–70); mean ODI score of 21%, or moderate (range 4%–48%); and mean TSK score of 38, or moderate–high (range 24–49).

After segmentation and removal of noisy or obscured video segments, our final data set consisted of 16 blocks of lectures, 24 blocks of Tuesday exercise sessions, and

* Continuous digital recording with a camera and three additional external microphones captured the classroom and gym activities. The digital tapes were converted to MPEG-2 files, and then to *.mov files, combined with the external audio tracks using MacIntosh iMovie, Quick Time Pro, and Audacity software. The final product was a video that could be viewed in QuickTime Player version 10.

32 blocks of Thursday exercise sessions, for a total of 12 hours of video. The data from the checklists were compiled to indicate the number of blocks, the BCT type (behavioural, cognitive, or motivational), and the setting (lecture vs. exercise) across the 6 weeks (see Figures 1–3). The physiotherapist used techniques from each grouping in every setting; only 6 of the 29 techniques were not observed.

DISCUSSION

Recent discussions of how to address psychosocial risk factors associated with chronic LBP have focused on the physiotherapist's skills in identifying risk factors⁵⁵ and applying biopsychosocial interventions.^{26,38,47,56} Publications have reported on effectiveness studies comparing "physiotherapy" to a physiotherapy-led CBT approach.^{38,40–45} This welcome examination of the use of psychological techniques in physiotherapy has opened up ways to explore enhancing the effectiveness of practice. Our study contributes to this growing field by proposing language to describe the BCT that physiotherapists use when working with patients with chronic LBP. The items in the PT-BCT checklist were drawn from published

studies describing both physiotherapy and psychology interventions. Evidence for the validity of the items was derived from three main sources: the participation of a behavioural psychologist (MV) in the study, the 72% overlap of physiotherapy-specific and psychology-specific BCT, and the review and endorsement of the checklist by a panel of research and clinician experts. Intra- and inter-rater reliability of the checklist were moderate to high. These results suggest that with training, the PT-BCT checklist could be used in observing and identifying BCT in physiotherapy practice.

Cognitive-behavioural approaches combine clinical methods from both cognitive and behavioural therapy; as physiotherapists, we receive limited education about these psychological therapies. The literature review we conducted for this project revealed that most publications did not offer much detail; at best, a list of techniques (e.g., goal setting and education) was provided, but often, there was little information either about what techniques were used or about how they were delivered. If physiotherapists' use of BCT and CBT approaches are showing promise to improve patient outcomes, then we need to be able to provide effective and evidence-based

Figure 1 Observed behavioural BCT from lecture, Tuesday, and Thursday sessions of the Back to Fitness programme.

pt Modelling—prompting patient modelling /social comparison.

PT Modelling—modelling by the physiotherapist.

HW—prompting homework.

Phys Skills Acq—prompting physical skills acquisition.

Pos Reinforce—providing positive reinforcement.

Relaxation—relaxation training.

Figure 2 Observed cognitive BCT over 16 sessions of the Back to Fitness class from lecture (5), Tuesday (6), and Thursday (5) sessions.

Behav-health—providing general information on the behaviour-health link.

Info on Conseq—providing information on consequences.

Cog Restruct—cognitive restructuring.

Prob Solving—problem solving / maintenance and dealing with flare-ups.

Barrier Ident—barrier identification.

Stress Mngmnt—stress management.

Social Support—planning social support.

practical instruction so that more physiotherapists can practise using these approaches. The checklist created for our study gives us a start by providing examples of BCT used in physiotherapy with working descriptions.

With our treatment emphasis on exercise, activity, and movement, physiotherapy research often focuses on the effectiveness of these physical interventions. As a complement to that line of research, our research addresses the challenge of engagement: even if the most effective exercise is prescribed, patients will not benefit unless they are engaged in the exercise programme. In our view, an important treatment goal for our patients with chronic pain should be successful long-term engagement in an exercise programme. We can achieve this goal by making patient self-management our focus, as we have recently described elsewhere.⁵⁷ A simplified explanation of the interactive process between the physiotherapist and the client starts with building a rapport, creating trust, and developing the therapeutic alliance. By using different BCT, physiotherapists help their clients to understand that they need to engage in the services

that are being provided. Once there is a perceived need, the physiotherapist uses a broad range of BCT that help clients find solutions that are tailor-made to address their problem and provide the opportunity to develop self-confidence in mastering the rehabilitation programme and become competent self-managers.⁵⁷ The BCT described in this study are useful clinical tools to enhance and extend the impact of the physiotherapist's relatively brief work with each patient.⁵⁷

Since our field study used the PT-BCT checklist to assess one physiotherapist leading a class designed to enhance patient self-efficacy and self-management skills, our finding that the therapist used a broad range and several types of BCT may not be surprising. We observed almost continual use of these psychological techniques by the physiotherapist—brief, in-the-moment responses and intentional prompts used *while* patients were thinking about or trying new exercises. The fact that one physiotherapist used 26 different BCT with a group of 12 patients suggests that a broad repertoire may be important. A study of physiotherapists in private practice

Figure 3 Observed motivational BCT over 16 sessions of the Back to Fitness class from lecture (5), Tuesday (6), and Thursday (5) sessions. Self Mon Behav—prompting self-monitoring of behaviour and thoughts. Feedback—providing feedback. Intern Reinforce—facilitating internal reinforcement. Goal Setting—prompting specific goal setting.

Box 1 Behavioural / Social Learning Techniques

- Setting graded activities or exercises
- Physiotherapist modelling
- Prompting physical skills acquisition
- Providing graded exposure
- Shaping
- Providing positive reinforcement
- Prompting patient modelling/ social comparison
- Role modelling
- Relaxation training
- Pacing
- Prompting homework

Box 2 Cognitive Techniques

- Providing general information on behaviour–health link
- Providing information on consequences
- Providing information on other's approval
- Prompting intention formation
- Cognitive restructuring
- Prompting visualization
- Providing stress management
- Prompting barrier identification
- Problem solving / maintenance / dealing with flare ups
- Planning social support

Box 3 Motivational / Self-Regulation Techniques.

- Motivational interviewing
- Prompting specific goal setting
- Seeking agreement to a behavioural contract
- Prompting self-monitoring of behaviour
- Prompting review of behavioural goals
- Facilitating internal reinforcement
- Providing feedback on performance
- Providing booster sessions

found that they highly valued patient education;⁵⁸ it is during this communicative interaction⁵⁸ that there is opportunity to encourage patient behaviour change and enhance self-management skills. Not all physiotherapists have the same background as the one in our study, nor do they all work in environments that favour this approach; however, the PT-BCT checklist (see Appendix 1 online) includes techniques common to physiotherapy practice (e.g., Modelling by the Physiotherapist, Providing Information on the Behaviour Health Link, and Prompting Specific Goal Setting). It is also important to understand that there is a well-developed theoretical background—learning theory—for these techniques; to make that more obvious, we have organized the techniques in the checklist accordingly (behavioural, cognitive, and motivational; see Boxes 1–3).

Behavioural/social learning techniques

The behavioural learning approach considers that physical action, *doing*, is a key force in learning. Another important consideration is *conditioning*—the process (association) by which a behaviour is more likely to be repeated.⁵⁹ Social cognitive learning theory brings together aspects of several behavioural theories with the understanding that we can also learn by *observing* someone else (modelling) and that reinforcement (operant conditioning) can occur both directly and indirectly through observing the consequences of others' behaviour.^{60,61} Social cognitive theory is also reflected in the BCT that address how individuals engage with learning, how people are examples for others, how one person's behaviour can influence another's, and how we can set goals or targets for our own learning.⁵⁹

Cognitive techniques

Cognitivists understand learning from a thinking, reasoning, and problem-solving perspective.⁵⁹ When we think, we construct frameworks to create meaning, and this process influences learning and behaviour; cognitive techniques attempt to re-frame existing thoughts and provide new explanations.⁶² In our study, cognitive techniques were observed in lecture settings and conversations with patients in class; these techniques included providing relevant information to assist in reasoning and planning to adopt an exercise programme. Cognitive restructuring specifically targets an important factor in chronic pain management: the ability to modify maladaptive thoughts, beliefs, and attitudes about pain. Using the cognitive restructuring technique, a physiotherapist might prompt a patient to examine his or her concerns about movement or challenge the notion that exercise will make his or her condition worse. With a visualization technique, a patient might be prompted to “see” him- or herself successfully completing a feared activity or movement in a particular context. Graded exposure is a systematic increase in the requirement to perform a behaviour that evokes anxiety or fear⁶³ by first creating a baseline and then progressively increasing the activity in the context of the anxiety or fear. A key part of this technique is having patients think about what they are afraid of before performing the activity and comparing their belief to the reality.⁶³

Motivational / self-regulation techniques

This group of techniques is aimed at supporting patient self-management and focuses on intrinsic motivation for improvement and on reinforcing positive changes in behaviour. These techniques, which involve self-instruction, self-monitoring, and self-reinforcement, prompt self-directed behaviours that can help with motivation or identify where further assistance is needed.⁶⁴ When motivation is lacking, the use of the behavioural and cognitive techniques described previously can help to engage the patient in the treatment. Working with patients where they are in terms of readiness to change is

important.⁶⁵ Several techniques derived from approaches such as Motivational Interviewing⁶⁶ can be used to get patients to create intention, create strategies to succeed, and set specific goals that can be monitored. Through providing feedback on how a patient is doing with his or her programme or giving booster sessions, therapists can use extrinsic motivation to help patients to stay with their exercise programme. Prompting practice outside of clinical sessions is another technique that supports self-regulation. Although these external forces are useful at the beginning of treatment, self-regulation requires intrinsic motivation; using BCT such as prompting patients to initiate self-monitoring of thoughts and behaviours and to develop problem-solving skills to address common setbacks and challenges facilitates self-regulation.⁶⁴

The PT-BCT checklist provides an organized list of psychological techniques used by physiotherapists. The techniques described are clearly linked to learning theory, concretely illustrating the educational aspect of physiotherapy practice. Issues remaining for future research include exploring outcomes linked to the use BCT, at what point in treatment patient self-management is enhanced, how we teach a BCT approach, and whether we can examine the elements that are most powerful or that work best in particular situations or with identified conditions. To further develop the checklist, future studies should include observations of different physiotherapists in other settings. It would be of interest to understand the effect of different BCT on patient behaviour and discover other techniques that physiotherapists use that are not included in this version of the checklist.

Our study has several limitations. First, because the PT-BCT checklist is derived from the physiotherapy literature in musculoskeletal health and a nomenclature for psychology-led approaches, we cannot be sure how broadly applicable it is. Second, our field study was an observational analysis of one physiotherapist's practice; therefore, our finding that a broad range and several types of BCT were used may not apply in other settings or with other practitioners.

CONCLUSION

The main result of our study is the development and testing of a checklist of BCT that are used in physiotherapy practice during the management of patients with chronic LBP. With this preliminary nomenclature, researchers can begin to use a common language and familiar definitions of terms and study the effectiveness of approaches that use BCT.

KEY MESSAGES

A better understanding of the psychological techniques that physiotherapists use with their patients, how to describe these techniques, and how they are employed will help physiotherapists with further research, education, and practice in this important aspect of the physiotherapy profession.

What is already known on this topic

The therapeutic alliance physiotherapists have with their patients has an important influence on treatment outcomes. Chronic low back pain patients benefit from multidisciplinary interventions including physiotherapy-led cognitive behavioural therapy approaches.

What this study adds

This study created a provisional nomenclature of behavioural change techniques (BCT) used by physiotherapists for CBT approaches in the chronic low back pain population.

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