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Original Research Article

A Single-Arm Feasibility Trial of Problem-Solving Skills Training for Parents of Children with Idiopathic Chronic Pain Conditions Receiving Intensive Pain Rehabilitation

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Abstract

Objective To adapt problem-solving skills training (PSST) for parents of children receiving intensive pain rehabilitation and evaluate treatment feasibility, acceptability, and satisfaction. **Methods** Using a prospective single-arm case series design, we evaluated the feasibility of delivering PSST to 26 parents (84.6% female) from one of three pediatric pain rehabilitation programs. Parents completed four to six sessions of PSST delivered during a 2–4-week period. A mixed-methods approach was used to assess treatment acceptability and satisfaction. We also assessed changes in parent mental health and behavior outcomes from pretreatment to immediate posttreatment and 3-month follow-up. **Results** Parents demonstrated excellent treatment adherence and rated the intervention as highly acceptable and satisfactory. Preliminary analyses indicated improvements in domains of mental health, parenting behaviors, health status, and problem-solving skills. **Conclusions** Findings demonstrate the potential role of psychological interventions directed at reducing parent distress in the context of intensive pediatric pain rehabilitation.

Key words: adolescents; children; chronic and recurrent pain; intervention outcome; mental health; parents.

Introduction

Caring for a child with chronic pain is challenging for parents. Unlike other childhood chronic illnesses (e.g., cancer, diabetes), idiopathic chronic pain conditions (i.e., headache, abdominal pain, musculoskeletal pain) do not have an easily identifiable cause. It is common for parents to spend months to years searching for a diagnosis before establishing care in a specialty pediatric pain management clinic. Even then, treatment plans are complex, time-consuming, and counter-intuitive. Parents are told to ignore instincts to protect their suffering child and instead support their child in participating in daily activities despite pain (Palermo & Law, 2015).

Parents of children with chronic pain report significant anxiety and depressive symptoms, roll stress, family conflict, and financial burden (Palermo,

Valrie, & Karlson, 2014). Palermo & Chambers (2005) propose that parents impact children's adjustment to chronic pain via direct and indirect pathways including parent emotions and behaviors, parent–child interactions, and family functioning. Indeed, parent distress, protective behavior, and family dysfunction have been associated with poorer emotional and functional outcomes for these youth (Palermo et al., 2014).

Although intensive pain rehabilitation is well studied among adults with chronic pain (Kamper et al., 2014), this treatment has only recently been applied to children. Intensive pain rehabilitation is recommended for children with extreme pain-related disability, certain pain conditions (e.g., complex regional pain syndrome), and those who have failed outpatient treatment. Similar to adult treatment, the goal is to improve functioning with the expectation that reductions in pain will occur along with or subsequent to improvements in function.

There is wide variability in psychological parent-focused interventions in intensive pain rehabilitation programs. Many psychologists teach parents behavior management strategies to support their child's functional gains (Hechler et al., 2015). To our knowledge, psychological interventions aimed at reducing parent distress have not been incorporated into intensive pain rehabilitation programs. In the only study to report parent outcomes after intensive pain rehabilitation (Eccleston, Malleson, Clinch, Connell, & Sourbut, 2003), improvements were found on parent pain-specific anxiety, depression, and role stress. Research is needed to explore the feasibility of psychological interventions targeting parent distress, and to understand the effects of intensive pain rehabilitation on parent functioning.

Among children with other chronic medical conditions, meta-analyses indicate that problem-solving skills training (PSST) is effective for reducing parent distress (Eccleston, Fisher, Law, Bartlett, & Palermo, 2015; Law, Fisher, Fales, Noel, & Eccleston 2014). PSST is based on the social problem-solving model (D'Zurilla & Nezu, 1999) and teaches a structured approach to solving problems. PSST has been adapted for parents of children with chronic pain receiving outpatient treatment, and a pilot randomized controlled trial (RCT) indicated that PSST is feasible, acceptable, and more effective than standard care at improving parent mental health and behavioral responses to pain (Palermo, Law, Essner, Jessen-Fiddick, & Eccleston, 2014; Palermo et al., 2016). There were also positive downstream effects on children's mental health, even though children did not receive PSST (Palermo et al., 2016). Based on these findings, we hypothesized that PSST may be a promising adjunctive treatment for parents of children receiving intensive pain rehabilitation.

Our first aim was to adapt PSST for parents of children receiving intensive pain rehabilitation. Compared with outpatient treatment, intensive pain rehabilitation is more physically and emotionally demanding, requires prolonged time away from home/work, and has a shorter timeframe. Our second aim was to evaluate feasibility in three pain rehabilitation programs using a prospective single-arm case series design. Our third aim was to evaluate acceptability and satisfaction using quantitative and qualitative methods. We also conducted preliminary analyses examining changes in treatment outcomes in the domains of parent mental health and behavior from pre- to posttreatment and 3-month follow-up.

Methods

Participants

Participants were recruited from three pediatric pain rehabilitation programs in the United States. The principal investigator's institution was designated as the lead site, and the remaining were collaborating sites. Inclusion criteria were (1) parent of a child with idiopathic chronic pain between the ages of 10 and 17 years (when chronic pain is most prevalent in childhood; King et al., 2011) and (2) enrolled in one of the three participating intensive pain rehabilitation programs. Exclusion criteria were (1) parent did not read or speak English and (2) parent had active suicidal ideation or psychosis. The Institutional Review Boards at all three sites approved this study.

Procedures

Potential participants were referred by providers sequentially either after they were placed on the waiting list for the pain rehabilitation program (lead site) or within the first 2 days after starting the pain rehabilitation program (collaborating sites). Potential participants were contacted by telephone before starting the pain rehabilitation program (lead site) or approached in person within the first 2 days of starting the pain rehabilitation program (collaborating sites). Owing to limitations on therapist time at the collaborating sites, we instituted the following recruitment procedures a priori: (1) study therapists had a maximum caseload of two participants at any given time and recruitment was temporarily closed when this threshold was met, and (2) the recruitment goal at the collaborating sites was set at four participants each.

Participants completed informed consent before initiating study procedures. After completion of the pretreatment assessment, parents received up to six individual sessions of PSST over 2–4 weeks. Sessions were offered in person and by telephone. Questionnaires were completed online via the secure, web-based application REDCap (Research Electronic

Data Capture; Harris et al., 2009), which is designed to collect, track, and export research data. Participants completed surveys privately in their homes. Study staff not involved in treatment delivery managed survey administration. After completing the final assessment, participants at the lead site were invited to complete a semistructured, qualitative interview by telephone. Study staff not involved in treatment delivery conducted, transcribed, and coded the qualitative interviews. Parents were provided with gift cards after completing assessments (pretreatment = $20; posttreatment = $30; follow-up = $40) and the interview ($50).

PSST Intervention

Treatment materials were adapted from an existing PSST protocol for parents of children with chronic pain receiving care in an outpatient pain clinic (Palermo et al. 2014), which uses the "Bright IDEAS" framework developed by Sahler and colleagues (2002). "Bright" represents optimism about the problem to be solved, and I = Identify the problem, D = Define the options, E= Evaluate the options and choose the best solution, A = Act out the solution, and S = See if the solution worked, revise, and try again. A research team composed of clinical psychologists with expertise in pediatric pain management, intensive pain rehabilitation, and problem-solving, cognitive-behavioral, and family therapies adapted the treatment materials.

We made several alterations to the published protocol to address the needs of families participating in intensive pain rehabilitation. To facilitate treatment completion, we altered the frequency and duration of sessions (i.e., instead of one 60-min session per week, we scheduled two 60–90-min sessions per week, with each session 2–3 days apart) and encouraged treatment delivery by telephone. We also adapted the content of treatment by developing a vignette booklet to provide examples of problems faced by parents of children receiving intensive pain rehabilitation and to illustrate the problem-solving steps. In addition, we amended the "Problems to be Solved" worksheet (used to identify target problems) to include problems relevant to this population. The treatment materials (therapist and parent manuals, vignette booklet, skills worksheets) were reviewed and revised by the research team.

Using these treatment materials, we delivered four to six individual sessions of PSST to parents over 2–4 weeks. Children did not participate in PSST sessions. Session structure was flexible so that content not covered in one session could be addressed in the subsequent session. Therapists used modeling, behavioral rehearsal, and performance feedback during sessions and assigned homework to facilitate skills practice (see Table I for a description of the treatment content).

Therapist Qualifications, Training, and Treatment Fidelity

Six postdoctoral psychology fellows delivered treatment (four at the lead site, and one each at the collaborating sites); all had experience in cognitive-behavioral therapy for pediatric pain management. Study therapists were trained via a 4-hr online program that included didactic instruction in PSST principles and the treatment protocol, downloadable treatment materials, and quizzes that evaluated knowledge acquisition (available by request from the first author). To support treatment fidelity, the treatment protocol was scripted and included structured worksheets to deliver skills training. In addition, study therapists were required to demonstrate understanding of PSST principles (via review of responses to the multiple-choice questions and discussion of case examples) and ability to deliver the treatment protocol (via role-play). Fidelity was monitored in weekly supervision using a case conference format led by the first author (a licensed clinical psychologist with prior experience in PSST). Corrective feedback was provided as needed to ensure treatment delivery was consistent with the manual.

Intensive Pain Rehabilitation

PSST was delivered to parents during their child's participation in one of three intensive pain rehabilitation programs. Each program had a primary goal of functional restoration and used a day treatment model where children were enrolled 5 days per week for 1–4 weeks. All children received physical therapy, occupational therapy, and psychotherapy for pain. All parents received pain education. None of the programs offered individual psychotherapy to parents.

Treatment Feasibility, Acceptability, and Satisfaction Measures

Feasibility

Feasibility was assessed using three metrics: (1) study recruitment/enrollment statistics, (2) completion of study assessments, and (3) treatment adherence as demonstrated by the number of parents who completed treatment (i.e., completion of four or more sessions), the number of missed/rescheduled treatment sessions, the number and duration of sessions completed by telephone versus in person, and therapist ratings of parents on homework completion, motivation to learn, understanding of the PSST principals, and rapport on 0–10 Likert scales. Therapist ratings were completed at the end of each session and then averaged across sessions for data analysis.

Table I. Treatment Description: PSST for Parents of Children in Intensive Pain Rehabilitation

Session (60–90 min each)	Goals, structure, content
Session 1 (Build Rapport, Orient to Treatment, Learned Optimism)	The primary goals for the first session are to: • Build rapport • Conduct a clinical interview to identify the impact of the child's pain on child, parent, and family functioning • Establish treatment expectations • Orient parents to the Bright IDEAS framework for problem-solving • Introduce learned optimism as a central component of the problem-solving process • Help parent identify whether their general orientation to solving problems is positive or negative • If a negative problem-solving orientation is identified, encourage parents to shift to a more positive problem orientation through instruction and guided practice in cognitive techniques including identification of negative automatic thoughts, thought stopping, and creation of positive self-statements • Assign homework to begin reading parent manual and vignette booklet
Session 2 (Teach Steps of Problem-Solving)	The primary goals of Session 2 are to: • Provide instruction in Bright IDEAS steps for problem-solving by applying the steps to a problem of the parent's choice • Encourage parents to select a combination of short-term and long-term problems (problem may or may not relate to their child's pain condition) to allow for practice of all the problem-solving steps • Use worksheets in session to facilitate learning of each problem- step • Create an action plan with parents to carry it out for homework
Sessions 3–6 (Practice Steps of Problem-Solving, Rapid Problem Solving, Relapse Prevention)	The primary goals of Sessions 3–6 are to: • Review the outcome of the action plan implemented and revise action plan as needed • Continue to practice the steps of problem-solving with the same problem or a new problem, with parents carrying out remaining steps for homework • Provide instruction in rapid problem-solving • Prepare for termination based on parents' ability to implement the problem-solving steps independently outside of session • Review relapse prevention strategies

Treatment Acceptability and Satisfaction

Parents completed the nine-item Treatment Evaluation Inventory–Short Form (TEI-SF) to assess acceptability and satisfaction with PSST (Kelley, Heffer, Greshem, & Elliott, 1989. Items were modified to be specific to PSST (i.e., "I find PSST to be an acceptable way of dealing with children's pain"). Item scores range from 1 (*strongly disagree*) to 5 (*strongly agree*) and are summed to create a total score. Total scores above 27 indicate that treatment has achieved moderate acceptability (Kelley et al., 1989). The TEI-SF has demonstrated adequate reliability and validity across a wide range of treatment studies (Kelley et al., 1989). Cronbach's alpha in the present study ranged from .82 to .94.

Semi-structured telephone interviews were administered to assess treatment satisfaction with PSST and elicit feedback. All participants ($n = 18$) at the lead site were invited to participate in the interview; nine parents agreed to participate and completed interviews. Interviews included a standard set of questions and probes focused on parents' experience with PSST.

Pretreatment Measures

Demographics and Pain Characteristics

Parents reported their age, gender, race, and family income level. Parents also reported their child's age, gender, race, primary pain location, and average pain frequency during the past 3 months.

Psychological Distress

To characterize general psychological distress at pretreatment, parents completed the 18-item Brief Symptom Inventory-18 (BSI-18; Derogatis, 2001). Scores range from 0 (*not at all*) to 4 (*extremely*). Raw scores were summed and converted to T-scores to create the Global Severity Index. T-scores ≥ 63 indicate clinically significant distress. The BSI has demonstrated good validity and reliability (Derogatis, 2001). Cronbach's alpha was .88.

Treatment Outcome Measures

Mental Health Composite

Parent mental health was assessed using measures of general mental health, general depression, pain-specific depression, and pain-specific anxiety.

General mental health. Parents completed the 65-item Profile of Mood States (POMS Standard; McNair, Lorr, & Droppleman, 1992) for assessing mood in the past week on a 5-point scale from 0 (*not at all*) to 4 (*extremely*). The Total Mood Disturbance score represents general mental health, with higher scores representing more distress. The POMS has excellent reliability and validity (McNair et al., 1992). Cronbach's alpha in the present study was .87–.91.

General depression. Parents completed the 21-item Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996). Responses ranged from 0 to 3 and were summed to create a total score, with higher scores representing more severe symptoms during the past 2 weeks. The BDI-II has excellent psychometric properties (Beck et al., 1996). Cronbach's alpha was .87–.93.

Pain-specific depression and anxiety. The Bath Adolescent Pain–Parental Impact Questionnaire (BAP-PIQ; Jordan, Eccleston, McCracken, Connell, & Clinch, 2008) was used to assess parent pain-specific depression (nine items) and anxiety (six items) in the past 2 weeks. Response options ranged from 0 (*never*) to 4 (*always*). Items were summed to create total scores for each subscale, with higher scores representing more distress owing to caring for a child with chronic pain. The BAP-PIQ has demonstrated good reliability and validity (Jordan et al., 2008). In the present study, Cronbach's alpha ranged from .82 to .89.

Mental health composite score calculation. Given that the four measures were highly correlated ($r = .58$–.84), we created a mental health composite score. Scores were transformed per Moeller's (2015) guidelines (i.e., dividing the maximum possible score and then multiplying by 100). Cronbach's alpha for the transformed scores was strong (.86–.92). The transformed scores were then averaged together to create the composite.

Parenting Role Stress

Parents completed the 36-item Parenting Stress Index–Short Form (Abidin, 1995). Responses ranged from 0 (*strongly agree*) to 4 (*strongly disagree*). Items were combined to create a total stress percentile score, with higher scores reflecting greater parenting role stress. This measure has demonstrated good reliability and validity (Abidin, 1995). Cronbach's alpha in the present study ranged from .93 to .95.

Pain Catastrophizing

Parent catastrophizing about their child's pain in the past 2 weeks was assessed using the 5-item pain catastrophizing subscale of the BAP-PIQ (Jordan et al., 2008; see above). Cronbach's alpha for the present study ranged from .78 to .88.

Parenting Behaviors

Protective parenting behaviors were assessed using the 11-item protective behavior subscale from the BAP-PIQ (Jordan et al., 2008; see above). Higher scores indicate more maladaptive protective behaviors. Cronbach's alpha for the present sample ranged from .62 to .92. Miscarried helping behaviors (i.e., parental helping behaviors resisted by the child) were assessed with the 15-item Helping for Health Inventory–Pain (HHI; Fales, Essner, Harris, & Palermo, 2014).

Responses ranged from 1 (*rarely*) to 5 (*always*), with higher scores reflecting greater miscarried helping. The HHI has demonstrated good reliability and validity in chronic pain samples (Fales et al., 2014). Cronbach's alpha in this study ranged from .85 to .87.

Health Status

The 12-item Short-Form Health Survey (SF-12; Ware, Kosinksi, & Keller, 1996) was used to evaluate health status in the past 4 weeks. Item response options vary by question (e.g., dichotomous yes/no options, Likert-type scales). Computerized scoring algorithms were used to calculate the physical component summary score and the mental component summary score. Higher scores indicate better health status. The SF-12 has demonstrated excellent reliability and validity (Ware et al., 1996).

Problem-solving Skills

Problem-solving skills were assessed using the Social Problem-Solving Skills Inventory–Revised (SPSI-R; D'Zurilla, Nezu, & Maydeu Olivares, 2002), a 52-item measure that evaluates thoughts, feelings, and actions in response to important and challenging problems. Responses ranged from 0 (*not at all true of me*) to 4 (*extremely true of me*) and were combined to create total problem-solving and constructive problem-solving scores (higher scores represent better problem-solving ability), and a dysfunctional problem-solving score (higher scores represent poor problem-solving ability). The SPSI-R has demonstrated strong reliability and validity in caregivers of patients with medical conditions (Sahler et al., 2002). Cronbach's alpha for the present sample ranged from .87 to .96.

Adverse Events

Parents had the opportunity to report adverse events at each assessment period in an open-ended manner and to attribute these to treatment procedures.

Data Analysis Plan

Quantitative data analysis was conducted using IBM SPSS v.21 (IBM Corp., 2012). Descriptive statistics summarized demographic (see Table II) and pretreatment characteristics of the sample and quantitative ratings of treatment feasibility, acceptability, and satisfaction. Quantitative outcome measures were scored and missing data addressed per published scoring manuals. Rates of missing data were low. Multilevel modeling (MLM) was used to examine change in treatment outcome variables over time. MLM accounts for repeated measures within subjects, accommodates missing observations, and includes all available observations in analyses. Linear growth model specifications procedures were based on Shek & Ma (2011).

Table II. Parent and Child Demographic Characteristics

Parent demographic characteristics	$n = 26$
Gender (% female)	84.6
Age (M_{years}, SD)	45.77 (5.2)
Race (% Caucasian)	88.5
Marital Status (% married)	92.3
Education	
High School or less	7.7%
Vocational School/Some College	23.1%
College	38.5%
Graduate/Professional School	30.8%
Household Annual Income	
10,000–29,999	3.8%
50,000–69,999	11.5%
70,000–100,000	34.6%
>100,000	50.0%
Employment status	
Full time	53.8%
Part time	11.5%
Not working	34.6%
BSI Global Severity Index (M, SD)	51.58 (9.5)
Child demographic characteristics	$n = 26$
Gender (% female)	69.2
Age (M_{years}, SD)	14.4 (2.0)
Race (% Caucasian)	76.9
Primary pain location	
Headache	26.9%
Stomach	7.7%
Musculoskeletal	53.7%
Missing	11.5%
Pain frequency	
1–3 times per month	3.8%
1 time per week	3.8%
Daily	84.6%
Missing	7.7%

Time was treated as a categorical variable, and pretreatment values were specified as the reference point so that results were interpreted as change from pretreatment to immediate posttreatment and pretreatment to follow-up. Separate linear growth models were conducted for each outcome measure. A significance level of $p = .05$ was used in this feasibility trial.

Qualitative interviews were coded using a grounded theory approach (Charmaz, 2006). Consistent with grounded theory methodology, we sought to understand participants' satisfaction with PSST inductively, without a predefined conceptual framework or theory. In other words, we sought to identify all possible codes directly from the data. The qualitative coding team was composed of psychologists with experience in problem-solving therapy and pediatric pain management, and graduate and undergraduate students in clinical psychology and medicine.

To promote rigor and credibility of our qualitative data analysis, we took the following steps recommended by Wu and colleagues (2016): (1) the primary coders kept a notebook about ideas emerging from the data as the data were being coded and documented

decisions and definitions of codes during the coding process; (2) we used an iterative coding process such that codes were compared across participants as they were developed and refined to identify similarities and differences; (3) we held weekly meetings as a research team to discuss the data and their interpretation in detail as the codes were developed; and (4) we triangulated findings from the qualitative data with our quantitative ratings of treatment satisfaction.

Consistent with grounded theory methodology (Charmaz, 2006), data analysis began with the research team reading all of the transcripts to become familiar with the data. Two primary coders then created the initial codes by organizing segments of text into meaningful groups using NVivo v.10 (QSR International, 2012). In weekly coding meetings with the coding team, the primary coders compared their application of the codes, and disagreements were resolved. Initial coding continued in an iterative fashion until the team agreed that the coding scheme accurately captured the data. In the next step, focused coding was conducted to create subcategories by sorting and refining the initial codes. Each code could be placed into more than one subcategory, thus preserving as much variation in the data as possible and facilitating identification of linkages between subcategories. Within each subcategory, all of the coded segments of text were reviewed to ensure that the data comprising the subcategories were coherent. This process was iterative and continued until the team agreed that the subcategories accurately represented the data, which sometimes required refinement of the initial codes. The data were then reviewed again to combine and refine the subcategories into the final set of core categories. Creation of core categories was also an iterative process that continued until consensus was reached. The final coding scheme was applied to all of the interviews. The coding team operationally defined each of the final core categories, and these results are presented below.

Results

Participants

Twenty-six parents were enrolled, including 22 mothers and 4 fathers between the ages of 35 and 55 years ($M = 45.77$, $SD = 5.2$). Their children were 10–17 years of age ($M = 14.40$, $SD = 2.00$). Parents and children were primarily female, Caucasian, and middle class. The majority of parents had completed college or higher education. Children had musculoskeletal pain (69.3%), headache (30.7%), and abdominal pain (15.4%). Four parents (15.4%) reported clinically significant emotional distress at baseline (BSI T-score ≥ 63). Participants at the three sites (lead site: $n = 18$, collaborating sites: $n = 4$ each/8 total) did not differ on any demographic factors or pretreatment variables. Demographic characteristics are presented in Table II.

Feasibility

Study Recruitment and Enrollment

Across sites, potential participants were recruited sequentially in the order that they were referred. Recruitment at the lead site occurred over 12 months and resulted in 39 referrals. Ten of the referred parents were unable to be reached for recruitment. Of the 29 parents who were recruited, 11 declined owing to lack of time or interest. The final sample from the lead site included 18 parents. For the collaborating sites, the recruitment goal was set, a priori, at four parents each (eight total) owing to limitations in study therapist time. All parents who were recruited at the collaborating sites agreed to participate, and the recruitment goal was reached within 2 months. The final sample included 26 participants (lead site: $n = 18$, collaborating sites: $n = 4$ each/8 total; overall recruitment/enrollment rate = 70.3%).

Assessment Completion

Assessment completion was high with 84.6% of parents completing all three assessments (pretreatment: $n = 26$, posttreatment: $n = 24$, follow-up: $n = 22$).

Treatment Adherence

Of the 26 parents in the final sample, 22 completed treatment (i.e., four or more sessions; treatment completion rate = 84.6%). Parents received a range of one to six treatment sessions (M sessions = 4.5). Parents were adherent to scheduled sessions with few missed/rescheduled sessions (range 0–3 per participant). Sessions were delivered in person (58% of sessions) and via telephone (42% of sessions). Average duration of telephone and in-person sessions was similar ($p = .09$; M = 56 min, and M = 61 min, respectively). Therapists rated parents as being highly compliant with homework ($M = 8.16$ of 10), motivated ($M = 8.49$ of 10), understanding of the PSST principles ($M = 8.38$ of 10), and having strong rapport ($M = 8.49$ of 10).

Treatment Acceptability and Satisfaction

Quantitative ratings indicated that parents found the intervention to be highly acceptable and satisfactory ($M = 32.60$ of 45). Qualitative data analysis of the nine parent interviews resulted in an organizing framework of core categories that together describe participants' satisfaction with PSST (both positive and negative), their experience using the PSST skills, and their ideas to improve the intervention. The final set of core categories included (1) benefits of the PSST program, (2) limitations of the PSST program, (3) use of PSST skills posttreatment, and (4) mode of treatment

delivery. Consistent with the guidelines set forth by Wu and colleagues (2016), we summarize findings from the categories below and present quotes from parents in Table III.

Benefits of the PSST Program

The PSST program was described as emotionally validating and reflective of participating in intensive pain rehabilitation. The problem-solving skills were reported to be helpful in parents' daily lives. Parents who had been trained in problem-solving skills by their employers described learning to apply these skills in new ways.

Limitations of the PSST Program

Parents shared their perspectives on how to improve the PSST intervention. For example, one parent raised a concern that the PSST materials were not specific enough to the chronic pain population. Others wanted more advanced training in PSST skills, as well as additional support from therapists after the end of treatment.

Use of PSST-skills Posttreatment

Of the nine parents interviewed, eight parents (88.9%) reported continued use of the PSST skills in their daily lives after completing treatment. Five parents (55.6%) reported continued use of the PSST materials (binder, worksheets), and six parents (66.7%) reported that they had spontaneously taught the PSST skills to other family members.

Mode of Treatment Delivery

Parents appreciated the flexibility to complete sessions either in person or via telephone. We also assessed parents' interest in a future, technology-delivered version of the PSST intervention. Some parents expressed a preference for a web-based intervention that included human support. Others indicated that they would appreciate the accessibility of an entirely web-based or mobile intervention.

Treatment Outcomes

Means and standard deviations of parent outcomes at pretreatment, posttreatment, and follow-up are presented in Table IV.

Mental Health Composite

Significant improvements were found on the parent mental health composite score from pretreatment through posttreatment and follow-up ($b = -13.92$, $p < .001$, $d = -0.86$, 95% CI = [−1.44, −0.27]; $b = -14.20$, $p = .001$, $d = -0.75$, 95% CI = [−1.44, −0.26], respectively). These were large effects.

Table III. Example Quotes for Core Categories From Qualitative Treatment Satisfaction Interviews

Benefits of the PSST program
"I felt kind of guilty about having those thoughts: 'This is exhausting, this is horrible, why is my child like this?' Reading notes of other parents who felt the same way was really reassuring because, you know, we're really isolated. . .out in our own world. So that was really comforting to know I wasn't alone in feeling that way, and it was okay to feel that way."
"I really liked the skills that I learned. I mean, it helped me not only in solving her problems or helping her, but in many areas of my life in general it helped me."
"It validated some of the military training I had, which was a benefit for me, because then I could say, 'Look, it works in real life!' to my guys. It also allowed me to take a step back and look at [child's] situation and make sure that I was approaching it to be helpful."
Limitations of the PSST program
"Occasionally, I kind of went, 'This doesn't quite fit.' And obviously there's some similar things, but I think in some ways there's major differences because a lot of us that are dealing with chronic pain, the doctors keep trying all these things and we don't really know what causes it, why he's even got it, and so there's a lot more uncertainty."
"It was just so basic. I've been working on problem solving for, you know, how many years?"
"I couldn't call and say 'Help!' [laughing]. When you get to a point, it's like 'Okay, I've exhausted everything you've taught me and we're still at a stalemate. Do you have any suggestions?' I think that would be key."
Use of PSST skills posttreatment
"We've used [the problem-solving skills], as a family, and myself in particular. I've been trying to use the books for coming up with solutions to something when somebody gets pushy with me. 'Let's see if we can find another way, because this isn't working.'"
"I took [child] and I told her, 'This is for solving problems' and we went through the steps, and I actually showed her the steps in the book, and then [for husband], I actually had him read it and then I explained, 'This is what the study is about and it really works!' He actually applied a little bit of it, too!"
"I haven't [used the problem-solving skills since the study]. I thought about, you know, actually using some of the visuals in the manual. I'm kind of thinking sometimes when my son's whining, 'Oh, I need to. . .' It was helpful at the time, I guess."
Mode of treatment delivery
"We did, I think, one of the [sessions] when we were still in the area and then we did the rest of them over the phone I believe. It was nice to have that flexibility and not have to come in to do it every time."
"I don't mind doing things, you know, online or on my phone or whatever, but if I can actually have a human being to connect with or something, you know, along the way, I feel like I get a little bit more out of it."
"That would be cool because then I could do it on my phone or at work. It would be handy no matter where I was."

Table IV. Unadjusted Descriptive Statistics on Measures of Treatment Outcomes

Measure	Mean (*SD*)		
	T1	T2	T3
Mental health composite	41.05 (15.79)	27.04 (16.93)	26.61 (14.81)
Parenting role stress (PSI)	62.58(33.91)	58.00(35.77)	61.43(32.79)
Pain catastrophizing (BAPQ-PIQ)	10.00 (4.37)	7.00 (5.38)	9.33 (3.80)
Parenting behaviors			
Protective parenting (BAPQ-PIQ)	24.42(4.61)	14.79(8.68)	14.76(6.62)
Miscarried helping (HHI)	33.31(9.75)	30.37(10.08)	30.95(9.31)
Health Status (SF-12y)			
Physical component summary	49.64(10.61)	50.16(9.07)	49.74(10.04)
Mental component summary	38.39(11.43)	42.01(13.38)	46.08(11.02)
Problem-solving skills (SPSI-R)			
Constructive problem-solving	52.26(15.37)	60.84(15.86)	59.91(16.60)
Dysfunctional problem-solving	19.45(10.23)	19.05(9.61)	19.69(11.07)
Total problem-solving	14.18(1.83)	14.91(1.96)	14.76(2.10)

Parenting Role Stress

There was no significant change in parent role stress.

Pain Catastrophizing

Parents reported a significant and large reduction in catastrophizing about their child's pain from pre- to posttreatment ($b = -3.05$, $p = .002$, $d = -0.61$, 95% CI = [−1.17, −0.04]), although this was not maintained at follow-up.

Parenting Behaviors

Parent protective behaviors and miscarried helping behaviors significantly improved from baseline through posttreatment ($b = -9.56$, $p < .001$, $d = -1.27$, 95% CI = [−1.88, −0.66]), which were medium to large effects. Gains in parent protective behaviors, but not miscarried helping behaviors, were maintained at follow-up ($b = -9.74$, $p < .001$, $d = -1.65$, 95% CI = [−2.31, −0.98]).

Health Status

There were significant gains with large effect sizes in mental component summary scores observed at follow-up only ($b = 8.10$, $p = .007$, $d = 0.69$, 95% CI = [0.08, 1.29]). Physical component summary scores did not change.

Problem-solving Skills

Total problem-solving scores improved significantly from baseline to posttreatment ($b = 0.71$, $p = .03$, $d = 0.38$, 95% CI = [−0.18, 0.94], medium effect), but this was not maintained through follow-up. Improvements were found on constructive problem-solving from baseline to posttreatment and follow-up ($b = 8.61$, $p = .002$, $d = 0.55$, 95% CI = [−0.02, 1.11]; $b = 7.46$, $p = .01$, $d = 0.48$, 95% CI = [−0.10, 1.05], respectively; these were medium to large effects). Dysfunctional problem-solving scores did not change

Adverse Events

Parents did not report any study-related adverse events. One parent withdrew from the study after their child experienced a medical emergency; this was unrelated to study procedures.

Discussion

To our knowledge, this study is the first to examine a psychological intervention that targets parent distress in an intensive pain rehabilitation setting. We adapted a problem-solving intervention tested in other populations for this population and evaluated feasibility and acceptability of delivering our treatment protocol within three pediatric pain rehabilitation programs using a prospective single-arm case series design. Our findings generally support the feasibility of delivering this intervention during busy and logistically complex intensive pain rehabilitation programs.

The majority of parents completed assessments, adhered to scheduled treatment sessions, and complied with homework. Therapists rated parents as highly motivated to learn, showing good understanding of the PSST principles, and having strong rapport. Recruitment/enrollment was lower at the lead site versus the collaborating sites, which may have occurred due to differences in recruitment methodology. Recruitment at the lead site was conducted by telephone before starting pain rehabilitation, and was conducted in-person within 2 days *after* starting pain rehabilitation at the collaborating sites. Recruiting parents in-person after entering pain rehabilitation may be a more effective strategy for enrolment into intervention studies. Stigma against mental health treatment may have also impacted enrollment. Delivery of PSST via technology-based platforms could potentially decrease stigma and increase parents' receptivity to treatment (e.g., Mohr et al., 2010), and should be considered in future research.

Using a mixed-methods approach, we examined acceptability and satisfaction with PSST. Quantitatively, parents rated the intervention as having high acceptability and satisfaction. Qualitative interviews demonstrated that parents felt emotionally validated and found the problem-solving skills valuable and applicable to their daily lives. In fact, several parents independently taught the problem-solving skills to other family members. Flexibility in scheduling treatment sessions either in person or by telephone was identified as a strength of the intervention protocol.

Qualitative interviews also revealed opportunities for improvement. Parents requested additional PSST intervention, including advanced training in problem-solving skills and access to therapist support following termination. Importantly, much of the work involved in intensive pain rehabilitation takes place after discharge when parents are expected to implement family-oriented lifestyle changes to maintain their child's functioning. The PSST protocol could be delivered following program discharge from intensive pain rehabilitation to specifically focus on maintenance of treatment gains. Parents were interested in receiving PSST via an Internet program or mobile application, which could support session attendance.

To inform future trials, we conducted preliminary analyses examining change in parent outcomes from pre- to posttreatment and 3-month follow-up. In this small sample, we found significant improvements with moderate to large effect sizes on measures of mental health, parenting behaviors, health status, and problem-solving skills. No change was observed on parent role stress or physical health. These findings are somewhat consistent with the only other study to report parent outcomes after intensive pain rehabilitation (Eccleston et al., 2003). Using a single-arm case series design, improvements were reported in pain-specific depression, anxiety, and role stress (Eccleston et al., 2003). Our results indicate that future controlled trials of PSST should assess both parent mental health and behavioral responses to pain.

Limitations, Clinical Implications, and Directions for Future Research

Parents in this trial had middle to high socioeconomic backgrounds, which, although similar to other chronic pain samples, impacts the generalizability of our findings. Research is needed to evaluate the feasibility and efficacy of PSST for parents of youth with chronic pain who are from more diverse backgrounds. In other chronic disease populations, research teams have demonstrated efficacy of PSST compared with standard care and supportive care interventions for parents who are from low socioeconomic backgrounds, non-Caucasian, and non-English speaking (Sahler et al., 2013; Seid, Varni, Gidwani, Gelhard, & Slymen, 2010).

We also cannot draw conclusions about the efficacy of our PSST intervention and this was not a study aim. Although we found improvements in parent outcomes, without a control group it is not possible to determine whether this occured because of PSST versus intensive pain rehabilitation versus the passage of time. Despite this limitation, we chose to report parent outcome data to contribute to the limited available literature regarding parent functioning after intensive pain rehabilitation and to inform assessment protocols for future, controlled trials.

Nearly all studies of intensive pediatric pain rehabilitation have used retrospective chart review or case series design, and no multisite trials have been reported (Hechler et al., 2015). Conducting RCTs in intensive pediatric pain rehabilitation is challenging because withholding treatment may be clinically inadvisable. To date, there has been only one RCT evaluating the efficacy of intensive pediatric pain rehabilitation (Hechler et al., 2014). This trial randomized on the timing of intervention: the active treatment arm received treatment immediately, while the control condition received delayed treatment. We encourage additional novel designs in trials of intensive pediatric pain rehabilitation such as the multisite stepped-wedge cluster RCT design (Hemming, Haines, Chilton, Girling, & Lilford, 2015). With this approach, each site would serve as its own control where following a randomized control period, intervention would be delivered. This allows for a unique opportunity to make comparisons between control and intervention conditions while allowing all sites to deliver active treatment.

Intensive pain rehabilitation is increasingly offered to youth with complex and disabling chronic pain. Psychological interventions targeting parent distress such as PSST have the potential to improve parent and child outcomes (Palermo et al., 2016). However, little guidance exits regarding optimal approaches to involving parents in treatment. Our findings have important clinical implications. We demonstrated that it is feasible to deliver PSST to parents during intensive pediatric pain rehabilitation. Parents found PSST to be highly acceptable and satisfactory. PSST for parents of children in intensive pain rehabilitation is deserving of further attention by clinicians and researchers.

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References

Abidin, R. R. (1995). *Parenting stress index*. Odessa, FL: Psychological Assessment Resources.

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Manual for the beck depression inventory-II*. San Antonio, TX: Psychological Corporation.

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. London, UK: Sage Publications.

D'Zurilla, T. J., & Nezu, A. M. (1999). *Problem solving therapy: A social competence approach to clinical intervention* (2nd edn.). New York: Springer Publishing.

D'Zurilla, T. J., Nezu, A. M., & Maydeu-Olivares, A. (2002). *Manual for the social problem-solving inventory-revised*. North Tonawanda, NY: Multi-Health Systems.

Derogatis, L. R. (2001). *Brief symptom inventory (BSI-18): Administration, scoring and procedures manual*. Minneapolis, MN: NCS Pearson.

Eccleston, C., Fisher, E., Law, E., Bartlett, J., & Palermo, T. M. (2015). Psychological interventions for parents of children and adolescents with chronic illness. *The Cochrane Database of Systematic Reviews*, *4*, CD009660. doi: 10.1002/14651858.CD009660.pub3

Eccleston, C., Malleson, P. N., Clinch, J., Connell, H., & Sourbut, C. (2003). Chronic pain in adolescents: Evaluation of a programme of interdisciplinary cognitive behaviour therapy. *Archives of Disease in Childhood*, *88*, 881–885.

Fales, J. L., Essner, B. S., Harris, M. A., & Palermo, T. M. (2014). When helping hurts: Miscarried helping in families of youth with chronic pain. *Journal of Pediatric Psychology*, *39*, 427–437.

Harris, P., Taylor, R., Thielke, R., Payne, J., Gonzalez, N., & Conde, J. (2009). Research electronic data capture: A metadata-driven methodology and workflow process for providing translational research informatics support. *Journal of Biomedical Informatics*, *42*, 377–381.

Hechler, T., Kanstrup, M., Holley, A. L., Simons, L. E., Wicksell, R., Hirschfeld, G., & Zernikow, B. (2015). Systematic review on intensive interdisciplinary pain treatment of children with chronic pain. *Pediatrics*, *136*, 115–127. doi: 10.1542/peds.2014-3319

Hechler, T., Ruhe, A., Schmidt, P., Hirsch, J., Wagner, J., Dobe, M., … Zernikow, B. (2014). Inpatient-based intensive interdisciplinary pain treatment for highly impaired children with severe chronic pain: Randomized controlled trial of efficacy and economic effects. *Pain*, *155*, 118–128. doi: 10.1016/j.pain.2013.09.015

Hemming, K., Haines, T. P., Chilton, P. J., Girling, A. J., & Lilford, R. J. (2015). The stepped wedge clustered randomized controlled trial: Rationale, design, analysis, and reporting. *BMJ*, *350*, h391.

IBM Corp. (2012). *IBM SPSS statistics for windows, v.21.0. Armonk*, New York: IBM Corp.

Jordan, A., Eccleston, C., McCracken, L. M., Connell, H., & Clinch, J. (2008). The Bath Adolescent Pain-Parental Impact Questionnaire (BAP-PIQ): Development and preliminary psychometric evaluation of an instrument to assess the impact of parenting an adolescent with chronic pain. *Pain. 137*, 478–487.

Kamper, S. J., Apeldoom, A. T., Chiarotto, A., Smeets, R. J., Ostelo, R. W., Guzman, J., & van Tulder, M. W. (2014). Multidisciplinary biopsychosocial rehabilitation for chronic low back pain. *Cochrane Database of Systematic Reviews*, *9*, CD000963.

Kelley, M. L., Heffer, R., Gresham, F., & Elliot, S. (1989). Development of a modified treatment evaluation inventory. *Journal of Psychopathology and Behavioral Assessment*, *11*, 235–247.

King, S., Chambers, C. T., Huguet, A., MacNevin, R. C., McGrath, P. J., Parker, L., & MacDonald, A. J. (2011). The epidimiology of chronic pain in children and adolescents revisited: A systematic review. *Pain*, *152*, 2729–2738.

Law, E. F., Fisher, E., Fales, J., Noel, M., & Eccleston, C. (2014). Systematic review and meta-analysis of parent- and family-based interventions for children with chronic medical conditions. *Journal of Pediatric Psychology*, *39*, 866–886.

McNair, D. M., Lorr, M., & Droppleman, L. F. (1992). *Manual for the Profile of Mood States*. San Diego, CA: EdITS.

Moeller, J. (2015). A word on standardization in longitudinal studies: Don't. *Frontiers in Psychology*, *6*, 1389.

Mohr, D., Siddique, J., Ho, J., Duffecy, J., Jin, L., & Fokuo, J. K. (2010). Interest in behavioral and psychological treatments delivered face-to-face, by telephone, and Internet. *Annals of Behavioral Medicine*, *40*, 89–98.

Palermo, T. M., & Chambers, C. T. (2005). Parent and family factors in pediatric chronic pain and disability: An integrative approach. *Pain*, *119*, 1–4.

Palermo, T. M., & Law, E. F. (2015). *Managing your child's chronic pain*. New York, NY: Oxford University Press.

Palermo, T. M., Law, E. F., Bromberg, M., Fales, J., Eccleston, C., & Wilson, A. C. (2016). Problem-solving skills training for parents of children with chronic pain: A pilot trial. *Pain, 157*, 1213–1223.

Palermo, T. P., Law, E. F., Essner, B., Jessen-Fiddick, T., & Eccleston, C. (2014). Adaptation of problem-solving skills training (PSST) for parent caregivers of youth with chronic pain. *Clinical Practice in Pediatric Psychology*, *2*, 212–223.

Palermo, T. M., Valrie, C. R., & Karlson, C. W. (2014). Family and parent influences on pediatric chronic pain: A developmental perspective. *American Psychologist*, *69*, 142–152.

QSR International. (2012). *NVivo qualitative data analysis software for windows, v.10. Victoria*, Australia: QSR International Pty Ltd.

Sahler, O. J., Varni, J. W., Fairclough, D. L., Butler, R. W., Noll, R. B., Dolgin, M. J., … Mulhern, R. K. (2002). Problem-solving skills training for mothers of children with newly diagnosed cancer: A randomized trial. *Journal of Developmental & Behavioral Pediatrics*, *23*, 77–86.

Sahler, O. J., Dolgin, M. J., Phipps, S., Fairclough, D. L., Askins, M. A., Katz, E. R., … Butler, R. W. (2013). Specificity of problem-solving skills training in mothers of children newly diagnosed with cancer: Results of a multisite randomized clinical trial. *Journal of Clinical Oncology*, *31*, 1329–1335.

Seid, M., Varni, J. W., Gidwani, P., Gelhard, L. R., & Slymen, D. J. (2010). Problem-solving skills training for vulnerable families of children with persistent asthma. Report of a randomized trial on healht-related quality of life outcomes. *Journal of Pediatric Psychology*, *35*, 1133–1143.

Shek, D. T., & Ma, C. M. (2011). Longitudinal data analyses using linear mixed models in SPSS: Concepts, procedures and illustrations. *The Scientific World Journal*, *11*, 42–76.

Ware, J., Kosinski, M., & Keller, S. (1996). A 12-Item Short-Form Health Survey: Construction of scales and preliminary tests of reliability and validity. *Medical Care*, *34*, 220–233.

Wu, Y. P., Thomspon, D., Aroian, K. J., McQuaid, E. L., & Deatrick, J. A. (2016). Commentary: Writing and evaluating qualitative research reports. *Journal of Pediatric Psychology*, *41*, 493–505.