Targeted Interventions to Prevent Chronic Low Back Pain in High Risk Patients: Development and Delivery of a Pragmatic Training Course of Psychologically Informed Physical Therapy for the TARGET Trial

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Abstract

Background: Low back pain (LBP) is a public health concern because it is highly prevalent and the leading cause of disability worldwide. Psychologically Informed Physical Therapy (PIPT) is secondary prevention approach that first aims to identify individuals at high risk for transitioning to chronicity and then provides tailored treatment to reduce that risk. Training models that are feasible to implement with acceptable training quality are needed to improve scalability for widespread implementation of PIPT. This manuscript describes the PIPT training program that was developed for training physical therapists providing PIPT in the TARGET Trial.

Methods: The PIPT training program was developed, tested, and modified using an iterative process. Content development consisted of stakeholder engagement, beta testing, modification of training and confirmation of final course objectives. Methods of delivery consisted of a website that included brief educational modules followed by a live 8 hour workshop that included video based mock case scenarios and case-based role playing. Attitudes, beliefs and confidence in implementing PIPT principles were assessed before and immediately after training to measure training quality and impact.

Results: Early stakeholder engagement and beta testing indicated the need for increased emphasis on experiential learning opportunities and patient-centered communication training. Booster training varied extensively across TARGET sites with involvement of 'clinician champions' brief follow-up sessions identified as best practice. Favorable post training changes in physical therapist attitudes and beliefs toward biopsychosocial treatment orientation and increased confidence in implementing PIPT principles were observed.

Conclusions: PIPT training for provider participation in the TARGET Trial was feasible to deliver. Course content was acceptable to physical therapists and resulted in improved beliefs and confidence in applying PIPT skills during clinical practice. Ongoing consultation and site-based continuing education were methods by which specific TARGET sites maintained or augmented PIPT skill training, however implementing ongoing training was challenging in general. Consistent with a pragmatic trial whether this training directly impacted treatment fidelity was not measured, which was a limitation to our training approach.

Background

Low back pain (LBP) is an imperative public health concern because it is highly prevalent and the leading cause of disability worldwide [1]. Global prevalence of LBP has increased by 17.3% from 2005 to 2015 and continues to be a leading cause of global years lived with disability since 1990 [1,2]. Although most individuals will rapidly recover [3], many continue to experience ongoing or chronic pain, accounting for a large proportion of the burden associated with LBP [4,5]. The risk factors for chronic pain are complex and multifactorial including psychological and behavioral features such as pain catastrophizing [6], fear-

avoidance beliefs [7], and maladaptive pain coping [8]. These factors can be addressed via cognitive-behavioral therapy, typically offered by psychologists and other behavioral healthcare providers, however seldom addressed through initial treatment delivered by primary care providers or physical therapists.

Prevention of chronic pain has emerged as a high priority in the United States, with specific emphasis placed on identifying at-risk patients and offering nonpharmacologic treatments as 'front-line' options [9-11]. One promising strategy is Psychologically Informed Physical Therapy (PIPT), a secondary prevention approach for LBP that first aims to identify individuals at high risk for transitioning to chronicity and then provides tailored treatment by merging impairment-focused physical therapy with cognitive behavioral therapy methods as needed to reduce that risk [12,13]. The primary goal of PIPT is prevention of future LBP-associated disability via: 1) identification of individuals with elevated pain-associated distress and at high risk for transitioning from acute to chronic LBP, and 2) providing targeted treatment aimed at ameliorating psychological factors linked to prolonging disability in conjunction with traditional impairment-based physical therapy. PIPT optimizes variables predictive of persistent pain and is therefore consistent with a top priority of the Federal Pain Research Strategy (i.e., formalizing individualized treatment recommendations based on risk factors) [14].

Recent systematic review findings indicate psychologically-based treatments can enhance physical therapy interventions for patients at high risk for prolonged LBP related disability while emphasizing the role of risk stratification for acute LBP and specifically recommending the need for determining reproducibility in the United States and optimizing implementation in clinical practice [15,16]. One successful risk stratification approach for LBP uses the 9-item STarT Back tool [17] to screen for modifiable prognostic factors, determine patient risk for developing persistent LBP related disability and uses that information to match patients with different care pathways. Physical therapists have played an integral role as treatment providers of PIPT in previous studies that found significant improvements in patient LBP disability and quality of life outcomes, while also resulting in less time off work and greater healthcare cost savings when compared to standard care [18,19]. However, the training to deliver these and other psychologically-based interventions has ranged from 2 to 9 days [20-25], which may not be scalable for widespread implementation in many United States health care systems.

There is a need for pragmatic PIPT training models that are feasible to implement with acceptable training quality and impact. These training models should also recognize clinician preferences for continuing education and be scalable to be responsive to national priorities for pain research and practice [14]. A study by Beneciuk and George [26] provides 'proof of concept' as support that one-day pragmatic PIPT training models are feasible and can result in improved physical therapist attitudes and beliefs about managing back pain using psychological principles. In contrast, minimal changes were observed for clinicians that did not participate in the stratified care and PIPT training module. Furthermore, therapists who received PIPT training had better 4 week patient clinical outcomes for pain intensity and self-report disability compared to therapists who were not trained [26]. There is a timely opportunity for striking a balance between lengthy comprehensive training programs and pragmatic single day courses. The latter are capable of providing a general overview, making such an approach feasible for widespread

participation, without drastically compromising training quality and impact. Such pragmatic approaches that encourage efficient treatment delivery strategies may provide a viable option for enhancing clinical practice paradigms aimed at improving patient outcomes through widespread implementation [14].

The manuscript describes the PIPT training that was developed and delivered to prepare physical therapists for providing treatment in the TARGET Trial [http://www.targettrial.pitt.edu]. TARGET is a large, pragmatic cluster-randomized clinical trial of patients seen in the primary care setting with acute LBP determined by the STarT Back tool to be at high risk for persistent LBP related disability. In this manuscript we will first provide a brief overview of the TARGET Trial design and goals to place the purpose of the training in context. Second, we will describe development and delivery of the PIPT training to prepare physical therapists at TARGET Trial clinical treatment sites and describe strategies used to enhance learning. Third we will provide data on training quality and impact. Finally, we will discuss preliminary lessons learned and provide suggestions for future pragmatically delivered PIPT training initiatives.

Methods

TARGET Trial Overview

The TARGET Trial is a multisite, pragmatic cluster-randomized clinical trial studying patients with acute LBP who seek care from a primary care physician and are at high risk for persistent disability. The study is designed to assess if prompt referral of patients to physical therapists with PIPT training reduces the rate of progression to chronic LBP 6-months later (primary trial outcome) and improves back-related function as compared to guideline-based primary care management. Secondary outcomes include additional healthcare resource utilization. The ongoing TARGET Trial enrolls patients from primary care clinics across multiple health systems in five geographic regions across the United States (Pittsburgh, PA; Boston, MA; Baltimore, MD; Salt Lake City, UT; and Charleston, SC) with a total planned sample size (n = 1860) that exceeds or is similar to previously completed studies [18,19,27]. The TARGET Trial is funded by the Patient Centered Outcomes Research Institute and was prospectively registered with ClinicalTrials.gov (NCT02647658) on January 4, 2016.

PIPT Training Program

Considering the pragmatic study design, several factors were considered when developing the overall structure of the PIPT training program. First, there was the need for developing a multidisciplinary training team consisting of individuals representing physical therapy and clinical psychology. Second, there was the challenge of addressing the feasibility barrier of providing training to physical therapists from different healthcare systems located across five diverse geographical regions in the United States. Finally, there was the importance of identifying facilitators for physical therapists to attend the PIPT training (e.g., cost, continuing education credit, and time commitment). Prior to trial initiation, the PIPT training program was developed, tested, and modified using an iterative process to enhance optimal effects during study training that were intended to be implemented during routine clinical practice (**Figure 1**).

Training Background

Development of the PIPT training program was guided by previous protocols that have tested risk stratification approaches for LBP using the STarT Back Tool [21,24]. In addition, members of the TARGET intervention team (JMB and SZG) provided PIPT training for a small scale feasibility study, training providers within a single healthcare system [26]. Key developers of the TARGET Trial PIPT training program consisted of physical therapy, clinical psychology and chiropractic providers.

Content Development

PIPT training program content development consisted of stakeholder engagement, beta testing, modification of training and confirmation of final course objectives. Each of these stages is described in greater detail below.

1. *Stakeholder engagement*

Prior to providing formal PIPT training, feedback and support from key stakeholders was obtained. We initially targeted a single healthcare system (University of Pittsburgh Medical Center, Centers for Rehab Services) to provide an introduction and overview of the TARGET Trial and PIPT training program. Our initial strategy included a formal task force meeting consisting of representation from TARGET Trial investigators, healthcare system executives, outpatient clinical education, senior management and clinicians. The key objective of this meeting was to prepare a task force of physical therapists within UPMC Centers for Rehab Services to become '*clinical champions*' for implementing a standard biopsychosocial model for patients with musculoskeletal pain conditions.

2. *Beta testing*

Beta testing of the PIPT training program was conducted two times over a two-month period in Pittsburgh, PA and at a professional conference in National Harbor, MD. Participant feedback was collected and key suggestions were considered during subsequent modifications to the PIPT training program. One important outcome of the beta testing was that training team members identified the need for blended learning opportunities (i.e., strategic use of combined web-based and in-person content with interactive activities to enhance clinician learning), which lead to strategies for developing additional delivery platforms (e.g., PIPT website).

3. *Modification of training*

An iterative process of development for the PIPT training program was used, that incorporated feedback from course participants, standardized self-assessments and intervention team discussions. This lead to restructuring of the live workshop to include several interactive breakout sessions, designed for the participants to gain initial experience implementing PIPT skills. Further, video-based mock clinical scenarios suitable for live course learning opportunities, and viewing online modules for training maintenance were developed. In addition, increased time allotment and enhanced training methods were dedicated to specific PIPT content areas (e.g., patient-centered communication) based on initial feedback

from participants to address barriers to clinical practice integration. These modifications are consistent with enhancements provided following pilot testing of other previous training packages [24].

4. *Final course objectives*

Following beta testing, feedback from participants and modification of training content and methods, final course learning objectives were finalized by the investigator team (**Table 1**). The overall objectives of the course were to provide participants with a summary of evidence and clinical skills necessary to support implementing PIPT principles into routine clinical practice for patients identified as being at high risk for transitioning from acute to chronic LBP. Specific learning objective included identifying relationships between biopsychosocial pain models, understanding development and maintenance of chronic LBP; understanding Cognitive-Behavioral Therapy (CBT) principles; and developing effective communication skills for patient education and PIPT implementation

5. *Final course content*

Detailed description of final course content is provided in **Table 2**. Course content was broadly described as either '*Overview*' – providing theoretical rationale and supporting data or '*PIPT Management*' – providing specific principles or skills with demonstration and practice. '*PIPT Management*' content consisted of: 1) patient-centered communication; 2) pain coping skills; 3) patient education; 4) activity based intervention; 5) impairment based intervention; and 6) treatment monitoring components (**Figure 2**). The course content was provided in sequential order for all training sessions.

Methods of Delivery

Consistent with the pragmatic study design of the TARGET Trial, the training was designed to be easily replicated in clinical settings to promote delivery of PIPT implementation. The intention was that each site would determine specific methods favorable for that specific geographical region and health delivery system.

1. *PIPT website*

The TARGET Trial website [http://www.targettrial.pitt.edu/] provided an alternative delivery platform for content resources that included an overview of the TARGET Trial and provider resources (including key recommended readings). Course participants registered for formal training courses were directed to a separate PIPT website [http://www.rstce.pitt.edu/pipt/] that provided a course overview, learning objectives, education modules, and additional educational resources for patients. Twelve brief pre-course online educational modules were developed to provide necessary foundational information required to optimize the experiential nature of the 1-day live workshop. These online educational modules were designed to be viewed in sequence, with each module ranging from 8 to 22 minutes in duration. Links to voiceover PowerPoint presentations, electronic handouts and audio files were provided for each module to offer course participants different learning platform options. Physical therapists had the opportunity to obtain 2.5 hours of continuing education credit after viewing all the online modules.

2. *Live workshop*

Live one-day workshops were provided by at least one physical therapist and clinical psychologist up to three times at each of the five TARGET sites throughout the United States (Pittsburgh, PA; Boston, MA; Baltimore, MD; Salt Lake City, UT; and Charleston, SC). Combinations of teaching methods (**Table 2**) were used during each 8-hour workshop including: PowerPoint presentations; video based mock case scenarios depicting appropriate and inappropriate communication styles; and case-based role playing. To enhance clinical skills training, we utilized several structured teaching and learning strategies including: 1) instructor lead teaching on specific clinical skill; 2) instructor lead case-based role playing with mock patient; 3) course participant lead case-based role playing (i.e., breakout sessions) where smaller groups of 2 to 4 participants each assumed different stakeholder roles (e.g., patient, clinician, and observer) for a variety of clinical scenarios; and 4) class discussion to provide individual learning experience perspectives. To further enhance learning, participants were encouraged to demonstrate newly acquired clinical skills that were evaluated by instructors and other participants for real-time feedback. This case-based role playing was used to develop clinical skills involving self-reflection, motivational interviewing, pain coping skills, and activity-based interventions. Barriers and facilitators to implementing PIPT components (**Figure 2**) during routine clinical practice were addressed throughout the live workshops.

3. *PIPT course materials*

Each physical therapist was provided with course materials at the live one-day workshop that could be referenced afterwards. These materials consisted of workshop content, including specific descriptions and scenarios pertaining to PIPT interventions such as patient-centered communication, pain coping skills, patient education, activity-based intervention, impairment-based intervention, and treatment monitoring components.

Strategies to Enhance and Assess Quality and Impact of Provider Training

Establishing treatment fidelity to insure the reliability and validity of behavioral interventions has been identified as a major challenge [28,29]. The National Institutes of Health Behavior Change Consortium (NIHBCC) has developed and recently updated a treatment fidelity framework consisting of five domains (i.e., study design, training of providers, treatment delivery, treatment receipt, and treatment enactment) [28,29]. Consistent with the pragmatic nature of the TARGET Trial, balance between feasibility and obtaining comprehensive fidelity assessments was considered [30]. The PIPT program was designed to promote treatment fidelity by providing quality training that impacted key provider factors and could be replicated. Thus, we incorporated measures and strategies to enhance treatment quality and impact of training (assessment of physical therapist attitudes, beliefs and confidence; PIPT treatment checklists; and booster training).

Training quality and impact

To determine if training positively impacted physical therapist attitudes and beliefs regarding biopsychosocial treatment orientation for LBP and confidence in PIPT skill application, several statistical analyses were performed. First, paired samples t-tests were used to assess for pre to post-course changes in attitudes, beliefs, and confidence scores (described in greater detail below). Second, separate multiple regression models were used to evaluate the contribution of viewing pre-course online modules as a predictor of post-course attitudes, beliefs, and confidence scores. Third, one-way analysis of variance with Bonferroni post-hoc procedures was used to compare physical therapist attitude and belief residualized change scores between TARGET site locations to evaluate for training replicability.

Attitudes and beliefs

Physical therapist attitudes and beliefs about biomedical and biopsychosocial treatment orientations were assessed before training, immediately after completion of training, and 4-months later using the Pain Attitudes and Beliefs Scale for Physical Therapists [31,32]. The PABS-PT biomedical scale (10 items) has a potential score range from 10 to 60 and the PABS-PT biopsychosocial scale (9-items) has a potential score range from 9 to 54 with higher scores indicating increased biomedical or biopsychosocial treatment orientation depending upon the respective scale. To further explore if different delivery aspects were associated with post-course scores, we evaluated the impact of viewing pre-course online modules and pre-course scores by TARGET site location. TARGET site leaders initiated a request for follow-up assessment four months after training through email that directed course attendees to a remote website containing an electronic version of the PABS-PT with reminders being sent 2 weeks later.

Confidence in PIPT skill application

Physical therapist confidence in implementing PIPT principles was assessed before training and upon completion of training. Specifically, participants were asked to "*rate your level of confidence with implementing psychological informed principles during clinical practice*" using an 11-point scale (range 0 to 10) with "0" indicating "no confidence" and "10" indicating "extreme confidence". To further explore if different delivery aspects were associated with post-course confidence scores, we evaluated the impact of viewing pre-course online modules and pre-course scores by TARGET site location. Follow-up assessments of confidence 4-months after training were not performed.

PIPT treatment checklist

To promote treatment fidelity, physical therapists were trained to indicate specific PIPT treatment content delivered during patient care by completing self-report checklists [28-30,33]. Strategies for administering checklists varied across geographical regions ranging from traditional hardcopy methods to direct entry into the electronic medical record.

Booster Training

Due to the pragmatic nature of the trial, the amount and frequency of follow-up communication and training maintenance was different in each geographical region. As a result, booster or refresher training

varied extensively, with course instructors and site coordinators offering several options following the live workshop. All course participants were provided options for continued remote communication with instructors, and were encouraged to submit follow-up questions and testimonials to promote a flipped classroom learning environment. One implementation process that may be described as possible 'best practice' within this trial consisted of one-hour follow-up sessions provided at several clinical sites in the Salt Lake City, UT region that were focused on improving specific PIPT skills physical therapists found difficult to implement. For example, prior course participants indicated difficulty with initiating PIPT interventions, specifically related to patient-provider communication. Cognitive reassurance (engaging the patient in education) was thoroughly discussed in group settings and motivational interviewing strategies were revisited through case-based role playing using specific patient scenarios that were lead by site mentors. Another strategy in Pittsburgh, PA, Baltimore, MD, and Boston, MA regions consisted of offering brief 45-60 minute webinars where course participants were asked to submit topical questions with instructors and clinical champions providing strategies to overcome barriers to successful implementation.

Results

Attitudes and beliefs

Follow-up assessments upon completion of training were performed for 91.5% (431/471) of course participants. PABS-PT biomedical scale scores decreased from 31.1 [SD = 6.8] to 25.0 [SD = 7.1] (P<.001) and behavioral scale scores increased from 36.8 [SD = 4.8] to 41.4 [SD = 5.2] (P<.001). Linear regression models explained 38% and 17% of the variance in post-course PABST-PT biomedical and behavioral scale scores, respectively. Pre-course PABS-PT biomedical (β = .62, P < .001) and behavioral (β = .41, P < .001) scale scores were the strongest predictors of post-course PABS-PT biomedical and behavioral scale scores, respectively. TARGET site location only added 1% additional variability to prediction of post-course PABS-PT biomedical (β = .09, P = .022) and behavioral (β = .12, P = .018) scale scores. Viewing pre-course online modules did not significantly explain any additional variability in post-course PABS-PT biomedical or behavioral scale scores (P > 0.05). After adjustment for pre-course scores by each site location, there were no differences in PABS-PT biomedical (P = .140) or behavioral (P = .095) scale change scores between TARGET site locations. A total of 134 (28.4%) course participants completed a web-based version of the PABS-PT 4-months after training with biomedical (25.4±7.9) and behavioral (40.9±4.4) scale scores observed, however this data was de-identified which does not allow us to determine if sustained scores were maintained over longer duration of time.

Confidence in PIPT skill application

Follow-up assessments of confidence upon completion of training were performed for 96.2% (453/471) of course participants. Confidence in the ability to implement PIPT principles increased from 4.8 [SD = 2.2] to 7.3 [SD = 1.9] (P<.001). The linear regression model explained 27% of the variance in post-course confidence scores. Pre-course confidence scores (β = .46, P < .001) was the strongest predictor explaining

20% of the variance in post-course confidence scores. TARGET site location (β = .21, P < .001) added 5% additional variability to the prediction of post-course confidence scores. Viewing pre-course online modules (β = .12, P = .003) explained 2% additional variability in post-course confidence scores. Greater post-course confidence scores were observed for those who viewed modules when compared to those who did not (mean = 7.7 [SD = 1.3] versus 7.2 [SD = 1.7], P = .004). After adjustment for pre-course scores, differences in confidence change scores between TARGET site locations were observed (P < .001). Specifically, Boston, MA reported less improvement in confidence compared to Pittsburgh, PA (mean difference = 1.2, 95% CI = 0.1-2.3, P = .029), Salt Lake City, UT (mean difference = 1.6, 95% CI = 0.5-2.7, P = .001), Baltimore MD (mean difference = 1.7, 95% CI = 0.6-2.7, P<.001) and Charleston, SC (mean difference = 2.4, 95% CI = 1.3-3.4, P<.001). Additional findings indicated Boston, MA participants were younger in age (32.4 years [SD = 8.1]) and had less experience in clinical practice [6.1 years [SD = 7.0]) compared to all other TARGET site locations (P < .001) which may have influenced observed changes in confidence (**Table 3**).

Discussion

The overall objectives of the training course were to provide physical therapists with a summary of evidence and clinical skills necessary to support implementing PIPT principles into clinical practice for patients identified as being high risk for transitioning from acute to chronic LBP. Our experiences have provided several important “lessons learned” that can be used to guide future study of PIPT implementation for long-term sustainability [34].

Emphasis on Experiential Learning

During beta testing, course participants provided consistent feedback about the need to reduce didactics and increase the amount of time devoted to experiential learning experiences. Therefore, PIPT treatment concepts were introduced using video and live mock case scenarios that transitioned into small group practice sessions during each 8 hour workshop. These teaching principles were also utilized in certain regions following initial training as a component of booster training and could perhaps be described as ‘best practice’ within the TARGET Trial.

PIPT Clinician Champions

Several strategies to enhance routine application of PIPT principles following the live course and during active patient enrollment periods (i.e., booster training) were planned during program development stages; however due the pragmatic nature of the trial and geographical distribution of health systems, implementing these efforts was associated with considerable heterogeneity. For example, although clinician generated case reports that were intended to be the focus of dynamic learning communities may have conceptually been a virtuous strategy, engaging clinicians to be accountable for active learning initiatives was a difficult process and only resulted in a small number of case examples; potentially due to busy, high volume clinical practice. Therefore, future implementation efforts should focus on strategies to identify and incentivize clinical champions within a health system or small region for leading subsequent

active learning initiatives (e.g., webinars, formal mentoring opportunities) following initial training. Optimally, these individuals should demonstrate special interest and skill in PIPT and could be valuable resources for circumstances where continued on-site interaction with primary trainers is not feasible. Personal communication with physical therapists that received PIPT training and provided similar care for a previous smaller scale study indicated the need for additional follow-up opportunities to address barriers in clinical practice following the training course [26].

Need for Specialized Training

Despite recent recommendations for increased delivery of psychological based treatment [9,10] and enthusiasm for risk stratification approaches to LBP management [14,15] there are other challenges to successful wide spread implementation. For example, a potent barrier to successfully delivering psychological-based treatment is the vital need for additional specific post-professional training [12,35-38] . This dilemma is particularly relevant to health care providers where biomedical or impairment-based perspectives have been predominantly emphasized during entry-level education and clinical practice, thereby resulting in clinicians that are not confident or unprepared in delivering psychological-based interventions [35,36,39]. Consequently, gaining additional specific knowledge, problem-solving skills and practical experience through formal mentoring opportunities that incorporate booster training is a vital necessity for beneficial shifts in clinical practice paradigms to occur. However, many PIPT or cognitive behavioral treatment approaches require specialized time intensive training, which may not be feasible for all clinicians and may perhaps present a significant barrier to successful widespread future clinical implementation. Providing single day overview courses that are followed by structured mentorship experiences over an extended period of time may perhaps provide a viable model for future PIPT training programs.

Patient-Centered Communication

In our experience, physical therapists' initial perception was that implementing PIPT strategies in practice would be challenging. Training in patient-centered communication appears to be an important component for integrating PIPT into routine clinical practice. As previously indicated, increased time and enhanced training methods were dedicated to patient-centered communication during preliminary phases of our training program based on early feedback from participants involving barriers to clinical practice integration. Similar challenges and enhancements to communication content and delivery methods have been acknowledged during development of other PIPT based training programs [24,40]. Clinician challenges to providing patient-centered and biopsychosocial oriented communication for patients with LBP is common [35-37,39,41], which is not surprising considering the lack of content dedicated to this topic during entry-level physical therapy training programs. Specifically, our patient-centered communication interventions were enhanced early during trial training stages by integrating motivational interviewing skill development with significant time permitted for: 1) instructor lead case-based role playing with mock patients; 2) course participant lead case-based role playing (i.e., breakout sessions) where smaller groups of 2 to 4 participants each assumed different stakeholder roles (e.g., patient,

clinician, and observer) for a variety of clinical scenarios; and 3) class discussion to provide individual learning experience perspectives. Future implementation strategies should strongly consider providing direct examples that combine patient-centered communication skills and other PIPT interventions such as graded activity or graded exposure to optimize treatment efficiency. This approach may be particularly beneficial as most patient expectations for physical therapy treatment may not be aligned with PIPT based principles.

Provider Training

Training quality and impact could have been further enhanced by including an assessment of skill acquisition, standardized methods to prevent skills drift, and provided accommodations to diverse learning styles [29]. However, the PABS-PT provided one viable option for assessment of the impact of PIPT training on clinician attitudes and beliefs. Updated strategies for assessment provided by the National Institutes of Health's Behavioral Change Consortium have indicated importance of ensuring "buy-in" for treatment [29]. We observed favorable treatment orientation shifts from predominantly biomedical to biopsychosocial following attendance at the live workshop which is consistent with previous studies where similar duration of PIPT training was delivered [26,42]. Our viewpoint was that this favorable change in treatment orientation and confidence is a practical indicator that the PIPT training has potential for altering therapist attitudes, beliefs and confidence. However, additional assessment would be needed to determine if the PIPT training resulted in behavioral change for the provider.

These findings highlight the need to consider clinician attitudes and beliefs regarding treatment orientation when introducing new treatment approaches such as PIPT if they are to be adopted in clinical practice [43]. Systematic review findings indicate health care providers with predominant biomedical treatment orientations are more likely to suggest limited work and physical activity and less likely to adhere to clinical practice guidelines that emphasize activation for patients with LBP [43,44]. Changing provider beliefs is critical if we are to optimize care for patients who widely believe their persistent LBP results from anatomical or biomechanical causes [45]. Therefore, future studies should consider long-term assessment of PIPT training quality and impact to determine if favorable changes in clinician attitudes and beliefs are sustained over time.

Long Term Follow Up to Sustain Changes

Considering our strategies for continual engagement with physical therapists following in-person training may have been less than optimal, we suggest several strategies to enhance this process in an effort to sustain beneficial changes in attitudes and beliefs over long term periods. First, sustained communication between instructors, site leaders, and course participants may enhance PIPT training maintenance opportunities. Second, continuing education credit or organizational quality improvement initiatives may provide clinicians with incentive for participating in maintenance activities. Third, system-level recognition for cohorts achieving specific maintenance participation rates may provide clinicians with a sense of personal satisfaction. Finally, we used the PABS-PT to assess clinician attitudes and beliefs about treatment orientations and a single question to assess confidence in implementing PIPT

principles (with the latter not being assessed at 4 months), therefore ongoing assessment and feedback may assist with skill maintenance.

Suggestions to Increase Scalability

Based on our experiences, future pragmatically delivered PIPT training initiatives should consider providing single day overview courses that are followed by structured mentorship experiences over an extended period of time. This may perhaps provide a viable continuing education model for future PIPT training programs that can be lead by local clinical champions, moderated by course instructors, and provided using remote learning platforms (e.g., webinars, discussion boards). Providing clinicians with incentives to assume these leadership roles will be important as participation and time spent developing formal case reports for 'real world' learning experiences (as an example) will require personal commitment and most likely dedication of time outside of clinical practice.

Conclusions

The PIPT training in the TARGET Trial, which consisted of online educational modules followed by a 1-day live discussion and skills-based training, was feasible to deliver. The final format for the course was acceptable to physical therapists and resulted in improvement in biopsychosocial attitudes and beliefs and confidence in applying PIPT skills during clinical practice. Ongoing consultation and site-based continuing education were methods by which specific TARGET sites maintained or augmented the PIPT skill training, however ongoing training was challenging for most TARGET sites in general. Treatment fidelity was not able to be measured directly, which was a limitation to our training approach and will continue to be a struggle for future pragmatic trials.

Declarations

Ethics approval and consent to participate

This specific study describing development and delivery of the TARGET Trial PIPT training program met the University of Pittsburgh Institutional Review Board definition for quality improvement and not research, therefore was not reviewed.

Consent for publication

Not applicable.

Availability of data and material

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

All authors read and approved the final manuscript.

(JMB, SZG, CG, MS, and STW) made substantial contributions to development, enhancement, and delivery of PIPT program. (JMB, SZG, MS, CG, and STW) have been involved in drafting the manuscript and revising it critically for important intellectual content. (RS and AD) reviewed and provided final approval of the version to be published. Each author participated sufficiently in order to take public responsibility for appropriate portions of the content; and agreed to be accountable for all aspects of the work.

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Authors' information (optional)

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Tables

Table 1. Psychologically Informed Physical Therapy Training Course Learning Objectives.	
1.	Summarize relationships between pain neuroscience, pain models, and the development and maintenance of chronic low back pain.
2.	Identify patients at high risk for transitioning from acute to chronic low back pain.
3.	Apply targeted treatment for patients at high risk for transitioning from acute to chronic low back pain.
4.	Differentiate key principles and application between graded activity and graded exposure.
5.	Understand primary assumptions of CBT and specific skills associated with CBT based interventions.
6.	Recognize effective communication skills and be able to implement as a key component to PIPT.
7.	Review the Low Back Pain Clinical Practice Guidelines from the Orthopaedic Section of the American Physical Therapy Association to become familiar with: 1) ICF-based classifications; 2) symptoms; 3) impairments; and 4) suggested intervention strategies.
8.	Be able to implement PIPT practice principles for patients with low back pain.

PIPT = Psychologically Informed Physical Therapy; CBT = Cognitive-Behavioral Therapy; ICF = International Classification of Functioning, Disability, and Health.

Table 2. PIPT Training Course Content and Methods of Delivery.			
	Methods of Delivery		
	PowerPoint presentations and instructor lead group discussion	Video based mock case scenarios	Case-based role playing (breakout sessions)
Overview			
Pain Science Update	X		
PIPT Overview	X		
Risk Stratification	X		
Targeted Treatment	X		
Cognitive Behavioral Therapy	X		
Self-reflection	X	X	X
PIPT Management			
Patient-Centered Communication			
Active Listening	X	X	
Motivational Interviewing	X	X	X
Goal-setting	X	X	
Pain Coping Skills			
Physiologic Relaxation	X		X
Imagery	X		X
Replacing cognitive distortions	X	X	X
Patient Education	X		
Activity Based			
Graded Exercise	X	X	X
Graded Exposure	X	X	X
Impairment Based			
Clinical Practice Guidelines	X		
Treatment Monitoring	X		
Challenges and Opportunities	X		

Table 3. PIPT Course Participant Characteristics.

	Pittsburgh, PA (n = 77)	Boston, MA (n = 61)	Salt Lake City, UT (n = 80)	Baltimore, MD (n = 111)	Charleston, SC (n = 142)	P-Value
Age (years)	40.3 (11.2)	32.4 (8.1)	39.3 (10.3)	36.9 (11.2)	39.5 (11.4)	<.001
Years in practice	14.6 (11.5)	6.1 (7.0)	11.0 (10.4)	10.9 (11.4)	12.6 (10.2)	<.001
PABS-PT biomedical (pre-training)	30.3 (6.5)	30.4 (7.6)	28.2 (6.8)	31.0 (6.8)	33.2 (6.0)	<.001
PABS-PT biomedical (post-training)	26.0 (7.0)	24.3 (7.6)	23.1 (6.8)	25.2 (7.1)	26.2 (7.4)	.032
PABS-PT behavioral (pre-training)	36.6 (3.2)	36.9 (4.2)	38.3 (3.8)	37.1 (3.3)	36.1 (3.7)	.001
PABS-PT behavioral (post-training)	40.1 (3.8)	41.7 (5.2)	41.7 (4.3)	41.7 (4.4)	41.2 (3.5)	.067
Confidence (pre-training)	4.8 (2.1)	4.6 (2.3)	4.9 (2.2)	5.1 (2.3)	4.5 (2.2)	.292
Confidence (post-training)	7.0 (1.7)	5.6 (3.1)	7.4 (1.8)	7.8 (1.2)	7.7 (1.4)	<.001

Figures

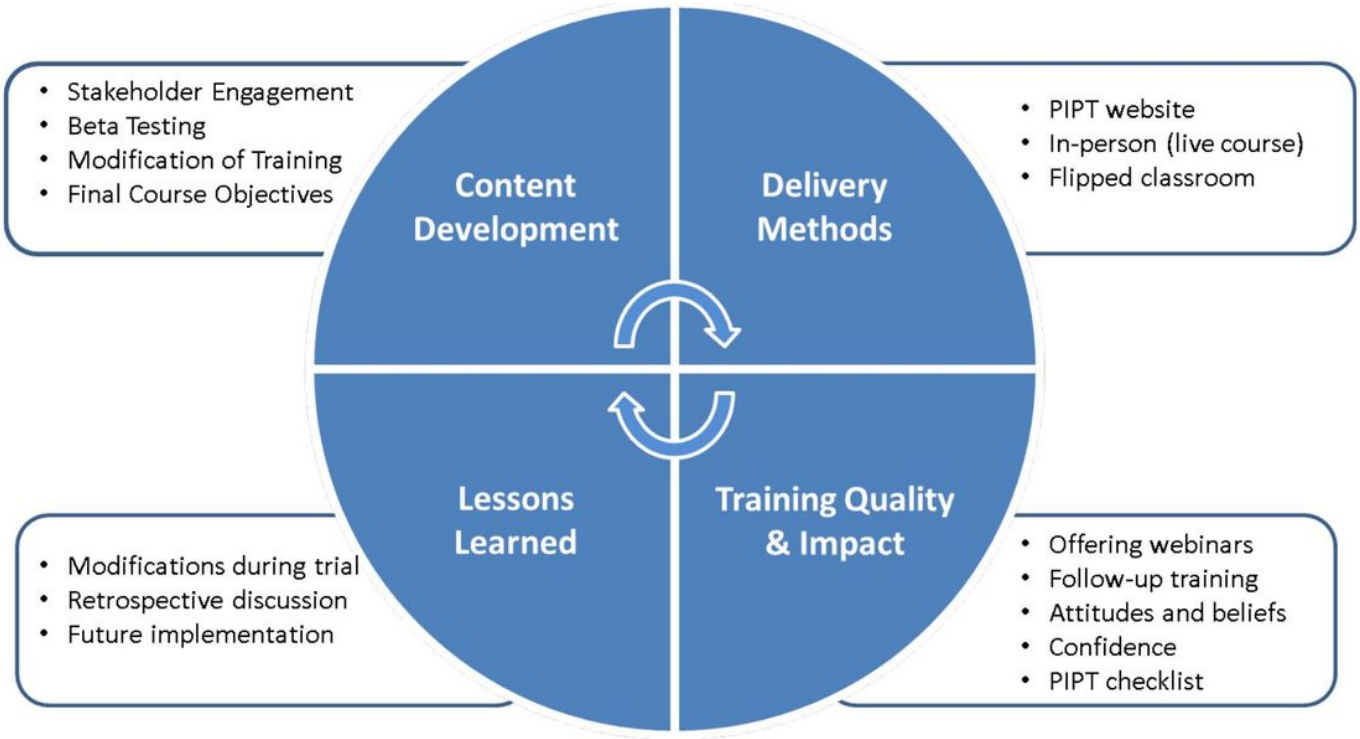

Figure 1

PIPT training program iterative process for development, testing, and modification.

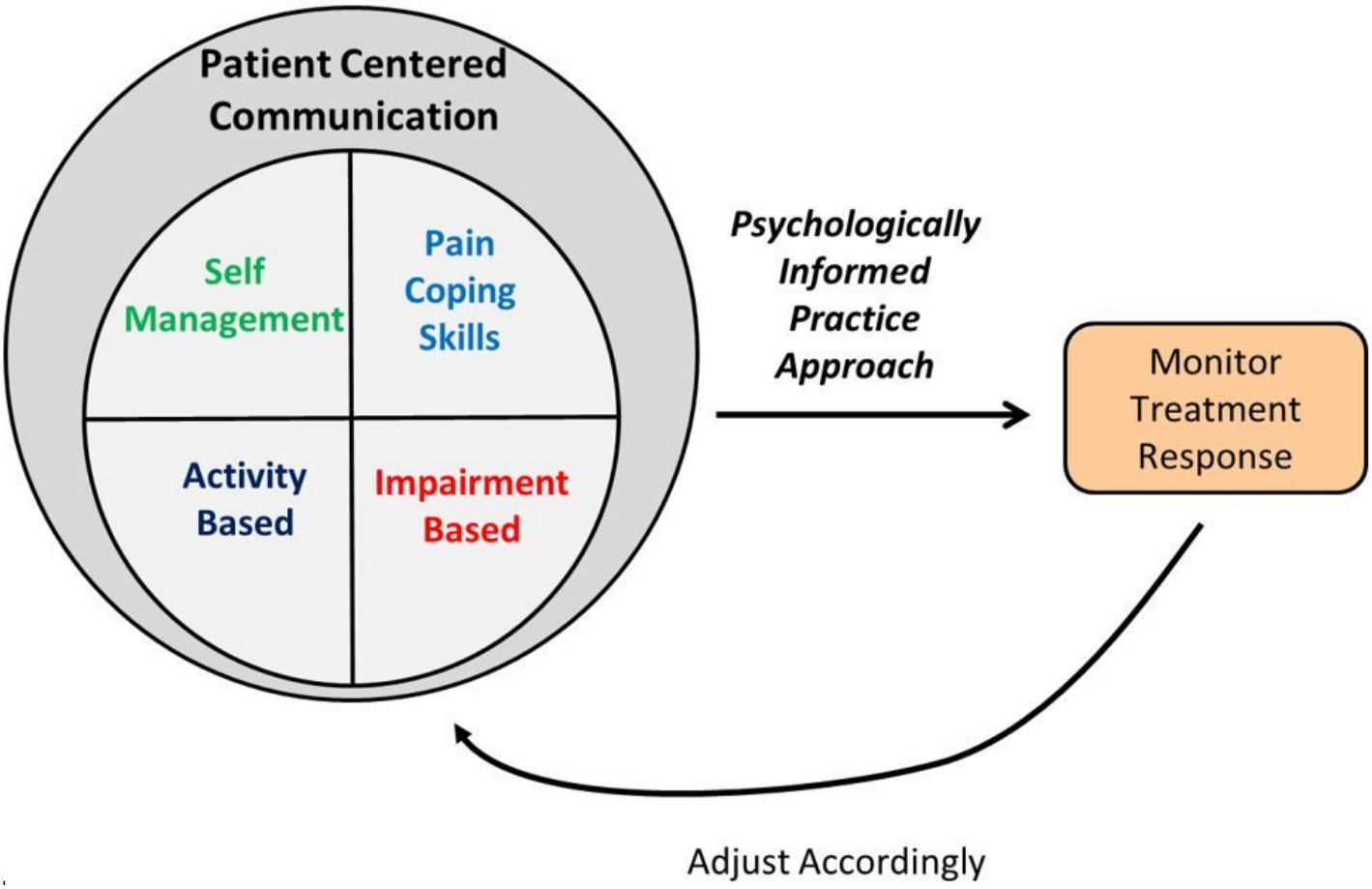

Figure 2

Overview of key PIPT treatment components for high risk patients in TARGET Trial.