



Treatment engagement in an internet-delivered cognitive behavioral program for pediatric chronic pain



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ABSTRACT

Internet-delivered cognitive-behavioral therapy (iCBT) is a promising treatment for chronic pain among youth, but effect sizes are small, and strategies aimed at enhancing treatment effects are needed. Participants' engagement with the program may be an important factor in determining treatment outcomes. The primary aim of the current study was to examine the relationship between treatment engagement and treatment outcomes. Secondly, we sought to characterize participant engagement in an iCBT program for adolescents with chronic pain and their parents. Participants included 134 adolescents randomized to the intervention arm of a controlled trial examining iCBT for chronic pain. Overall engagement with the intervention by adolescents and parents was high. Parental engagement (number of modules completed by parents and number of parent logins) predicted adolescent activity limitations change scores at post-treatment. Contrary to our expectation, adolescent treatment engagement was not predictive of treatment outcomes. Results indicate that parental engagement with the program may be an important predictor of treatment outcomes. Further research is needed to better understand influences of treatment engagement on outcomes in iCBT for youth.

1. Introduction

Chronic pain is common in childhood, impacting as many as 1 in 4 youth (King et al. 2011). A subset of youth with chronic pain experience significant pain-related disability as well as anxiety and depressive symptoms, sleep disturbance, and reduced quality of life (Huguet and Miro 2008; Valrie et al. 2013; Vinall et al. 2016). Over 30 years of research supports the efficacy of cognitive-behavioral therapy for pain management to reduce pain and disability among youth with chronic pain (Fisher et al. 2014). However, many youth with chronic pain do not receive psychological treatment due to barriers such as lack of access to trained professionals, burden associated with missed work and high costs for parents, and stigma against mental health treatment (Chandra and Minkovitz 2006; Ernst et al. 2015). Internet-delivered cognitive-behavioral therapy (iCBT) interventions for youth with chronic pain have the potential to address these barriers to care and a recent systematic review found that a few programs have been developed which show beneficial but small effects (Fisher et al. 2015).

Research is needed to identify strategies that can enhance the effectiveness of Internet-delivered treatment protocols for youth with chronic pain.

There is a general assumption that greater engagement with Internet delivered treatment programs will lead to behavior change and positive treatment outcomes. Indeed, conceptual models have been developed to define engagement with Internet-delivered interventions and propose how this relates to treatment response (Mohr et al. 2014; Ritterband et al. 2009). Across these models, program use (e.g., logins, completion of program modules, completion of assignments) and human support (e.g., communication with an online therapist or coach) have been identified as important mediators of treatment efficacy. These conceptual models have been supported by numerous studies of adult populations, which have demonstrated that greater program use (i.e., completion of program modules, completion of assignments) is associated with improved treatment outcomes (e.g. Glasgow et al. 2011; Hadjistavropoulos et al. 2016; Hedman et al. 2015). Available data on the impact of human support on treatment efficacy are mixed.

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For example, some studies have indicated that iCBT is more effective with human support (Andersson et al. 2013), while others, including a study on iCBT for chronic pain among adults, have shown similar outcomes when comparing iCBT with and without human support (Dear et al. 2015).

Little is known about the impact of treatment engagement on response to iCBT for youth with chronic pain. To our knowledge, our research team has published the only evaluation of treatment engagement in iCBT among youth with chronic pain (Law et al. 2012). In this secondary data analysis of a small pilot RCT, we focused on the role of human support using a narrative coding scheme to categorize the content of asynchronous messages sent by adolescents to online coaches during the treatment program. The coding scheme specified three types of message content: rapport, treatment skills, and technical issues. Results showed enhanced treatment outcomes for adolescents who sent messages with rapport or treatment content but not technical issues (Law et al. 2012), indicating certain types of engagement with human support may improve treatment efficacy for these youth. However, associations between program use and treatment outcomes were not examined in this small pilot study, and research in this area is needed.

There is evidence of some early work examining Internet program use in other pediatric populations such as youth with anxiety (Morgan et al. 2018), which found that parental completion of assignments is associated with greater improvements in children's treatment outcomes. Although preliminary, these findings highlight the need to consider the impact of both parent and child program use on the efficacy of iCBT interventions for pediatric populations. To our knowledge, no prior published RCTs of iCBT for youth with chronic pain have reported on associations between program use and treatment outcomes.

To address this gap, the aim of this study was to examine the impact of treatment engagement on treatment response among adolescents who received iCBT for chronic pain. We have previously reported on the outcomes for this multisite randomized controlled trial (RCT), which demonstrated positive effects of iCBT on reducing adolescent activity limitations, but not pain intensity, at six-month follow-up compared to Internet-delivered pain education (Palermo et al. 2016). For this analysis, we hypothesized that greater adolescent and parent treatment engagement would predict greater reductions in adolescent's activity limitations and pain intensity at post-treatment and 6-month follow-up. Treatment engagement was defined as *program use* (module completion, assignment completion, logins) and *human support* (content of messages to the online coach with rapport or treatment skills content). As a secondary aim, we sought to characterize adolescent and parent engagement in the iCBT program.

2. Methods

2.1. Study design

Participants were randomized to the active treatment arm in a RCT evaluating the efficacy of iCBT for pediatric chronic pain. We have previously published manuscripts from this trial, including two manuscripts reporting on treatment outcomes (Law et al. 2018; Palermo et al. 2016) and one manuscript examining longitudinal associations between parent and child functioning (Law et al. 2017). Here we report for the first time on adolescent and parent engagement with the iCBT program and examine associations between engagement and treatment outcomes.

Families were enrolled from 15 multidisciplinary pediatric pain management clinics in the United States and Canada. Only participants randomized to the iCBT arm of the trial have been included ($n = 134$) in the current study. All families received the iCBT program, which was adjunctive to the standard care that participants received from their local pain clinic. Further information on the design, procedures, and participants of this RCT can be found in our prior publication reporting primary outcome analyses (Palermo et al. 2016).

The study was approved by the primary site's Institutional Review Board and the Institutional Review Boards at each referring center. Parents gave informed consent and adolescents gave assent prior to initiating study procedures. The clinical trial was registered and the full protocol is available (ClinicalTrials.gov Identifier NCT01316471).

2.2. Procedures

2.2.1. Internet-delivered cognitive behavioral therapy (iCBT)

All participants received iCBT for pain management (Palermo et al. 2016). Treatment content is grounded in cognitive-behavioral and social learning theories of pain management. The program includes eight treatment modules, designed to be completed in 30 min each, over 8–10 weeks. The program includes separate websites for adolescents and parents. The program is travel themed and has four main sections that are accessible from the home page: 1) treatment modules, 2) a message center, 3) a progress tracker, and 4) audio files of relaxation exercises. Core treatment components include education about chronic pain, training in behavioral (e.g., deep breathing, relaxation) and cognitive coping skills (e.g., reducing negative thoughts), instruction in increasing activity participation, and education about pain behaviors as well as parent operant and communication strategies.

Within each module, participants complete interactive fields in response to queries about their treatment goals, challenges they have faced due to their pain problem, and action plans for practicing treatment skills. These responses are then repopulated later in the modules to provide tailored and personalized instruction for behavioral assignments. At the end of each module, participants complete interactive quizzes to test knowledge acquisition. The program also has audiovisual features, including videos of peer models and audio files of relaxation exercises that participants can listen to via the program website or download onto their own device.

In six of the eight modules, participants are given a behavioral assignment focused on practicing skills learned in that module. Participants are asked to work on each assignment for one week, and then complete the assignment by logging back into the program and answering questions about their experience. Each assignment must be completed before participants are allowed to progress to the next module. An online coach reviews all completed assignments. In this trial, there were five online coaches (four were PhD-level psychology post-doctoral fellows and one with a master's degree) who all had previous experience delivering CBT. The online coach provided asynchronous feedback on each assignment via an online message center. Participants could also initiate messages to the online coach, although this was not required. Coaches used a previously developed manual to guide their responses to assignments and participant messages.

2.2.2. Assessment protocol

Assessments were completed at pre-treatment, immediate post-treatment, and 6-month follow-up through the secure study website. Adolescents and parents were instructed to complete assessments independently and privately.

2.3. Measures

2.3.1. User demographics

Parents reported on parent and adolescent's age, sex, race and family income at pre-treatment.

2.3.2. Treatment engagement

The web program automatically recorded the number of times adolescents and parents completed a module, completed an assignment, logged into the program, or sent a message to the online coach. To examine the content of e-mail messages sent by adolescents and parents to the online coach, we conducted automated textual analysis using Latent Dirichlet Allocation (LDA) (Blei et al. 2003) available through

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