Acceptance and Values-Based Treatment of Adolescents With Chronic Pain: Outcomes and Their Relationship to Acceptance

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Objective Psychological treatments for pediatric chronic pain are moderately effective. However, there have been few studies of the psychological processes associated with treatment response. This study examines the effects of Acceptance and Commitment Therapy (ACT) treatment on a severely disabled group of adolescents with chronic pain, examining relationships between outcome and acceptance.

Methods 98 adolescents with pain, mean age 15.6 years, underwent an uncontrolled trial of 3-week residential ACT treatment.

Results Adolescents improved in self-reported functioning and objective physical performance at 3-month follow-up. They were less anxious and catastrophic, attended school more regularly, and used health care facilities less often. Most positive treatment outcomes were associated with improvements in acceptance.

Conclusions An intensive ACT-based pain rehabilitation course was an effective treatment for disabled adolescents with chronic pain. Its results were theoretically consistent—improvements were associated with changes in acceptance and were achieved without pain control or cognitive restructuring techniques.

Key words adolescents; chronic pain; cognitive-behavioral therapy; depression; disability; school attendance.

Children and adolescents commonly experience recurrent pain (Perquin et al., 2000). In most cases, they do not seek help for this, and it does not interfere with their lives. However, a proportion of children experience persistent pain that is more troublesome. In many cases, it is not directly associated with a definable medical condition (e.g., chronic abdominal pain), and it results in substantial distress, functional interference, and a pattern of seeking treatment (Konijnenberg et al., 2005).

Children and adolescents with chronic pain usually receive analgesic and medical treatments, but these are often only partially effective and are poorly evidenced for this population (Currie, 2006). In contrast, psychological treatments that focus on skilful coping responses and cognitive-behavioral techniques are well supported by research. A recent meta-analysis included 25 well-conducted trials and showed evidence of benefit for headache, abdominal pain, and fibromyalgia (Eccleston, Palermo, Williams, Lewandowski, & Morley, 2009). However, this review showed that the majority of studies were of brief treatments for children with headaches, and despite good evidence for pain relief, there was much less evidence for reduced disability after treatment. Also, there has been little innovation in the psychological models and techniques used in pain treatments, with most trials using relaxation, biofeedback, or established cognitive-behavioral techniques. Where these treatments are effective, it is unclear why; studies of treatment process are essential for treatment development and are lacking in the cognitive-behavioral therapy (CBT) literature in general (Longmore & Worrall, 2007).
Acceptance and Commitment Therapy (ACT) is a new cognitive-behavioral approach that has substantial supporting evidence in adult populations (Ruiz, 2010). It extends classic CBT by placing a relatively greater emphasis on acceptance-based and experiential treatment methods, on committed action, and on patient values (Hayes, Strosahl, & Wilson, 1999). In ACT, symptom control (e.g., reduction in pain or depressive symptoms) is not a primary focus. Instead, ACT aims to help individuals encounter distress openly and without ineffective resistance or struggling, also known as “acceptance.” This can liberate an individual to focus on living a personally meaningful and valued life, despite the likely presence of distress (termed “values-based living”). ACT endorses these therapeutic assumptions for most psychological problems (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). However, it is clearly particularly relevant for chronic conditions where remission or recovery from symptoms is unlikely, such as chronic pain. ACT also differs in its approach to cognitive factors in pain; although acknowledging the importance of thoughts and beliefs, it addresses these without any attempt to change them by questioning or experiment.

ACT has been a successful treatment approach for adult chronic pain. Adults with long-standing pain-associated disability and distress improve in most important treatment domains after intensive interdisciplinary treatment using ACT (Vowles & McCracken, 2008). The evidence for the particular therapeutic process within ACT also is relatively strong in the adult literature, including acceptance (McCracken, Vowles, & Eccleston, 2004; McCracken & Eccleston, 2003) and values-based action (McCracken & Gutierrez-Martinez, 2011; Vowles & McCracken, 2008). However, studies of treatment process in any psychological model are generally lacking in the pediatric pain literature.

There is preliminary evidence showing that in adolescents with chronic pain, increased acceptance of pain is strongly and independently associated with better functioning and less distress (McCracken, Gauntlett-Gilbert, & Eccleston, 2010). Acceptance can be measured by a version of the Chronic Pain Acceptance Questionnaire (CPAQ-A) adapted for adolescents (McCracken et al., 2010). There is also preliminary evidence that similar qualities of acceptance and values-based action in parent behavior are associated with better adolescent functioning (McCracken & Gauntlett-Gilbert, 2011). Wicksell et al. have studied ACT treatment for pediatric pain in both a case series (Wicksell, Melin, & Olsson, 2007) and a small randomized controlled trial (Wicksell, Melin, Lekander, & Olsson, 2009), finding positive effects for individually delivered treatment, including improvements in functional ability and pain-related discomfort (Wicksell et al., 2009). This group have also carried out a thorough process analysis of their ACT treatment (currently the only example of pediatric pain literature), showing some evidence that ACT processes mediate outcome, but without using validated ACT-specific psychometric measures (Wicksell, Olsson, & Hayes, 2011).

This study extends existing research by examining ACT treatment for highly disabled adolescents. It examines treatment effects on functional disability in a range of domains (self-reported, school attendance, and direct physical measures), as recommended by a recent review (Eccleston et al., 2009). Although functional disability has often been examined cross-sectionally in pediatric pain research, it has been neglected in treatment studies (Eccleston et al., 2009). It includes an analysis of the relationship between treatment outcome and acceptance, extending the work of Wicksell et al. by using an ACT-specific process measure validated for adolescents with pain (the CPAQ-A—McCracken et al., 2010). This study also examines ACT applied as a group interdisciplinary intensive treatment, including physiotherapy and other rehabilitation input. This is a contrast to previous research on individual psychology-delivered treatment studied by Wicksell et al. (2009). Interdisciplinary treatment is common in specialist pain centers (e.g., Eccleston, Crombez, Scotford, Clinch, & Connell 2004; Simons, Logan, Chastain, & Cerullo, 2010) and has been a “gold standard” of chronic pain treatment in the field of adult pain for decades (e.g., Turk & Burwinkle, 2005). Interdisciplinary treatment is often delivered using an overarching behavioral model, but this model has often been CBT (Eccleston et al., 2004); this study of an ACT approach is unique in the pediatric pain literature.

**Methods**

**Participants**

Participants were 98 adolescents with nonmalignant chronic pain (mean age 15.6 years), accompanied by a parent, who consecutively attended a residential adolescent pain management program at a national specialist center in the United Kingdom. Both adolescents and parents gave written consent to this research, which was approved by local ethics committees. Details in Table I show that they were predominantly female and had relatively chronic pain (the mean pain duration is inflated by a small number of participants with very high values—median was 40 months). The group was diagnostically heterogeneous. The inclusion criteria were (1) the presence of significant...
disability, (2) convincing evidence of motivation to participate in the rehabilitation approach, (3) an absence of medical pathology that would either require treatment or prevent safe participation in physical rehabilitation, and (4) an absence of other effective medical options for pain control. The adolescents seen were referred from secondary or tertiary centers across the United Kingdom, often after multiple unsuccessful treatments. They had missed a substantial amount of school owing to their pain condition (on average more than half a year), and those who were still attending school managed, on average, only half time.

Assessment

Adolescents and their parents completed self-report questionnaires and objective physical measures before and after the program and at 3-month follow-up. Many variables were indexed by the Bath Adolescent Pain Questionnaire, a multifactorial instrument that demonstrated validity, internal consistency ($\alpha = .79-.89$), and temporal stability in this population (Eccleston et al., 2005). The specific subscales used are as follows:

### Pain

Adolescents were asked to rate the typical pain they experienced over the last week on a 0–10 visual analog scale, a reliable and valid assessment of pain intensity (Varni, Thompson, & Hanson, 1987).

### Functioning

Physical functioning (e.g., “I need help with dressing or bathing”) and social functioning (e.g., “I feel distant from my friends”) were measured using subscales of the Bath Adolescent Pain Questionnaire (nine items each, scored 1–5 “never” to “always”). Higher scores indicate worse functioning; the scales are reliable ($\alpha = .83$ and .85, respectively; Eccleston et al., 2005).

### Distress and Psychological Response

The Bath Adolescent Pain Questionnaire was also used to measure depression, general anxiety, and pain-specific anxiety (6-, 7-, and 7-item subscales, respectively, scored 1–5 “never” to “always”). These scales have all been standardized for a chronic pain population and are more appropriate than mood scales designed for adolescents with mental health problems. They are reliable (all $\alpha$s between .80 and .83) and have been validated against other existing measures (Eccleston et al., 2005). To index how adolescents respond to their pain, we used two measures of pain-specific psychological response: acceptance and catastrophizing. Pain catastrophizing was measured using a child-specific instrument, the pain catastrophizing scale, which has demonstrated reliability and validity (13 items, scored 0–4 “not at all” to “extremely”; $\alpha = .87$; Crombez et al., 2003). Acceptance of pain was measured using the adolescent version of the CPAQ-A (20 items, rated 0–4 “not at all” to “always true”; $\alpha = .87$), which has also been validated in this population (McCracken et al., 2010). With the exception of the acceptance measure, higher scores indicate more distress.

### Physical Performance

A Timed Walk test was used, which recorded adolescents’ walking distance in meters during a 2-min interval. To measure activity tolerance and lower body strength, a sit-to-stand task was used, which required the adolescents to stand up fully from a low chair as many times as possible in a minute.

### School Attendance and Health Care Use

Adolescents were asked to record the number of school weeks that they had missed in total and their current school attendance status; they also reported the number of sessions (half days) that they were typically missing in a...
week. A final variable was created that indexed the number of sessions of mainstream school missed per week. This variable excluded activities such as hospital, school, and home tutoring; although these are useful, they do not represent developmentally normative education and socialization. Parents reported on adolescents’ health care use over the last 3 months (number of nights admitted, number of outpatient appointments, number of primary care physician attendances, and number of A&E attendances). This was converted into a cost estimate using established prices from 2010 (Curtis, 2010).

**Treatment**

Participants all attended a 3-week, ACT-based, group residential pain management program. This structured interdisciplinary program is modelled on similar adult pain management treatments, but with explicit developmental adaptation and parent involvement (McCracken, 2005). There were approximately 90 hr of treatment over 15 days, including gym attendance and outdoor activity. Parents accompanied their children and participated fully in all sessions apart from a 4-day period of separate working, where they attended 2–3 hours of parent-only work instead. In this time, the adolescents worked without their parents.

The program had three main components: physical conditioning, activity management, and psychology. These delivered a range of specific pain management interventions, all within an ACT framework. Across all treatment strands, the ACT therapeutic agenda of acceptance, mindfulness, and valued living was followed; the goal of trying to reduce or control pain was acknowledged, but its workability questioned. Pain reduction or control was not a primary target of therapeutic intervention. Similarly, negative thoughts were not questioned or refuted; rather, they were acknowledged, accepted, and a focus on present moment behavioral change was emphasized. Relaxation was not pursued as a desirable goal in itself, and “active coping” was questioned where it seemed to have an experientially avoidant quality (e.g., if rushing around “problem solving” was in fact an attempt to avoid uncertainty or anxiety). However, the possibility of engagement and flexible persistence or change was emphasized. Present moment contact, values, committed action, and self-as-context). Experiential tasks, metaphor, and behavioral experimentation were emphasized above didactic explanation or persuasion. Specific ACT exercises were selected for their developmental appropriateness, and other developmental adaptations were made where necessary. The ACT model emphasizes a balance of mindful acceptance and committed action; thus, in vivo tasks, role play, and challenging physical exercises were a central part of treatment, alongside structured training in mindfulness techniques.

**Analysis**

Three treatment time points were examined: pretreatment (the first day of treatment), posttreatment (last day of treatment 3 weeks later), and follow-up (3 months after the end of treatment). These intervals were dictated by existing clinical practice. Pretreatment scores were compared with posttreatment and follow-up scores using paired t-tests, as the distribution of “change” scores generally approximated to normality. This method also minimizes missing data. Repeated-measures effect sizes were calculated according to the formula given by Dunlap, Cortina, Vaslow, and Burke (1996). For the analysis of acceptance and outcome, we were mindful of our inability to use a mediation design, such as that used by Wicksell et al. (2011), owing to the lack of a control group; we could not examine the mediation of the relationship between “treatment” and “outcome,” as treatment was not a variable. Instead, we examined two time periods—the period of treatment (pre to posttreatment) and the overall period of the study (pretreatment to follow-up). Residualized change scores were calculated for each of these intervals for acceptance, catastrophizing, and the other outcome variables. Initially, we correlated changes in acceptance during the treatment interval with sustained changes in outcome variables (pretreatment to follow-up), following a strong tradition of such an approach to process analysis in pain research (e.g. McCracken & Gutierrez-Martinez, 2011; Vowles & McCracken, 2008). We then reversed this analysis to examine whether sustained changes in acceptance (pretreatment to follow-up) might be associated with a non-specific “boost” in functioning owing to treatment;
thus, sustained changes in acceptance were correlated with improvements in distress and functioning during treatment. We also repeated part of the analysis for catastrophizing, as it is a widely used variable and strongly associated with functioning and distress. However, ACT theory would not predict that it would be closely associated with improvement in ACT treatment. Thus, we examined whether changes in catastrophizing during the treatment period were associated with changes in distress and functioning by follow-up. We did not apply process analysis to variables that did not change significantly during the relevant period (e.g., pain intensity was not examined as it does not change significantly at follow-up). A relatively conservative criterion of \( p < .01 \) was adopted owing to multiple comparisons.

Results

Adolescent Results

Seventy-three adolescents and their parents attended the 3-month follow-up (74%). Means for the three time points and change scores for the pretreatment to follow-up period are given in Table III.

Analysis of Follow-up Attendees Versus Non-attendees

Follow-up attendees were compared with non-attendees on a range of pretreatment variables. There were no differences in age, pain duration, depression, general anxiety, or social disability (all \( p > .1 \)). Non-attenders made the same physical improvements during the course of the program as their contemporaries (\( p > .1 \)), indicating that their non-attendance was not owing to lack of treatment response. However, non-attendees were more physically disabled before treatment (\( p < .01 \)).

Changes During Treatment

Adolescents showed posttreatment improvements in self-reported and directly measured functioning that were sustained at the follow-up period. Self-reported social and physical functioning improved, and directly measured physical performance showed substantial increases (40% improvement in sit-to-stand, 20% improvement in walk distance). These improvements were achieved with no significant reduction in pain intensity (Table II).

Emotional and coping variables also improved, although the most consistent results were found in pain-specific variables. For example, pain-specific anxiety, catastrophizing about pain, and acceptance of pain all improved significantly. However, initial improvements in depression and perceived psychosocial development were not sustained to the follow-up period.

We measured other variables—school attendance, medication usage (parent report), and health care usage (parent report)—that are developmentally important, are difficult therapeutic targets, and extend the results beyond adolescent self-perceived functioning. School absence and number of medications taken were reduced at 3-month follow-up. Health care use was calculated as an estimated cost; pretreatment mean scores (and variance) were inflated by the high costs of a small number of patients who were inpatients for 3 months before the treatment. Thus, we elected to use a rank-based nonparametric test to include these data while eliminating their skewing effect. Using this approach, there was a significant drop in costs for the group as a whole (\( p = .004 \), Wilcoxon test).

Relationship of Acceptance and Catastrophizing to Outcome

We examined the association between changes in child acceptance of pain during treatment and changes in distress and functioning at follow-up (residualized change scores; Table III). Improvements in six of the eight outcome variables were associated with increased acceptance of pain. Significant relations were observed in relation to improvements in self-reported physical and social functioning, for directly measured sit-to-stand performance, and for all improvements in psychological variables. However, changes in directly measured walking speed and self-reported school absence were not associated with changes in acceptance.

We also examined the opposite possibility, examining the associations between changes in acceptance at follow-up and changes in general functioning and distress during treatment. Sustained changes in acceptance were not significantly associated with any of the improvements in functioning or distress seen during the treatment period (see Table IV).

We repeated the first part of this analysis for catastrophizing, examining the associations between changes in catastrophizing during treatment and changes in distress and functioning at follow-up (Table V). In contrast to acceptance, changes in catastrophizing were not associated with any measure of functioning, although reduced catastrophizing during treatment was associated with reduced pain-specific anxiety at follow-up. Reviewing Tables III and V shows that “early” changes in acceptance were associated with decreased catastrophizing at follow-up, whereas reductions in catastrophizing during
treatment were not associated with improvements in acceptance at follow-up.

**Discussion**

In this study an intensive, ACT-based, residential treatment for severely disabled adolescents with chronic pain was associated with positive clinical outcomes. Improvements were seen in functioning, psychological state, and in “real-world” outcomes, namely, school attendance and health care service use. Effect sizes were in the small to medium range. As there was no control group, we cannot positively conclude that improvements were owing to using an ACT-based treatment, as they might have arisen from non-specific effects of our intensive multicomponent program. However, clinical improvements were consistent with the ACT model in that improvements in distress and functioning were achieved in the absence of pain.

**Table II. Changes in Adolescent Outcome Variables During Treatment**

<table>
<thead>
<tr>
<th>Outcome variable</th>
<th>Preprogram (N = 98)</th>
<th>Postprogram (N = 94)</th>
<th>Follow-up (N = 73)</th>
<th>Change scores preprogram to follow-up (95% CI)</th>
<th>Effect size (d, preprogram to follow-up)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical disability (BAPQ)</td>
<td>18.4 (6.5)</td>
<td>16.1 (6.5)**</td>
<td>15.1 (7.6)**</td>
<td>2.3 (1.2 to 3.4)</td>
<td>0.32</td>
</tr>
<tr>
<td>Social disability (BAPQ)</td>
<td>18.0 (6.5)</td>
<td>15.7 (5.7)**</td>
<td>15.7 (6.7)*</td>
<td>2.0 (0.6 to 3.3)</td>
<td>0.28</td>
</tr>
<tr>
<td>Walk distance</td>
<td>113.8 (51.4)</td>
<td>135.0 (33.0)**</td>
<td>136.5 (50.6)**</td>
<td>-21.8 (-32.0 to -11.6)</td>
<td>0.47</td>
</tr>
<tr>
<td>Sit to stand</td>
<td>16.4 (10.2)</td>
<td>20.9 (13.1)**</td>
<td>23.0 (10.7)**</td>
<td>-6.0 (-8.1 to -4.0)</td>
<td>0.61</td>
</tr>
<tr>
<td>Pain intensity</td>
<td>7.9 (1.3)</td>
<td>7.7 (1.4)</td>
<td>7.2 (2.0)</td>
<td>0.5 (0.1 to 0.8)</td>
<td>0.25</td>
</tr>
<tr>
<td>Depression (BAPQ)</td>
<td>13.6 (4.3)</td>
<td>12.7 (4.0)*</td>
<td>12.7 (5.2)</td>
<td>1.1 (0.2 to 2.0)</td>
<td>0.22</td>
</tr>
<tr>
<td>Pain-specific anxiety (BAPQ)</td>
<td>14.3 (5.6)</td>
<td>12.1 (5.1)**</td>
<td>11.0 (6.7)**</td>
<td>3.0 (1.8 to 4.2)</td>
<td>0.48</td>
</tr>
<tr>
<td>Development (BAPQ)</td>
<td>26.0 (6.9)</td>
<td>23.9 (6.7)**</td>
<td>24.3 (7.3)</td>
<td>1.4 (0.0 to 2.9)</td>
<td>0.21</td>
</tr>
<tr>
<td>Catastrophizing about pain (PCS-C)</td>
<td>30.0 (9.6)</td>
<td>22.1 (15.1)**</td>
<td>21.8 (12.0)**</td>
<td>6.9 (4.8 to 9.0)</td>
<td>0.62</td>
</tr>
<tr>
<td>Acceptance of pain (CPAQ-A)</td>
<td>32.3 (11.1)</td>
<td>42.0 (11.8)**</td>
<td>41.9 (6.7)**</td>
<td>-9.1 (-12.1 to -7.2)</td>
<td>1.00</td>
</tr>
<tr>
<td>School sessions missed</td>
<td>5.9 (3.5)</td>
<td>-</td>
<td>3.7 (3.3)*</td>
<td>1.5 (0.5 to 2.5)</td>
<td>0.45</td>
</tr>
<tr>
<td>Number of medications</td>
<td>3.8 (2.8)</td>
<td>-</td>
<td>2.6 (2.4)**</td>
<td>1.2 (0.6 to 1.9)</td>
<td>0.47</td>
</tr>
<tr>
<td>Health care usagea</td>
<td>1,920.6 (6,652.0)</td>
<td>-</td>
<td>340.1 (921.1)*</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note. BAPQ = the Bath Adolescent Pain Questionnaire; CI = confidence interval; CPAQ-A = the Chronic Pain Acceptance Questionnaire; PCS-C = the pain catastrophizing scale. Mean scores across all time points. Significance values refer to that time point compared with preprogram; *p < .01, **p < .001.

*Amounts are estimated costs in pounds sterling; nonparametric tests used because of skewed data.

**Table III. Correlations Between Changes in Acceptance (Pre- to Posttreatment) and Sustained Changes in Outcome Measures (Pretreatment to Follow-up)**

<table>
<thead>
<tr>
<th>Change in acceptance</th>
<th>Physical disability</th>
<th>Social disability</th>
<th>Sit to stand</th>
<th>Walk distance</th>
<th>Pain-related anxiety</th>
<th>Catastrophizing</th>
<th>School absence</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.31*</td>
<td>-0.34*</td>
<td>0.30*</td>
<td>0.21</td>
<td>-0.33*</td>
<td>-0.42**</td>
<td>0.01</td>
<td></td>
</tr>
</tbody>
</table>

*p < .01, **p < .001.

**Table IV. Correlations Between Sustained Changes in Acceptance (Pretreatment to Follow-up) and Changes in General Distress and Functioning During Treatment (Pre- to Posttreatment)**

<table>
<thead>
<tr>
<th>Change in acceptance</th>
<th>Physical disability</th>
<th>Social disability</th>
<th>Sit to stand</th>
<th>Walk distance</th>
<th>Depression</th>
<th>Pain-related anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>0.16</td>
<td>-0.02</td>
<td>0.09</td>
<td>0.19</td>
<td>0.13</td>
<td></td>
</tr>
</tbody>
</table>

*p < .01, **p < .001.

**Table V. Correlations Between Changes in Catastrophizing (Pre- to Posttreatment) and Sustained Changes In Outcome Measures (Pretreatment to Follow-up)**

<table>
<thead>
<tr>
<th>Change in catastrophizing</th>
<th>Physical disability</th>
<th>Social disability</th>
<th>Sit to stand</th>
<th>Walk distance</th>
<th>Pain-related anxiety</th>
<th>Acceptance</th>
<th>School absence</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.21</td>
<td>0.16</td>
<td>-0.11</td>
<td>-0.05</td>
<td>0.36*</td>
<td>0.21</td>
<td>-0.16</td>
<td></td>
</tr>
</tbody>
</table>

*p < .01, **p < .001.
reduction. Cognitive variables such as catastrophizing improved without the use of thought-challenging interventions. Changes in acceptance during the course of treatment were associated with the majority of positive treatment outcomes at the follow-up period. In contrast, sustained changes in acceptance were not associated with initial, potentially non-specific, improvements in functioning or distress caused by treatment.

Participants in this study had high levels of pain-related disability, and outcome variables were selected to reflect both aspects of social functioning and directly measured physical performance. The participants were adolescents with a median pain duration of 40 months and who were using an average of 3.8 types of analgesic medication. Other studies of attenders at this clinic have indicated that they are among the most disabled in the chronic pain literature (Gauntlett-Gilbert & Eccleston, 2007). Along with directly measured physical functioning, we studied health care attendance and school absence, which are developmentally and socially important. Success in these areas requires multiple simultaneous changes; for example, increased school attendance and decreased health care use require sustained improvements in managing pain flares, physical capacity, and effective parenting. Thus, this study shows that severely disabled adolescents can achieve clinically substantial improvements in many domains, given sufficiently intensive behavioral rehabilitation. However, most effect sizes ranged between “medium” and “small” in this uncontrolled study. This indicates a clear need for future treatment development and also for studies with plausible active control conditions.

Self-reported and directly measured functioning were consistently improved by treatment, with substantial percentage increases in physical functioning. Results for distress and psychological variables were more complex. Pain-related variables—that is, pain acceptance, catastrophizing, and pain anxiety—showed strong sustained changes at follow-up. However, depression and self-rated psychosocial development showed initial posttreatment improvements that were no longer significant at the follow-up period. Treatment was explicitly aimed at creating sustained change in these areas, but initial improvements were not maintained. Thus, these results require examination. They could be owing to flaws in the treatment model or delivery, or alternatively because of posttreatment factors. For example, it is a consistent clinical observation that patients return home from this treatment to significant psychosocial adversity. Despite good relative improvements, adolescents still have substantial disability and struggle after the program, for example, with school attendance. The initial boost in mood provided by 3 weeks of daily social contact, exercise, and daily routine may fade on contact with reality at home. Similarly, optimistic estimates of their aptitude relative to their peers (the “development” variable) may have been influenced by interacting with other physically and socially disadvantaged adolescents in treatment rather than healthy peers. This could explain the improvements in “development” during treatment and their disappearance at follow-up period.

Our treatment involved more contact hours than typical CBT interventions (approximately 90 hr) and took place in a residential setting, which allows unusual opportunities for continuity of treatment and behavioral observation of patients. As there was no control group, it is possible to argue that the positive results arose from this combination, rather than to the specific ACT treatment philosophy. However, the nature of the results and the process analysis indicate that the positive outcomes were achieved in an ACT-consistent fashion. For example, these results show that pain control or reduction is inessential for improved function or reduced distress. Also, decreased anxiety and catastrophic thoughts were achieved in a treatment that explicitly avoided restructuring the content of thoughts or feelings. Thus, it appears possible to negate the challenge of distressing cognitions and feelings without trying to change their content. Physical and emotional exposure,” in a behavioral sense, was probably central to treatment outcome, given the regular and intense exercise and psychology sessions. However, ACT is a behavior therapy, and exposure is a core treatment method (Hayes et al., 1999). In contrast to traditional approaches to exposure, ACT therapists contest the idea that reduction of distress or cognitive change is central to its effects, preferring to emphasize the achievement of acceptance and behavioral flexibility in the face of difficulty.

It is possible that increases in acceptance might not have been caused by our ACT treatment; instead, they might have been caused by a non-specific “boost” in functioning owing to our intensive treatment, as acceptance is lower in adolescents who are less distressed (McCracken et al., 2010). Thus, although we have argued that changes in acceptance preceded improvement, the opposite order of causation is also possible. Although our single-group design cannot completely rule out these possibilities, the lack of association between (1) positive changes in distress and functioning during treatment and (2) sustained changes in acceptance at follow-up argues against this hypothesis. Also, it is possible that catastrophizing, a powerful variable targeted in CBT...
treatment, could have been a key driver of treatment response, despite the fact that it was not targeted clinically. However, the failure of treatment-period changes in catastrophizing to correlate with follow-up clinical improvements argues against this. Although such results broadly support ACT hypotheses, only a full treatment process analysis can test ACT propositions; this would probably entail collection of process and outcome variables regularly during treatment to examine the temporal order treatment changes, as well as using more than one ACT variable (e.g., acceptance, values) and contrasting these with other candidate variables like catastrophizing or kinesophobia.

Our analysis showed that the majority of improvements at 3-month follow-up were associated with increases in acceptance during treatment. However, acceptance was not associated with walk distance or school attendance. The latter result requires further examination, as school attendance is of key importance and the findings were against our predictions. Previous research has established that different aspects of adolescent functioning with pain can be associated with quite separate psychological variables (Gauntlett-Gilbert & Eccleston, 2007). Gauntlett-Gilbert and Eccleston’s (2007) study showed that school attendance was associated with different variables to both physical and social disability. Thus, at this stage it is unclear which psychological factors contributed to improvements in school attendance, and it remains unclear how school attendance relates to other more generic measures of physical or social disability.

The variable of “acceptance” is increasingly shown to be potent in the field of chronic pain. However, ACT specifies another five treatment processes alongside acceptance, including values-based action, “defusion” from thoughts, and a particular view of self (Hayes et al., 2006). All six ACT processes were targeted in treatment, although only one is studied here as a process variable. This may explain the failure of acceptance to be associated with some follow-up outcomes; studies in adults have shown that other ACT processes (e.g., values—McCracken & Yang, 2006) are independently associated with outcome. Also, it is important to clarify the relationship between “acceptance” and other psychological variables that are currently under investigation. For example, ACT-defined “acceptance” appears similar to a variable such as “accommodative coping,” which is defined as emotion-focused attempts to accommodate to an unchangeable symptom (e.g. Walker, Smith, Garber & Claar, 2005). However, ACT theory would see these variables as distinct. “Acceptance” is defined within ACT as a highly specific present-moment behavioral style of willing contact with pain and persistence with activity in the presence of pain. In contrast, accommodative coping is assessed with items such as “think of things to take your mind off the situation,” “tell yourself that the situation was not that bad,” and “try to accept the situation.” This mixture of distraction, reframing, and an attempt to change one’s own views are unrelated to “acceptance” as defined in ACT.

Acceptance also contrasts with catastrophizing, which is a cognitive variable encompassing negative beliefs and thought processes such as rumination. Acceptance is seen as a present-moment behavioral “posture” that can be adopted alongside a range of different beliefs. In this study, acceptance was more consistently associated with outcomes than catastrophizing, and early changes in acceptance were associated with follow-up changes in catastrophizing, but not vice versa. This is not surprising, as catastrophizing was not targeted in our treatment. It does not exclude the possibility that catastrophizing is a potent process variable in CBT treatment.

In summary, adolescents with severely disabling pain can be effectively treated with an ACT approach, in the context of an intensive multimodal rehabilitation program. This extends previous research on outpatient psychology-delivered treatment (Wicksell et al., 2009). Although the current results may not generalize to less intensive treatment settings, they show that ACT treatment philosophy can be extended to contexts beyond traditional psychological therapy and to the most disabled populations. Results were achieved in line with ACT philosophy, in the absence of any therapeutic emphasis on pain reduction, control over emotions, or restructured thoughts. Future studies can (1) include plausible control conditions, (2) carry out a full process analysis, (3) include other ACT process variables, and (4) examine school attendance in more detail.

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