Identifying Efficacious Treatment Components of Panic Control Treatment for Adolescents: A Preliminary Examination

Jamie A. Micco
Molly L. Choate-Summers
Jill T. Ehrenreich
Donna B. Pincus
Sara G. Mattis

ABSTRACT. Panic Control Treatment for Adolescents (PCT-A) is a developmentally sensitive and efficacious treatment for adolescents with panic disorder. The present study is a preliminary examination of the relative efficacy of individual treatment components in PCT-A in a sample of treatment completers; the study identified when rapid improvements in panic symptoms occurred over the course of treatment and which treatment components preceded these gains. Twenty-one adolescents (ages 13-17) completed weekly measures of panic-relevant symptoms, which were examined for between-session gains. Results in-
dicate that psychoeducation may precede notable decreases in panic attacks while cognitive restructuring may contribute to rapid declines in overall anxiety and cognitive errors. The authors discuss the importance of future controlled dismantling studies to examine the relative contribution of PCT-A treatment components. doi:10.1300/J019v29n04_01

KEYWORDS. Adolescents, panic disorder, panic control treatment, cognitive behavioral therapy, sudden gains

PREVALENCE AND PHENOMENOLOGY OF PANIC IN ADOLESCENT COMMUNITY AND CLINICAL SAMPLES

The onset of panic disorder, with or without agoraphobia, occurs most often in late adolescence (American Psychiatric Association, 2000), although a number of community and clinical studies have found that full-blown panic attacks and situational avoidance are also prevalent in early to mid-adolescence. While the proportion of adolescents who endorse having experienced a panic attack varies across studies, researchers consistently find that adolescents in the community endorse having had panic attacks both with self-report measures and clinical interviews (Hayward, Killen, & Taylor, 1989; Hayward, Killen, & Hammer, 1992; King, Ollendick, Mattis, Yang, & Tonge, 1996; Lau, Calamari, & Waraczynski, 1996; Macaulay & Kleinknecht, 1989). For instance, a large community study of 2,365 high school students (mean age = 15.4 years) found that 135 (5.7%) students reported a lifetime history of at least one panic attack with four or more symptoms, and 62 (2.6%) reported at least one spontaneous panic attack (Hayward, Killen, Kraemer, & Taylor, 2000). Prevalence estimates of panic disorder in adolescence range from 0.5% (Hayward, Killen, & Taylor, 2003) to 1.6% (Reed & Wittchen, 1998) in community samples.

In clinical samples, panic disorder is clearly a clinically relevant problem, with estimates ranging from 6% (in a pediatric psychopharmacology clinic; Biederman et al., 1997) to approximately 10% (in both an anxiety disorders clinic and an Italian outpatient clinic; Last &
Strauss, 1989; Masi, Favilla, Mucci, & Millepiedi, 2000) of referred children and adolescents meet criteria for the disorder. Additionally, compared to psychiatric and non-clinical control groups, adolescents who meet criteria for panic and/or agoraphobia have elevated comorbidity with depression and other anxiety disorders (Biederman et al., 1997), and they report higher anxiety sensitivity compared to a clinical control sample of children without panic disorder (Kearney et al., 1997). This underscores the importance of developing efficacious treatments for children and adolescents who experience panic attacks and panic disorder.

**PANIC CONTROL TREATMENT FOR PANIC DISORDER AND AGORAPHOBIA**

A number of studies have established the efficacy of cognitive-behavioral treatments (CBT) for adults with panic disorder and agoraphobia (Clark, 1989; Clark, Salkavakis, Hackmann, Middleton, Anastasiades, & Gelder, 1994; Telch, Schmidt, Jaimez, & Harrington, 1995). Panic Control Treatment (PCT) is one such cognitive-behavioral treatment developed by Barlow and Craske (2000) in the mid-1980s. PCT has been found to be superior to progressive muscle relaxation and waitlist control groups at both post-treatment and follow-up (Barlow, Craske, Cerny, & Klosko, 1989; Craske, Brown, & Barlow, 1991), and it appears to have a more durable effect at follow-up than tricyclic medication for panic-disordered patients (Barlow, Gorman, Shear, & Woods, 2000).

Ollendick (1995) conducted the first controlled study of CBT for panic-disordered adolescents, which employed a multiple-baseline design with four participants (ages 13 to 17). The treatment contained components of PCT, but also included progressive muscle relaxation and situational exposure. At post-treatment, all adolescents reported a reduction in the frequency of panic attacks, less situational avoidance, and lower scores on self-report questionnaires of anxiety sensitivity, fear, and overall anxiety (Ollendick, 1995).

Given the efficacy of PCT with panic-disordered adults, as well as Ollendick’s finding that CBT can be successfully applied to adolescents with panic disorder, Mattis and colleagues (Hoffman & Mattis, 2000; Mattis & Ollendick, 2002) developed a developmentally sensitive adaptation of the PCT protocol for adolescents. Panic Control Treatment for Adolescents (PCT-A) shares its predecessor’s focus on three main as-
pects of panic disorder. Specifically, PCT-A targets: (1) the cognitive, or misinterpretational, aspect, (2) the hyperventilatory response, and (3) conditioned reactions to physical sensations. However, several changes in the protocol were made so that it would be more appropriate for use with adolescents. These changes include clearer, simplified language (particularly during the psychoeducational component of the manual) and visual and verbal examples of important concepts. Situational exposure was also added to the PCT-A manual, given the high frequency of agoraphobic avoidance in panic-disordered adolescents (Biederman et al., 1997; Kearney et al., 1997).

Results of a recent, randomized controlled trial of PCT-A support the efficacy of the treatment protocol with adolescents who have been diagnosed with panic disorder and agoraphobia (Mattis, Cohen, Hoffman, Pincus, Choate, & Micco, 2001; Mattis & Pincus, 2003; Mattis, Pincus, Ehrenreich, & Barlow, 2006). Compared to adolescents randomly assigned to a waitlist control group and assessed post-waitlist, adolescents assigned to the treatment group showed significantly greater improvements on clinician severity ratings of panic disorder, the Multidimensional Anxiety Scale for Children (MASC; March, 1997), and the Revised Children’s Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1978) at post-treatment assessment (Mattis et al., 2006), among other measures (see Mattis et al., 2006, for a full review of the study’s findings).

**TREATMENT COMPONENTS OF PCT-A: DESCRIPTION AND RATIONALE**

PCT-A consists of 11 individual treatment sessions that are 60-90 minutes in length. There are seven main treatment components of PCT-A, which are described in Table 1. Breathing retraining is introduced in session three, following psychoeducation (session one) and situation exposure (session two). The inclusion of breathing retraining is based on the hyperventilation model of panic disorder, which holds that subtle, chronic hyperventilation (or overbreathing) in people with panic disorder leads to physical symptoms that, when noticed, can spiral into a full-blown panic attack (Ley, 1985). In support of this model, studies have shown that people with panic disorder have lower basal pCO2 levels (Roth, Wilhelm, & Trabert, 1998; Papp et al., 1997) and greater subjective response to voluntary hyperventilation (Rapee, Brown, Antony, & Barlow, 1992). Breathing retraining is intended to correct the patient’s
tendency towards subtle hyperventilation, and thus decrease physical sensations that predispose the patient to experience a panic attack.

The rationale for including cognitive restructuring and hypothesis testing in PCT-A is based on Clark’s (1988) cognitive model of panic, which holds that catastrophic misinterpretation of normal physiological anxiety reactions result in panic attacks. Indeed, adult patients with panic disorder are more likely than patients with other anxiety disorders and adults with no psychiatric disorder to interpret ambiguous physical sensations as something being physically or mentally wrong with them (Clark et al., 1997). Cognitive restructuring addresses this misinter-

<table>
<thead>
<tr>
<th>Treatment Component</th>
<th>Session(s) Introduced</th>
<th>Description</th>
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<tbody>
<tr>
<td>Psychoeducation</td>
<td>1-2</td>
<td>Therapist provides accurate information about feared physical sensations in the context of the body’s fight/flight system and describes and discusses the “cycle of panic”</td>
</tr>
<tr>
<td>Situational Exposure (SE)</td>
<td>2</td>
<td>Fear and Avoidance Hierarchy is developed; therapist emphasizes that remaining in feared situations will lead to habituation in panic-related symptoms; exposure from FAH is assigned at each session</td>
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<tr>
<td>Breathing Retraining (BR)</td>
<td>3-4</td>
<td>Adolescent is taught to breathe slowly from the diaphragm and practices twice daily at home</td>
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<tr>
<td>Cognitive Restructuring (CR)</td>
<td>4-5</td>
<td>Described as “thinking like a detective”; adolescent learns to identify automatic thoughts, including probability overestimation and catastrophic thinking, and is taught to challenge thoughts by looking at the evidence and generating rational responses</td>
</tr>
<tr>
<td>Interoceptive Exposure (IE)</td>
<td>5-6</td>
<td>Adolescent is desensitized to panic-like physical sensations through a series of exercises designed to elicit these sensations, such as spinning in a chair, breathing through a straw, and hyperventilating; exercises are repeatedly practiced in several settings until the sensations do not elicit anxiety</td>
</tr>
<tr>
<td>Hypothesis Testing</td>
<td>7</td>
<td>Adolescent makes predictions regarding the outcome of a feared situation, engages in the situation, and evaluates his/her original prediction</td>
</tr>
<tr>
<td>Naturalistic Interoceptive Exposure</td>
<td>8</td>
<td>Adolescent engages in situations in everyday life that elicit physical sensations (i.e., drinking caffeine, exercising, going on a roller coaster)</td>
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pretational aspect of panic disorder, as does hypothesis testing (behavioral experiments that test the accuracy of panic-related cognitions).

Children and adolescents with panic disorder and panic attacks are more likely to experience anxiety sensitivity, or hypervigilance and fear of physiological sensations than children and adolescents without panic disorder or panic attacks (Calamari et al., 2001; Ginsburg & Drake, 2002; Kearney et al., 1997; Weems, Hayward, Killen, & Taylor, 2002). Thus, helping adolescents with panic disorder become less fearful and vigilant of normal physiological sensations appears to be an important treatment goal, and this is the purpose of interoceptive exposure.

Although PCT-A is primarily an individual treatment, parents are included in the last 10 minutes of sessions one, four, seven, and 11 of PCT-A. Given that parents are integrally involved in their adolescents’ lives, it is expected that including them as part of therapy will result in greater reinforcement of the use of cognitive-behavioral skills at home, although more research is necessary to determine if this is the case (Barrett, 2000).

**IDENTIFYING EFFICACIOUS TREATMENT COMPONENTS OF PCT**

**Examination of Specific Treatment Components of PCT in Adults**

Identifying components of a treatment that most effectively lead to symptom reduction allows researchers to “fine tune” the treatment manuals they develop and clinicians to spend more time on aspects of treatment that seem to work. There are a number of studies that have examined the efficacy of specific cognitive-behavioral treatment components for adults with panic disorder, many of which have compared interoceptive exposure (IE) to other treatment components (Arntz, 2002; Bouchard et al., 1996; Craske, Rowe, Lewin, & Noriega-Dimitri, 1997; Hecker, Fink, Vogeltanz, Thorpe, & Signon, 1998; Ito, Noshirvani, Basoglu, & Marks, 1996). For instance, Hecker and colleagues (1998) provided 18 patients with panic disorder with four sessions of cognitive therapy (CT) and four sessions of IE; half of the patients got CT first, and half got IE first. Results show that both treatments led to similar clinical improvements, with the only difference being lower self-ratings of global disturbance in the CT-first group. The order of the treatment components did not influence outcome, as most patients made clinically significant treatment gains during the first half of treatment and maintained them during the second half (Hecker et al., 1998).
study randomly assigned 26 patients with panic disorder and agoraphobia to 10 weekly sessions of IE plus situational exposure (SE) or SE alone; neither treatment condition included CT (Ito et al., 1996). There were few differences in treatment outcome between the two groups, although more patients who had both IE and SE improved greater than 50% on measures of apprehension and agoraphobia (Ito et al., 1996).

Craske et al. (1997) compared IE to breathing retraining (BR) in a group of 38 adults with panic disorder and agoraphobia. All patients were treated using cognitive restructuring and SE, but half also received IE while the other half received BR. While both treatment packages were equally effective on a number of panic-relevant measures, those who had received IE (compared to those who received BR) had fewer panic attacks and lower overall severity at post-treatment and fewer panic attacks and phobic fears at six-month follow-up (Craske et al., 1997). Schmidt and colleagues (2000) found that adults with panic disorder and agoraphobia who received BR in combination with SE tended to have lower end-state functioning at a follow-up assessment when compared to adults who received SE without BR. The authors suggest that this finding may be due to patients using deep breathing in an attempt to avoid panicky physical sensations during panic attacks (Schmidt et al., 2000).

In sum, studies that have compared the efficacy of specific treatment components that are included in PCT for adults have found few differences in overall outcome on panic-relevant measures, including panic attack frequency, apprehension of panic, and agoraphobic avoidance, although there is some evidence for the efficacy of IE and SE having an advantage over that of BR in treatment outcome, particularly at follow-up. To date, however, no study has looked at specific treatment components of panic control treatment in children and adolescents.

“Sudden Gains” Treatment Studies

One way of examining the contribution of individual treatment components to overall improvement is to look at between-session treatment changes. If an abrupt reduction in symptoms occurs following a specific session, a treatment component addressed in that session may have contributed to overall improvement. Tang and DeRubeis (1999) examined between-session changes for adults receiving CBT for depression, particularly looking for abrupt changes from one session to the next, or “sudden gains” in treatment. The researchers found that significant cognitive changes (as measured by a clinician rating scale) tended to
precede sudden gains on the Beck Depression Inventory (Tang & DeRubeis, 1999). Pham and colleagues (2004) found similar results in their analysis of sudden gains on the Anxiety Sensitivity Index (ASI) for adults receiving CBT for panic disorder. Specifically, patients who made sudden gains had significantly lower anxiety sensitivity at post-treatment compared to patients who did not make sudden gains (Pham, Tang, Zinbarg, & Andrusyna, 2004). Thus, analysis of between-session treatment change may contribute to an understanding of the contribution of treatment components and have an impact on treatment outcome.

**AIMS OF THE PRESENT STUDY**

Given that a sizeable number of adolescents and children present to clinical settings with panic disorder and agoraphobia or sub-syndromal panic disorder, it is important to evaluate the efficacy of treatments provided to this population. While PCT-A appears to be an efficacious treatment for panic-disordered adolescents, it is unclear which components of the protocol actively contribute to the treatment’s efficacy. There have been a number of studies examining the relative efficacy of specific CBT components for adults with panic disorder but not for adolescents. The purpose of the present study is to conduct a preliminary examination of panic-related symptom changes in relation to the introduction of different treatment components of PCT-A, using sudden gains analysis. However, in contrast to Tang and DeRubeis (1999), who compared individuals who made sudden gains to those who did not, the purpose of the present study is to identify when adolescents with panic disorder as a group experienced significant improvements in panic-related symptoms over the course of PCT-A. More specifically, we sought to generate hypotheses about the relative efficacy of the treatment components of PCT-A by determining which treatment components of PCT-A were followed by sudden treatment gains.

**METHODS**

**Participants**

The data used in the present analysis were drawn from a randomized, controlled trial of PCT-A at an outpatient anxiety disorders clinic. The study included 21 adolescents (18 girls, three boys; mean age = 15.38,
SD = 1.16) who completed the treatment in its entirety. All adolescents, ages 13 to 17, who were principally diagnosed with panic disorder (with or without agoraphobia) at intake via the Anxiety Disorders Interview Schedule, Child/Parent Version (ADIS-IV-C/P; Silverman & Albano, 1996) between 1998 and 2002 were offered participation in the project. Exclusion criteria included diagnosis of a psychotic disorder, pervasive developmental disorder, mental retardation, and current suicidal ideation. Adolescents taking psychiatric medication were required to take the same dose of the medication for at least one month (for anti-anxiety medications) or three months (for anti-depressant medications) prior to participation in the project and remain on the same dose of medication until the end of their participation in the study. Of those who were offered the project, 80% agreed to participate; the primary reason for adolescents choosing not to participate was not wanting to wait for treatment should they be randomized to the waitlist condition of the study.

Adolescents who were eligible and agreed to participate in the project reviewed and signed informed consent and assent forms, along with their parents, after which they were randomly assigned to either the treatment or waitlist condition. The latter involved bi-weekly, 30-minutes “check-in” sessions over the course of eight weeks, during which adolescents established rapport with their therapist and described any panic-related symptoms they experienced over the course of the intervening two weeks. Other than the completion of weekly monitoring forms, waitlist sessions did not include any cognitive-behavioral treatment components. After the completion of the waitlist period, adolescents in this group received a full-course of PCT-A. Therapists included doctoral students in clinical psychology and doctoral-level psychologists. All sessions were videotaped, and 32.5% of the sessions were randomly selected and reviewed for treatment integrity by either a bachelor’s level research assistant or doctoral student. All session components were rated on a scale from 1 (not at all covered in session) to 5 (completely and thoroughly covered in session) and then averaged to create one treatment adherence rating for the entire session. The average treatment adherence across sessions in this study was 4.57 (SD = .37).

Ten girls and two boys from the immediate treatment group completed all the measures of interest to the present study. Two additional adolescents, one girl and one boy, dropped out of treatment after session eight and are not included in the analyses below. Of the waitlist group, eight girls and one boy who chose to participate in treatment after completing the waitlist period also completed all study measures; two girls
and one boy chose not to participate in treatment after completing the
waitlist period. As the waitlist group did not differ from the immediate
treatment group prior to treatment initiation on measures of anxiety,
panic disorder, depression, or anxiety sensitivity (Mattis et al., 2006),
both groups were combined to analyze their treatment sessions. Thus,
21 adolescents are included in the present study.

Despite efforts to recruit a more ethnically diverse sample, all partici-
pants in the study were Caucasian. Most of the adolescents’ parents
were married (90%), while 10% were divorced or separated. The modal
level of education for both parents was a bachelor’s degree. Of the 21
participants, 19 were diagnosed with panic disorder with agoraphobia
at the initial assessment, while two were diagnosed with panic disor-
der without agoraphobia. The mean clinician severity rating of panic disor-
der, based on the ADIS-IV-C/P (zero to eight, with a CSR of four and
higher representing a clinical level of severity), was 5.52. Most of the
participants (85.7%) had at least one additional clinical anxiety or mood
disorder; the mean number of additional diagnoses was 1.71.

Measures

Weekly Measures

Weekly Record of Anxiety and Depression (WRAD). The WRAD is a
monitoring form on which adolescents recorded their daily levels of av-
erage anxiety, depression, and pleasantness on a zero (not at all) to eight
(very much) scale. In a study of younger children (grades 3-6), the use
of a daily self-monitoring form to record anxiety symptoms was found
to be reliable, and the form differentiated test-anxious from non-test-
anxious children (Beidel, Neal, & Lederer, 1991). Adolescents in the
present study brought the WRAD to session each week and reviewed it
with their therapist. The present study used the “average anxiety” com-
ponent of the WRAD. We averaged the adolescents’ daily anxiety rat-
ings for each week, which yielded one average anxiety rating per
session.

Panic Attack Record (PAR). Adolescents monitored the frequency
and qualitative aspects of panic attacks over the course of the week on
the PAR, a self-monitoring form initially developed for adults by
Rapee, Craske, and Barlow (1990). Adolescents were instructed to use
one form per panic attack and to record the duration of the attack, maxi-

mum anxiety level, possible antecedents, and symptoms. In a largely
college-aged sample, Nelson and Clum (2002) found that the frequency
of panic attacks over a two-week period as measured by the PAR corre-
related highly ($r = .89$) with the frequency as measured by a Panic Attack
Frequency Calendar. From the PAR, we calculated the average number
of unexpected, full-blown panic attacks (i.e., with four or more physical
or cognitive symptoms) adolescents experienced in the week prior to
each session of PCT-A.

**Weekly Measure After Session 5**

*Belief Ratings.* Belief ratings measured the degree to which adoles-
cents engaged in “probability overestimation” and “catastrophic think-
ing.” Probability overestimation is the tendency to think that events are
more likely to occur than evidence would suggest. Catastrophic think-
ing is the tendency to believe that the consequences of a feared outcome
would be horrible and too difficult to handle. At session five, adoles-
cents identified their most anxiety-provoking probability overestima-
tion and rated the likelihood that the thought would come true ($0 = \text{not at all likely to } 100 = \text{very likely}$). In addition, adolescents identified their
worst catastrophic thought and rated their ability to cope if the feared
outcome actually occurred ($0 = \text{very poorly to } 100 = \text{very well}$). At ev-
every session after session five, adolescents re-rated these two beliefs.

**Measure Collected at Session 11**

*Perceptions of Treatment Questionnaire (PTQ).* The PTQ is a
self-report questionnaire, designed for the purposes of the PCT-A
study, which includes both forced-choice and free-response questions.
This measure assesses the aspects of treatment that adolescents did and
did not find to be helpful, such as specific treatment components and
therapist alliance. For the purposes of the present study, we only exam-
ined adolescents’ responses to the free-response PTQ question, “What
was most helpful about the treatment?”

**Data Analysis**

Sudden gains, or treatment improvements, using group averages for
each measure were analyzed for each of the three weekly measures. If
an adolescent did not complete a measure for a particular session, it was
not replaced with an individual average and instead dropped from the
calculated group average for that particular session. Although sudden
gains have previously been examined across individuals completing
There is no precedent for examining sudden gains from session-to-session across group averages. Thus, for each measure, we defined the first criterion for a sudden gain as a between-session change score of at least two standard deviations from the mean of all between-session changes across the 11 sessions. This “two standard deviation” criterion ensured that sudden gains were large relative to overall changes. In addition, similar to criteria established in Tang and DeRubeis’ (1999) study, sudden gains had to represent at least 25% of the pre-gain session’s WRAD score, panic attack frequency, or belief rating. Furthermore, to ensure that the improvement was stable, the mean scores across the three sessions before the sudden gain had to be significantly higher than the mean scores across the three sessions after the gain (when applicable), using a t-test with an alpha of 0.05. Finally, we examined the PTQ to determine which treatment component adolescents perceived to be most helpful during PCT-A.

RESULTS

Sudden Gains on WRAD, PAR, and Belief Ratings

The mean “average anxiety” score on the WRAD, as rated by the adolescents on a scale from zero to eight, was 2.90 (SD = 1.70) at pre-treatment and 1.20 (SD = 1.77) at session 11. The average between-session change across all sessions on the WRAD-Average Anxiety was a decrease of 0.15 units (SD = 0.33; range = −0.40-0.70). Thus, a between-session change on the WRAD had to exceed 0.66 to meet the two SD criterion as a sudden gain. The mean decrease in average anxiety between sessions four and five was 0.70, which met the first criterion. This gain was also greater than 25% of the previous session’s mean average anxiety rating of 0.30 (0.30 × 0.25 = 0.08). In addition, the mean average anxiety rating for the three sessions preceding the sudden gain (2.87) was significantly greater than that of the three sessions after the sudden gain (2.27; t = 10.39, p = 0.01). This significant improvement in average anxiety notably occurred after the introduction of cognitive restructuring in the treatment protocol. No additional between-session changes in average anxiety met sudden gain criteria (see Figure 1).

Adolescents experienced an average of 2.63 (SD = 3.50) panic attacks a week at pre-treatment, which decreased to 0.31 (SD = 0.58) at session 11. The average between-session decrease in number of
full-blown panic attacks (as measured by the PAR) was 0.26 (SD = 0.50; range = -0.25-1.50). In order to be considered a “sudden gain,” a between-session change in frequency of panic attacks would have to exceed 1.00. One between-session change met this criterion: the average decrease in panic attacks between sessions one and two (after the first session of psychoeducation) was 1.50 (see Figure 2). This between-session change met the second criterion to be considered a “sudden gain”; it was greater than at least 25% of the previous session’s panic attack frequency of 2.88 (2.88 × 0.25 = 0.72). However, although the mean number of panic attacks of the two sessions before the sudden gain (pre-treatment and session one; mean = 2.76) was greater than the mean frequency of attacks in the three sessions after the sudden gain (1.53), this difference is not statistically significant. Thus, the decrease in panic attacks between sessions one and two cannot be considered a full sudden gain. No other between-session changes on the PAR met the sudden gain criteria.

Adolescents’ belief in their most salient probability overestimation dropped from a mean belief rating of 49.00 (SD = 35.12) at session five to 13.05 (SD = 25.73) at session 11. The mean between-session decrease in adolescents’ belief ratings was 5.99 percentage points (SD =
6.59; range = 0.55-18.83). One between-session change was greater than two standard deviations from the mean (13.18); between sessions five and six, the average decrease in adolescents’ belief ratings was 18.83. Because belief ratings were recorded beginning at session five, the change between sessions five and six cannot be compared to belief ratings at earlier sessions. However, the belief rating at session five (49.00) is higher than the average belief rating of the three sessions following the sudden gain (26.15). This sudden change in probability overestimation belief came after the second session of cognitive restructuring (see Figure 3). At the individual level, eight out of 21 participants (38.1%) experienced a rapid decrease in their belief ratings between sessions five and six (i.e., a decrease that exceeded two standard deviations from the individual’s mean change in belief ratings from sessions five through 11).

Adolescent’s coping ratings (i.e., belief in how well they could cope if a feared outcome did occur) increased from an average of 56.57 (SD = 30.70) at session five to 78.14 (SD = 29.56) at session 11. The mean between-session increase in coping ratings was 3.60 percentage points (SD = 3.44; range = -1.20-9.48). The average increase in coping ratings between sessions five and six was 9.48, which is higher than two
standard deviations from the mean (6.88). The mean coping rating at session five (56.57) is lower than the average coping ratings at the two sessions following the sudden gain (69.59). Of the 21 participants, seven (33.3%) experienced an individual marked increase in their coping ratings (i.e., greater than two standard deviations from their individual mean change in coping ratings from sessions five to 11). No other between-session changes in coping ratings met criteria to be considered a sudden gain (see Figure 3).

**Adolescents’ Perceptions of Treatment**

Adolescent participants were asked to give a free response to the following question on the PTQ: “What was most helpful about the treatment?” Of the 19 participants who completed the PTQ, seven (36.8%) described cognitive restructuring as most helpful, while six (31.6%) felt the psychoeducational component of treatment was most helpful. Three (15.8%) listed breathing retraining and two (10.5%) listed situational exposure. One participant (5.3%) said that she found “having someone to talk to” was most helpful to her.
DISCUSSION

The present study is a preliminary examination of the relative efficacy of PCT-A treatment components with the aim of generating hypotheses for additional controlled studies of this treatment. Our results suggest that over the course of PCT-A, adolescents experienced periods of rapid improvement in panic-relevant symptoms. At pre-treatment, adolescents in this study experienced an average of 2.63 panic attacks per week, which is higher than the average weekly frequency of 0.92 experienced by “severe” non-clinical adolescent panicers (calculated from the three-week frequency of panic attacks), as reported by Macaulay and Kleinknecht (1989). After adolescents in the present study received their first session of treatment, they experienced an average of one-and-a-half fewer unexpected, full-blown panic attacks than they did the previous week. Although this decrease did not meet our third criterion to be termed a “sudden gain” (likely the result of only having only two sessions pre-gain on which to conduct the t-test), adolescents continued to experience fewer than two panic attacks per week on average after session one, an improvement that is clinically meaningful. While this decrease in frequency of panic attacks may well be the result of relief from initiating treatment, it is also possible that the decrease is related to the first session of psychoeducation regarding anxiety and panic, which emphasizes the interrelationship between thoughts, physical sensations, and avoidance. Between sessions one and two, each adolescent evaluated his/her own panic attacks in the context of the “cycle of panic” they learned at the first session. They were also oriented to the treatment model by their therapist, which likely resulted in an expectation of greater control over panic symptoms; this sense of control, in turn, may have led to a decrease in panic attacks.

Adolescents also experienced improvement in their ratings of average anxiety between sessions four and five, as measured by the WRAD. This sudden gain occurred after the first session of cognitive restructuring (CR), during which adolescents learn how to gather evidence against and challenge probability overestimations. Similarly, there were significant cognitive improvements between sessions five and six on two variables: how much adolescents believed their most salient probability overestimation was true, and how confident they were in their ability to deal with feared outcomes. These improvements occurred after the second session of CR, during which adolescents identify catastrophic cognitions and determine ways that they could cope with feared outcomes if they actually occurred.
Thus, it appears that psychoeducation and CR are two treatment components after which sudden symptom improvements were observed, although further studies are essential to determining if these are indeed active treatment ingredients. Interestingly, these were the same two treatment components that adolescents reported as being most helpful to them on the PTQ. However, given the limitations of our data, it is difficult to determine if each treatment component led to improvement in the specific symptom of panic disorder it intended to target, mainly because of the overlap in the presentation of different treatment components. Nevertheless, our impression is that CR appeared to precede a significant decrease in intensity of cognitive errors, as measured by the belief and coping ratings, suggesting that there is specificity to this treatment component. On the other hand, BR and IE did not result in sudden decreases in panic attacks as would be expected, although the frequency of panic attacks continued to decline steadily after both treatment components were fully introduced.

There are a number of limitations of this study that prevent us from drawing definitive conclusions about the relative importance of each treatment component. First, because of the overlap in the presentation of treatment components (for example, clients are still working on BR when they begin CR) and the lack of a control group, we cannot say with certainty that the sudden gains we found were the direct result of one particular treatment component. It was especially difficult to examine what effect SE had on the adolescents’ symptoms of panic and agoraphobia because this component was an active part of every session beginning at session two and because the measure of avoidance in the overarching study (the Fear and Avoidance Hierarchy) was not collected weekly over the course of the protocol. Also, while we can say that there was a sustained decrease in cognitive errors on the belief rating measure after session five, we cannot be certain that there were no changes in adolescents’ belief ratings before the introduction of CR, as this measure was not collected before session five (it was originally conceived as a treatment tool).

A second limitation is the small sample size of 21 adolescents, all of whom were Caucasian. Most of the adolescents came from intact families and had well-educated parents. These characteristics of our sample may limit the generalizability of the findings to other populations. In addition, all participants in the present study were treatment completers; we may have found that some treatment components were less effective if participants who did not complete the full treatment had been included in the analyses. A third limitation is that there is no standard defi-
nition of a “sudden gain” across group averages on a measure; the
definition that we used was modeled after that of Tang and DeRubeis
(1999), who looked at individual sudden gains, but our criterion that
sudden gains had to be larger than two standard deviations from the
mean on each measure was somewhat arbitrary, selected to ensure that
the sudden gains we found were large compared to changes across treat-
ment. However, this criterion may have missed between-session
changes that fell short of the two standard deviation criterion but were
still clinically significant. For future studies examining session-by-ses-
session changes, a standard definition of a mean “sudden gain” should
be established so that the criteria are not reinvented with each study, which
limits uniform interpretation of the results. Treatment outcome re-
searchers seeking an established but conservative definition of sudden
treatment gains may wish to employ the sudden gains criteria used in
the present study.

Finally, despite the fact that daily self-monitoring of anxiety and
panic attack records are widely used in cognitive-behavioral treatment
for anxiety, there have been few studies of their psychometric prop-
ties and none of the two measures designed particularly for the study of
PCT-A’s efficacy (the belief ratings and the PTQ). Nevertheless, it has
been shown that even children younger than the adolescents in this
study can reliably complete self-monitoring forms of anxiety symptoms
(Beidel et al., 1991). Furthermore, the portion of the PTQ used in the
present study for a qualitative analysis of what adolescents thought was
most helpful during treatment was intended as a supplement to their
quantitative ratings. However, future studies of cognitive-behavioral
treatment components may wish to include well-validated self-report
measures that are collected on a weekly basis in addition to weekly
self-monitoring and in-session belief ratings.

While a number of controlled studies comparing CBT ingredients
for panic disorder have been conducted with adults (i.e., Craske et al.,
1997; Hecker et al., 1998), there have been no studies for CBT of ado-
lescent panic, and very few studies in the child CBT literature in gen-
eral, that have looked at the contribution of individual treatment
components to a treatment manual as a whole. In a discussion of mech-
anisms of change in cognitive-behavioral treatments for anxious chil-
dren and adolescents, Hudson (2005) stresses the importance of future
research examining the differential efficacy of individual treatment
components. Along these lines, we recommend that the “active ingre-
dients” of PCT-A be examined more closely through controlled dis-
mantling studies. For example, the efficacy of SE in PCT-A can be
established by comparing panic-disordered adolescents who receive standard PCT-A to those who participate in PCT-A without the inclusion of SE.

The degree to which BR contributes to the overall efficacy of PCT-A is of particular interest in light of Schmidt and colleagues’ (2000) finding that this treatment component may put adults with panic disorder at risk for relapse, and Craske et al.’s (1997) finding that IE is superior to BR. Meuret, Wilhelm, Ritz, and Roth (2003) suggest that at this point, arguments for or against the inclusion of BR in treatment for panic disorder are premature given the significant variability in studies that have examined this treatment component (i.e., type of BR used, patient selection, study design). The authors argue that BR appears to correct maladaptive breathing patterns that increase vulnerability to panic attacks and that further research is necessary to clarify the role of BR in the treatment of panic disorder (Meuret et al., 2003).

In addition, given our finding that psychoeducation may have contributed to a significant reduction in average frequency of panic attacks, future research might examine if psychoeducation alone leads to the prevention of panic disorder and agoraphobia in adolescents at risk for developing the disorder, such as adolescents who have parents with panic disorder or adolescents who have previously experienced limited-symptom panic attacks.

**CONCLUSION**

The fact that as many as 10% of children and adolescents presenting to outpatient clinics meet criteria for panic disorder emphasizes the importance of developing and honing efficacious treatments for this population. Evidence suggests that PCT-A results in significant treatment improvements in adolescents with panic disorder and agoraphobia (Mattis et al., 1996), although which components of this treatment contribute to its efficacy remain to be seen. Our session-by-session analysis of treatment gains on panic-relevant measures suggests that psychoeducation may contribute to a reduction in the frequency of panic attacks, while cognitive restructuring appears to play a role in decreasing adolescents’ self-report of overall anxiety and the degree to which adolescents engage in cognitive errors. As clinical researchers develop increasingly helpful treatments for childhood anxiety disorders, it is particularly important to obtain more definitive evidence of the treatment components (individually and/or in combination) that are neces-
sary and sufficient to produce lasting treatment gains. Thus, we recommend that future research extend our findings by further elucidating the role of each treatment component of PCT-A in reducing adolescents’ panic symptoms.

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