Cognitive-Behavioral Treatment of Panic Disorder in Adolescence

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This investigation represents the first randomized controlled trial to evaluate the feasibility and efficacy of Panic Control Treatment for Adolescents (PCT-A). Thirteen adolescents, ages 14 to 17, were randomized to 11 weekly sessions of PCT-A treatment, whereas 13 were randomized to a self-monitoring control group. Results indicate that adolescents receiving immediate PCT-A showed a significant reduction in clinician-rated severity of panic disorder and in self-reported anxiety, anxiety sensitivity, and depression, in comparison to control group participants. These treatment gains were maintained at 3- and 6-month follow-up. Clinical severity of panic continued to improve from posttreatment to 3-month follow-up and then remained stable at 6-month follow-up. In light of study limitations, these findings suggest that cognitive-behavioral treatment for panic disorder in adolescence is a feasible and potentially efficacious intervention for this debilitating condition in youth.

The nature and prevalence of panic disorder in youth has been the focus of growing interest and attention in recent research (Aschenbrand, Kendall, & Webb, 2003; Goodwin & Gotlib, 2004; Wilson & Hayward, 2005). Research indicates not only that panic disorder occurs prior to adulthood but also that adolescence may be its initial peak period of onset (American Psychiatric Association, 1994). Modal age of onset is in midadolescence, with a greater percentage of girls than boys experiencing panic disorder (Kearney, Albano, Eisen, Allan, & Barlow, 1997; Lewinsohn, Gottlib, Lewinsohn, Seeley, & Allen, 1998). Panic disorder in adolescence is believed to have a moderately low base rate, with a prevalence of around 1% (Lewinsohn, Hops, Robers, Seeley, & Andrews, 1993). However, in clinical populations, 2 to 10% of adolescents referred to outpatient clinics (Diler et al., 2004; Last & Strauss, 1989), and 10 to 15% of hospitalized adolescents receive a panic disorder diagnosis (Masi, Favilla, Mucci, & Millepiedi, 2000).

As in adulthood, the most frequent and severe symptoms of panic attacks in adolescence are physiological...
sensations, such as palpitations, dizziness, chest pain, faintness, shortness of breath, and trembling or sweating (Diler et al., 2004). Heightened anxiety sensitivity or increased sensitivity to these physiological symptoms is commonly reported by youth with panic disorder (Kearney et al., 1997) or at risk for panic disorder (Hale & Calamari, 2006). Nelles and Barlow (1988) theorized that adolescents are cognitively able to make catastrophic misinterpretations and attributions about the source of such physiological sensations in a manner consistent with panic disorder. Doerfler, Connor, Volungis, and Toscano (2007) posited that by midadolescence most youth have developed the abstract reasoning skills that allow them to mistakenly attribute the cause of a distressing sensation (e.g., “I can’t catch my breath”) to an internal, catastrophic source (e.g., “I am going to stop breathing and die”), thereby increasing the likelihood of developing panic disorder.

Research on agoraphobia and its subsequent impairment among adolescents with panic disorder is scant. One study suggests that the vast majority of adolescents with panic disorder suffer from agoraphobia, most commonly avoiding restaurants, crowds, small and large rooms, elevators, parks, and stores (Kearney et al., 1997). However, research on the avoidance of developmentally specific activities, such as school or age-appropriate activities, is virtually nonexistent, perhaps due to the infrequency with which adolescents seek treatment in the early years of the disorder (Ollendick, 1995). The lag between panic disorder onset and its treatment may result in entrenchment of avoidance behaviors and greater consequent impairment among those diagnosed with panic disorder early in life (Weissman, Klerman, Markowitz, & Quellette, 1989). If panic disorder persists into adulthood, risk increases for poor general medical and emotional health, alcohol abuse, marital and occupational dysfunction, and medication and emergency room use (Hirschfeld, 1996). Adolescents with panic disorder frequently present with comorbid major depressive disorder, other anxiety disorders and/or bipolar disorder (Biederman et al., 1997; Diler et al., 2004; Doerfler, Toscano, & Connor, 2008; Masi et al., 2007). Moreover, panic disorder symptoms may increase the risk for both suicidal ideation and suicide attempts in late adolescence and early adulthood (Boden, Fergusson, & Horwood, 2007). Taken together, this research suggests that adolescents with panic disorder (with or without agoraphobia) are at substantial risk of poor emotional and health outcomes.

Despite this risk, research on treatments for adolescent panic disorder and agoraphobia to date has been both rare and limited in scope. In contrast, the treatment of panic disorder has been extensively studied in adults, and effective cognitive-behavioral and pharmacological treatments have been developed and evaluated in both clinic and community sites (e.g., Barlow, 2002; Huppert et al., 2001; Shear et al., 2001; etc.) Among psychosocial treatments, Panic Control Treatment (PCT; also referred to by its trade publication name, *Mastery of Your Anxiety and Panic*; Craske & Barlow, 2000, 2006), in particular, has shown consistent positive outcomes in the treatment of panic disorder in adults (e.g., Aaronson et al., 2008; Barlow, Craske, Cerny, & Klosko, 1989; Barlow, Gorman, Shear, & Woods, 2000). PCT is an 11-session, cognitive-behavioral treatment that consists of psychoeducation aimed at correcting misinformation about panic attacks, cognitive restructuring, breathing retraining, interoceptive exposure (i.e., exposure to bodily sensations associated with panic), and graduated exposure to feared or avoided situations for individuals with agoraphobia. Recent findings suggest that even adults with severe panic disorder may respond well to PCT and that treatment responders often demonstrate substantial gains early in treatment (e.g., by Week 4), with maintenance of such gains observed at posttreatment and beyond (Aaronson et al., 2008).

To date, only two previous investigations have examined cognitive-behavioral procedures specifically for adolescents with panic disorder. Using a single case, multiple-baseline design, Ollendick (1995) combined elements of the cognitive-behavioral treatments developed by Barlow and colleagues (e.g., Barlow et al., 1989) and Öst and colleagues (e.g., Öst, Westling, & Hellström, 1993) to treat four adolescents (three girls, one boy), 13 to 17 years of age, who met *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed., Rev. [DSM–III–R]; American Psychiatric Association, 1987) criteria for panic disorder with agoraphobia. Treatment duration ranged from six to nine sessions, with termination contingent on panic-free status for 2 consecutive weeks. All participants demonstrated a decrease in frequency of panic attacks, reduction of agoraphobic avoidance, and increased self-efficacy ratings in agoraphobic situations at treatment termination and 6-month follow-up. None met diagnostic criteria for panic disorder either at termination or follow-up. These findings suggested that cognitive-behavioral treatment procedures for panic disorder in adults may be successfully applied to the treatment of adolescents (Ollendick, 1995).

Hoffman and Mattis (2000) then adapted PCT for use with adolescents. The resultant intervention, Panic Control Treatment for Adolescents (PCT-A) incorporates interoceptive exposure (exposure to feared bodily sensations associated with panic), situational exposure, breathing retraining, psychoeducation, and cognitive restructuring over the course of 11 treatment sessions (see Hoffman & Mattis, 2000, for more detailed description of the PCT-A protocol). Hoffman and Mattis piloted this version of PCT-A with two 13-year-old
adolescents (one girl, one boy), both of whom evidenced significant improvements following treatment, including reduced frequency of panic attacks, increased ability to face previously avoided situations, a notable reduction in fear and avoidance ratings, and improvement on measures of anxiety and anxiety sensitivity. The positive outcomes of this initial pilot testing suggested that further evaluation of PCT-A was warranted.

The present study is a pilot, randomized controlled trial of PCT-A, representing the first such trial of cognitive-behavioral therapy for adolescent panic disorder. We hypothesized that adolescents randomly assigned to an immediate PCT-A condition would evidence significant improvements in panic disorder symptomatology, as well as reductions in general anxiety, anxiety sensitivity, and depression symptoms, relative to adolescents randomly assigned to a self-monitoring control condition for 8 weeks. We also hypothesized that those adolescents receiving PCT-A would continue to demonstrate improvements 3 and 6 months following treatment.

METHOD

Participants

Participants were 26 adolescents (19 girls, 6 boys), aged 14 to 17 ($M = 15.75$ years, $SD = 1.10$), drawn from consecutive referrals to a research clinic specializing in the treatment of anxiety and associated conditions. Approval was obtained by the Boston University Institutional Review Board to conduct this study. Parental consent and adolescent assent to participate were obtained from all participants. All adolescents who received a principal diagnosis of panic disorder with or without agoraphobia based on an initial diagnostic interview assessment were offered the Adolescent Panic Treatment Program. Half of the adolescents ($n = 13$) were randomly assigned to receive immediate PCT-A and the other half ($n = 13$) were assigned to a self-monitoring control group, in which they were asked to monitor panic and mood symptoms while waiting 8 weeks before receiving PCT-A. One adolescent from the self-monitoring control group (3.9%) dropped out of the study prior to completing the waiting period, reportedly due to a family stressor that prevented the adolescent from receiving weekly services in Boston; the family elected to seek treatment closer to their home. Twenty-two of the 25 participants who initiated treatment (88%) completed all 11 treatment sessions. Two participants dropped out midtreatment (1 after 6 and 1 after 8 sessions) but provided at least some posttreatment data, and 1 participant dropped out after 1 session and provided no further data. All cases are included in analyses, with missing data replaced using multiple imputation procedures. All participants completed assessments at baseline and either immediately posttreatment (Week 12) or post-self-monitoring control (Week 8). Participants from the control group then received PCT-A and were assessed immediately posttreatment. All participants were again assessed at 3 months and 6 months posttreatment.

The primary inclusion criteria for the present investigation was a principal diagnosis of panic disorder with or without agoraphobia at a Clinician Severity Rating (CSR) of 4 or higher during an initial diagnostic assessment using the Anxiety Disorders Interview Schedule for the DSM-IV, Child Version (ADIS–C/P; Silverman & Albano, 1997; see description next). Of note, all 26 initial participants were diagnosed with panic disorder with agoraphobia. None had panic disorder without agoraphobia or agoraphobia alone.

Adolescents between ages 14 and 17 only were selected for this investigation, as opposed to a wider age range, as this research represented an initial step in the evaluation of a downward extension of PCT, which targets an adult population. This age range was also selected (as opposed to including adolescents 12–17) to ensure that adolescents were more likely to be developmentally similar. Adolescents receiving pharmacological treatment were also required to undergo a 1-month (for benzodiazepines) or 3-month (for selective serotonin reuptake inhibitor [SSRI]) medication stabilization period prior to this initial diagnostic assessment. These stabilization periods were chosen for pharmacological reasons and reflect relative latency times to potency for the two classes of medication. These stabilization periods are consistent with prior investigations of cognitive-behavioral treatment for panic disorder (DiNardo, Moras, Barlow, Rapee, & Brown, 1993). Additional exclusionary criteria for participation in the initial assessment were a diagnosis of schizophrenia or other psychotic disorder, pervasive developmental disorder, organic brain syndrome, mental retardation, or current suicidal ideation. All participants were Caucasian, with a relatively high family income level ($M = 97,500$, $SD = 65,486$), although annual family income varied considerably across participants (range = $12,500–$300,000). Notably, ethnicity and family income in this sample were consistent with a larger sample of adolescents with panic disorder seen via an outpatient anxiety and mood disorder clinic (Diler et al., 2004).

Measures

Primary Outcome Measures

ADIS–IV–C/P (Silverman & Albano, 1997). The ADIS–IV–C/P is a downward extension of the ADIS–IV (Brown, DiNardo, & Barlow, 1994) tailored for use
with children and adolescents. It includes two semistructured diagnostic interviews, one with child and one with parent(s), used to diagnose all DSM-IV anxiety disorders, mood disorders, externalizing disorders of childhood, and selected other disorders (e.g., psychotic disorders, eating disorders, and somatization disorders). During the interview, the examiner assigns a CSR for all diagnoses on a 0-to-8 scale. A CSR of 4 or above is considered clinical (i.e., child obtains a clinical diagnosis of Panic Disorder), whereas a CSR less than 4 is considered subclinical. The ADIS-IV-C/P has previously demonstrated good interrater reliability \( (r = .98 \text{ and } .93 \text{ for the parent and child interviews, respectively; Silverman & Nelles, 1988}) \), good retest reliability \( (e.g., \kappa = .76 \text{ for the parent interview; Silverman & Eisen, 1992; Silverman, Saavedra, & Pina, 2001}) \), and sensitivity to treatment effects in youth with anxiety disorders \( (e.g., \text{Dadds, Heard, & Rapee, 1992; Kendall et al., 1997}) \). At this treatment site there was good interrater agreement on primary diagnosis \( (\kappa = .866) \) and clinical severity \( (\text{Pearson product-moment } r = .615) \). Interviewers were doctoral-level clinical psychologists and advanced doctoral students in clinical psychology who had met ADIS-IV-C/P training criteria, which includes observing three interviews, collaboratively administering three interviews with a trained clinicians, and conducting supervised assessments until reaching reliability (i.e., agreement on clinical diagnoses and severity ratings on three of five consecutive assessments). The full ADIS-IV-C/P was administered at baseline and a shorter version at all other assessments. The Mini–ADIS–IV–C was administered at baseline and a shorter version at all other assessments.

**Multidimensional Anxiety Scale for Children (MASC; March, 1997).** The MASC is a 30-item questionnaire designed to assess various anxiety dimensions in children. On the MASC, children rate how often each of 39 anxiety-related statements \( (e.g., \text{“I get dizzy or faint,” “I worry about other people laughing at me”}) \) is true for him or her on a 0-to-3 scale, ranging \( 0 \) (\( \text{never true about me} \)) to 3 (\( \text{often true about me} \)). The MASC total score measures overall level of anxiety and evidence to support its reliability and validity have been reported in clinical, epidemiological, and treatment studies \( (\text{March, Parker, Sullivan, Stallings, \& Conners, 1997; Muris, Merckelbach, Ollendick, King, \& Bogie, 2002}) \). Three-week test–retest reliability for the MASC is .79 in clinical samples and .88 in school-based samples \( (\text{March et al., 1997}) \).

**Childhood Anxiety Sensitivity Index (CASI; Silverman, Fleisig, Rabian, \& Peterson, 1991).** The CASI is an 18-item scale modified by Silverman et al. \( (1991) \) from the Anxiety Sensitivity Index \( (\text{Peterson \& Reiss, 1987}) \). Anxiety sensitivity is defined as the belief that anxiety or fear causes negative events such as illness, embarrassment, or additional anxiety \( (\text{Reiss \& McNally, 1985}) \). The CASI measures anxiety sensitivity in children by asking them to state how avariously they view anxiety symptoms \( (e.g., \text{“it scares me when my heart beats fast”}) \) by endorsing 1 (\( \text{none} \)), 2 (\( \text{some} \)), or 3 (\( \text{a lot} \)) in response to each item. The total anxiety sensitivity score is defined as the sum of the child’s endorsement ratings and ranges from 18 to 54. The CASI has been reported to have adequate test–retest reliability of .79 in a clinical sample and good internal consistency \( (\alpha = .87) \) in both clinical and nonclinical samples \( (\text{Chorpita, Albano, \& Barlow, 1996; Chorpita \& Daleiden, 2000; Silverman et al., 1991; Silverman, Ginsburg, \& Goedhart, 1999}) \).

**Children’s Depression Inventory (CDI; Kovacs, 1992).** The CDI is a widely used self-report inventory originally designed by Kovacs and Beck \( (1977) \) to measure depression in children and adolescents. It contains 27 items consisting of three statements that are graded in severity \( (0–2) \). The participant is asked to endorse the statement which best describes his or her thoughts and feelings during the past 2 weeks. A total score ranging from 0 to 54 is derived by summing the severity ratings of the endorsed statements. Adequate internal consistency and test–retest reliability have been reported for this instrument \( (\text{Kovacs, 1992; Smucker, Craighead, Craighead, \& Green, 1986}) \). The validity of the CDI has also been supported in past research \( (\text{Kovacs \& Beck, 1977}) \).

**Treatment Adherence and Satisfaction**

**PCT-A Treatment Adherence Forms (Mattis et al., 1997).** PCT-A Treatment Adherence Forms were developed for use in the current and other adolescent panic treatment investigations at our site. This adherence measure is a checklist of the individual PCT-A components included in each of the 11 sessions \( (e.g., \text{“Clinicin described anxious apprehension, using an example”}) \) and other clinician behaviors \( (e.g., \text{“Clinicin ensures adolescent completed monitoring forms correctly”}) \). Independent coders rate the degree to which a particular treatment component was delivered or behavior was observed in session on a 6-point Likert-type scale ranging \( 0 \) (\( \text{not completed or clinician does not cover this} \)) to 5 (\( \text{definitely completed or clinician thoroughly covers this} \)). Analyses from one third of the participants \( (n = 8) \) in this sample indicated fair interrater agreement \( (r = .63) \) for adherence ratings.
Perceptions of Treatment Questionnaire–Adolescent Version (POTQ-A; Mattis et al., 1997). The POTQ-A was developed for use in treatment studies at our Center to assess aspects of the acceptability of treatment and patients’ satisfaction with treatment. Participants rated the helpfulness of different treatment components and the acceptability of the treatment format on a 0-to-8 Likert-type scale, indicated how the treatment could have been changed to be more helpful and provided additional comments and suggestions in an open response format. Sample Likert-type questions included, “How much do you think the treatment helped you cope with anxiety and panic?” and “How confident would you be in recommending this treatment to a friend with difficulties with anxiety and panic?” Adolescents were assured that therapists would not directly view their responses. Acceptability and satisfaction data were also obtained at posttreatment from 19 adolescent participants (73% of total sample) using the POTQ-A.

Description of Two Treatment Conditions

Self-monitoring control condition. Participants in the control group were assigned to an 8-week self-monitoring condition that involved meeting with a therapist every other week for 20 to 30 min to discuss self-monitoring of panic and anxiety. The goal of this self-monitoring condition was to better equate attention between the two study groups. Patients were instructed to monitor on a daily basis changes in their mood state along with any panic attacks that occurred. This information was primarily used to check for improvement and/or clinical deterioration. During brief check-in meetings with the therapist, patients provided therapists with updates about their previous 2 weeks. Therapists did not provide any skills or advice to patients during this time. After the self-monitoring phase was complete, participants received a post-self-monitoring assessment and, subsequently, they received the same PCT-A protocol as those assigned to the immediate treatment condition. Adolescents assigned to the self-monitoring condition continued working with their assigned therapist when they began treatment.

Immediate treatment condition. As noted, PCT-A (Mattis & Ollendick, 1997) is a downward extension of Panic Control Treatment (Craske & Barlow, 2000, 2006), an empirically supported treatment for panic disorder in adulthood. PCT-A includes eleven 50-min weekly sessions but is typically conducted over a 12-week period, with an additional week between Sessions 10 and 11 to help facilitate practice of learned treatment skills. Similar to its adult counterpart, PCT-A targets three aspects of panic disorder symptomatology: the cognitive/misinterpretational aspect, the hyperventilatory response, and conditioned reactions to physical sensations.

The adolescent treatment retains the original content of much of the adult PCT protocol but was developmentally modified so that it was more appropriate and understandable for both young and older adolescents. First, PCT-A utilizes more simplified language and verbal and visual examples to illustrate therapy concepts. For example, rather than referring to the three components of anxiety as “physical, cognitive and behavioral,” the adolescent protocol referred to them as “what you feel, what you think, and what you do.” Handouts were provided to give adolescents concrete ways to visualize the interactions between these components. The protocol was also modified to include more concrete examples of abstract concepts, such as using an analogy of a swimmer being “alert to the possibility of a shark” to illustrate the concept of anxious apprehension. Furthermore, in place of the cognitive restructuring handouts from the adult protocol, a new handout was created that was entitled, “being a detective,” which encouraged adolescents to seek out the “facts” about the accuracy of their anxious thoughts. In addition, examples were altered to be adolescent friendly, such as talking about what thoughts occur when the teen enters a party or the mall, rather than a crowded room or office. For a complete review of how the PCT protocol was adapted for adolescents, see Hoffman and Mattis (2000).

Individual session content is displayed in Table 1. Initial PCT-A sessions target the cognitive/misinterpretational aspect of panic disorder through psychoeducation. In these initial sessions, the adolescent is given accurate information about the physical sensations of anxiety and panic and their relationship to the fight-or-flight response. Through such information, the adolescent learns that such sensations are harmless and that a panic attack represents a fearful reaction to normal physical sensations. Adolescents are also taught strategies for identifying and challenging anxiety-provoking thoughts (e.g., “I might faint”) by evaluating the evidence (e.g., “How many times have I actually fainted as a result of panic?”) as well as their ability to cope (e.g., “Even if I did faint, would it be the end of the world or could I get through it?”). The role of hyperventilation in panic attacks is discussed, and adolescents are taught slow, diaphragmatic breathing to reduce the frequency and intensity of physical sensations that trigger and maintain panic. Conditioned reactions to physical sensations are addressed during the second half of treatment through interoceptive exposure. Interoceptive exposure utilizes exercises and naturalistic activities to decondition fear reactions through gradual, repeated exposure to the physical sensations associated
with panic. For instance, the adolescent is asked to breathe through a thin straw or to go running in order to elicit feelings of breathlessness. Through such exercises, the adolescent begins to separate physical sensations from an automatic reaction of fear and to learn that such sensations are not truly dangerous. The adolescent develops a hierarchy of agoraphobic situations at the beginning of treatment, and situational exposure is incorporated as homework throughout treatment to encourage adolescents to approach these situations.

Parents were included in several ways in this intervention. First, parents were provided with a three-page handout, *Treating My Teenager’s Panic Disorder: A Guide for Parents*, which explains the nature of panic disorder and its etiology, explains the specific skills taught in the PCT-A program, and provides instructions on how parents can help their child by providing gentle encouragement and support without being a “safety person.” Parents are encouraged to ask the therapist any questions they have about how to be most helpful to a teenager with panic disorder. Parents were included in the final 10 min of session during Sessions 1, 4, 7, and 11 to allow the teenager to explain to the parent the new skills learned and to allow the therapist to answer any questions parents had about their child’s treatment.

All PCT-A sessions were audiotaped and/or videotaped to examine treatment adherence, with audiotapes used as a back-up recording in the case of videotape/camera failure. Approximately 45.5% (125 sessions) of individual PCT-A session videotapes (and/or audiotapes) were randomly selected for adherence coding and subsequently coded by either graduate students familiar with PCT-A or a Ph.D.-level clinical supervisor using the PCT-A Treatment Adherence Forms. Across sessions, ratings of treatment adherence were high ($M = 4.59$, $SD = .38$) ranging 0 (not completed or clinician does not cover this) to 5 (definitely completed or clinician thoroughly covers this). Adherence ratings were highest for Session 4 (Cognitive restructuring; $M = 4.72$, $SD = .27$) and lowest for Session 10 (In-vivo exposure; $M = 4.32$, $SD = .67$).

### Data Analyses

First, preliminary analyses were conducted to assess for potential pretreatment differences between the immediate treatment and control group conditions. Next, the effect of treatment was examined for each of the outcome variables using analyses of covariance predicting scores after the pretreatment assessment (i.e., at posttreatment in the immediate treatment group $[n = 13]$ and at the postwaitlist control group assessment for the self-monitoring control group $[n = 12]$). Finally, to assess whether treatment gains were maintained over time, we collapsed data across the immediate treatment and self-monitoring control/delayed treatment groups and used repeated measures analyses of variance to assess whether treatment gains were maintained over time.

### RESULTS

#### Preliminary Analyses

Independent samples $t$ tests and chi-square analyses were used to assess pretreatment differences between

### TABLE 1

**Outline of PCT-A Treatment Program**

<table>
<thead>
<tr>
<th>Session No.</th>
<th>Content of Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nature of panic/treatment rationale</td>
</tr>
<tr>
<td></td>
<td>Parent component</td>
</tr>
<tr>
<td>2</td>
<td>Psychoeducation: Physiology of panic and anxiety</td>
</tr>
<tr>
<td>3</td>
<td>Psychoeducation: Physiology of hyperventilation breathing retraining instruction</td>
</tr>
<tr>
<td>4</td>
<td>Nature of cognitions in panic disorder</td>
</tr>
<tr>
<td></td>
<td>Parent component</td>
</tr>
<tr>
<td>5</td>
<td>Probability overestimation, catastrophic thinking, identification of worst panic beliefs; cognitive restructuring</td>
</tr>
<tr>
<td>6</td>
<td>Interoceptive exposure, symptom induction tests</td>
</tr>
<tr>
<td>7</td>
<td>Interoceptive exposure review</td>
</tr>
<tr>
<td></td>
<td>Hypothesis testing</td>
</tr>
<tr>
<td></td>
<td>Avoidance/fear avoidance hierarchy</td>
</tr>
<tr>
<td></td>
<td>Parent component</td>
</tr>
<tr>
<td>8</td>
<td>Interoceptive exposure practice</td>
</tr>
<tr>
<td>9</td>
<td>Situational exposure homework</td>
</tr>
<tr>
<td>10</td>
<td>Interoceptive exposure</td>
</tr>
<tr>
<td></td>
<td>Naturalistic interoceptive exposure</td>
</tr>
<tr>
<td></td>
<td>Situation exposure homework</td>
</tr>
<tr>
<td>11</td>
<td>Skill review and discussion of worst panic and fear of panic</td>
</tr>
<tr>
<td>12</td>
<td>Skill review and plans for continued practice parent component</td>
</tr>
</tbody>
</table>
the immediate treatment and waitlist groups on demographic variables, including age, gender, family income, and parent’s level of education, as well as the outcome variables. The groups did not differ on any demographic variable except for age. There was a 1-year age difference between the self-monitoring control group ($M = 15.15$ years) and the immediate treatment group ($M = 16.31$ years). However, subsequent investigation revealed no significant association between age and any of the outcome measures. Furthermore, this 1-year difference was not deemed to be clinically meaningful, given that both groups, on average, were in their early high school years. Therefore, given power limitations present in this small sample, age was not included as a covariate in subsequent analyses. Four adolescents in the control group (33%) and 8 in the immediate treatment group (62%) were on medication prior to treatment (6 on SSRI only, 5 on both SSRI and benzodiazepine, 1 on benzodiazepine only). Pretreatment medication status did not significantly differ between groups, $\chi^2(1) = 1.99, p = .16$. In addition, although pretreatment scores on the four main outcome variables (CSR, CASI, MASC, and CDI) appeared slightly higher in the immediate treatment group than the self-monitoring control group, none of these differences were statistically significant, $t(23) < 1.6, ps > .10$.

**Assessment of Treatment Effects**

Table 2 shows the means and standard deviations on the four outcome variables at pre- and postassessments for the immediate treatment and waitlist conditions. Analyses of covariance were used to assess for an effect of treatment condition. For each outcome variable separately, scores at postassessment were predicted by treatment condition, with preassessment scores included as a covariate. As shown in Table 2, there was a significant main effect of treatment condition for all four outcome variables. Adolescents receiving PCT-A showed greater reductions in clinician-reported clinical severity ratings of panic disorder, self-reported anxiety sensitivity, general anxiety, and depressive symptoms than those in the control condition. Treatment effect sizes, calculated using Cohen’s $d$, were in the large range for all four variables. Planned comparisons revealed that the treatment group decreased significantly from pretreatment to posttreatment on all four measures: for CSR, $t(12) = 5.57, p < .001$; for CASI, $t(12) = 4.60, p < .01$; for MASC, $t(12) = 6.36, p < .001$; for CDI, $t(12) = 3.47, p < .01$.

**Assessment of Postintervention Treatment Effects or Maintenance of Treatment Gains**

Next, to assess maintenance of treatment gains in the 6 months following treatment, we examined scores on each of the four outcome variables at posttreatment, 3-month follow-up, and 6-month follow-up. Because both the immediate treatment group and the self-monitoring control group eventually received treatment with PCT-A, and both groups provided data at posttreatment and the two follow-ups, we collapsed data across the two groups and ran these analyses on the full sample ($n = 25$). Means and standard deviations of the four outcome variables in the full sample at each assessment are presented in Table 3. First, we reran dependent samples $t$ tests in the full sample to assess for changes on the outcome variables from pre- to posttreatment. As expected, scores on all four measures decreased significantly from pretreatment to posttreatment: for CSR, $t(24) = 8.50, p < .001$; for CASI, $t(24) = 5.72, p < .01$; for MASC, $t(24) = 3.36, p < .001$; for CDI, $t(24) = 3.64, p < .001$. Treatment effect sizes (Cohen’s $d$) were calculated using original means and standard deviations rather than the paired $t$ values to avoid inflated effect sizes estimates resulting from the correlated pre- and

### Table 2

<table>
<thead>
<tr>
<th>Measure</th>
<th>Pre</th>
<th>PCT-A$^a$</th>
<th>Control$^b$</th>
<th>Post</th>
<th>PCT-A$^a$</th>
<th>Control$^b$</th>
<th>Effect of Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSR</td>
<td>5.62 (0.65)</td>
<td>5.42 (1.00)</td>
<td></td>
<td>3.31 (1.60)</td>
<td>4.75 (1.36)</td>
<td></td>
<td>6.81**</td>
</tr>
<tr>
<td>CASI</td>
<td>40.57 (6.72)</td>
<td>36.52 (7.90)</td>
<td></td>
<td>28.62 (6.55)</td>
<td>32.67 (9.49)</td>
<td></td>
<td>7.90**</td>
</tr>
<tr>
<td>MASC</td>
<td>65.85 (16.25)</td>
<td>53.18 (23.77)</td>
<td></td>
<td>45.31 (22.75)</td>
<td>51.25 (25.77)</td>
<td></td>
<td>9.92**</td>
</tr>
<tr>
<td>CDI</td>
<td>15.54 (7.63)</td>
<td>12.05 (7.64)</td>
<td></td>
<td>8.77 (8.01)</td>
<td>10.80 (8.18)</td>
<td></td>
<td>4.20*</td>
</tr>
</tbody>
</table>

*Note. Effect of treatment was estimated using analysis of covariance predicting posttreatment score with pretreatment score included as a covariate. PCT-A = Panic Control Treatment for Adolescents; CSR = Clinician Severity Rating; CASI = Childhood Anxiety Sensitivity Index; MASC = Multidimensional Anxiety Scale for Children; CDI = Children’s Depression Inventory.

$^a n = 13$.

$^b n = 12$.

$^* p < .05$. **$p < .01$. 


posttreatment scores (cf. Dunlap, Cortina, Vaslow, & Burke, 1996). Posttreatment effect sizes were very large for CSR ($d = 2.17$) and CASI ($d = 1.33$) and in the medium range for MASC ($d = 0.66$) and CDI scores ($d = 0.63$).

Next, to assess for maintenance of treatment effects over the 6 months following treatment, for each outcome variable separately we conducted a repeated measures analysis of variance assessing for a within-subject effect of time on scores at immediate posttreatment, 3-month follow-up, and 6-month follow-up. There was no effect of time on CASI, MASC, or CDI scores, indicating that the treatment gains made by immediate posttreatment assessment were maintained during the following 6 months. There was an effect of time on CSR scores, $F(2, 48) = 8.12, p < .01$. Planned comparisons revealed that CSRs continued to decrease following active treatment, from immediate posttreatment to the 3-month follow-up assessment, $t(24) = 3.42, p < .01$, and then did not change from 3-month to 6-month follow-up (see Figure 1).

Finally, to address the possibility that 8 weeks of self-monitoring might enhance the maintenance of treatment effects, an additional set of repeated measures analyses of variance were run, again including time as a within-subject factor but also including treatment group (immediate treatment vs. delayed treatment following self-monitoring control) as a between-subjects factor. There were no main effects of treatment group on any of the outcome variables, and no Time × Treatment Group interaction, indicating that the magnitude of treatment effects and the maintenance of treatment gains were comparable across groups.

### Treatment Satisfaction

Adolescent-rated treatment acceptability and satisfaction were assessed using both quantitative and qualitative items from the POTQ-Adolescent for 19 of 25 participants completing a posttreatment session. Because this measure contains qualitative items, no data replacement strategy was utilized in regard to missing data. However, the amount of missing data did not differ by whether participants received treatment immediately or following the self-monitoring control condition. Across items, adolescents reported a high degree of treatment acceptability and satisfaction on the 0-to-8 scale provided ($M = 7.21, SD = 1.52$). Participants reported that the treatment very much helped them cope with anxiety and panic ($M = 7.05, SD = 1.62$) and that they would be very confident recommending PCT–A to a friend with anxiety or panic disorder ($M = 7.42, SD = 1.22$). Qualitative responses included very positive comments such as “[PCT-A] has changed my life completely. I am able to go places and do things I was never able to do before.” Adolescents generally

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**TABLE 3**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Pretreatment</th>
<th>Posttreatment</th>
<th>3 Month</th>
<th>6 Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSR</td>
<td>5.52 (0.82)</td>
<td>3.04 (1.43)</td>
<td>2.06 (1.72)</td>
<td>2.14 (1.54)</td>
</tr>
<tr>
<td>CASI</td>
<td>38.82 (7.51)</td>
<td>29.51 (6.78)</td>
<td>29.12 (5.94)</td>
<td>26.73 (5.80)</td>
</tr>
<tr>
<td>MASC</td>
<td>59.54 (20.78)</td>
<td>46.20 (19.48)</td>
<td>47.91 (19.16)</td>
<td>38.86 (17.71)</td>
</tr>
<tr>
<td>CDI</td>
<td>13.94 (8.04)</td>
<td>9.09 (7.24)</td>
<td>8.14 (6.32)</td>
<td>8.06 (6.98)</td>
</tr>
</tbody>
</table>

Note. $n = 25$. Means with different subscripts represent statistically significant differences. CSR = Clinician Severity Rating; CASI = Childhood Anxiety Sensitivity Index; MASC = Multidimensional Anxiety Scale for Children; CDI = Children’s Depression Inventory.

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**FIGURE 1** (a–d) Changes in outcome variables among combined sample. *Note: CSR = Clinician Severity Rating; CASI = Childhood Anxiety Sensitivity Index; MASC = Multidimensional Anxiety Scale for Children; CDI = Children’s Depression Inventory.*
noted that the format was acceptable and that they would not change the ordering of components or exclude any treatment components. Several adolescents indicated that diaphragmatic breathing and breathing retraining were among the most useful skills that they had learned. Others indicated that they would now tell a friend with panic that “there is hope” and to believe that they “can learn to face [their] fears” using PCT–A. Parents reported that the best part of the treatment was learning a “common language” to use with their adolescent, and learning how to best help their adolescent while they are experiencing a panic attack.

**DISCUSSION**

This study provides preliminary support for the feasibility and efficacy of an 11-session cognitive-behavioral treatment of panic disorder tailored specifically for adolescents. Findings revealed that PCT–A was effective at reducing teens’ symptoms of panic disorder, in comparison to a self-monitoring control condition. Immediately following treatment with PCT–A, participants’ average clinician-rated panic severity had fallen into the subclinical range, so that they no longer met diagnostic criteria for panic disorder. In contrast, for the control group, average clinician ratings of panic severity remained in the clinical range following 8 weeks of self-monitoring and limited therapist contact. Moreover, reductions in panic severity were maintained over the 6 months following treatment. These primary findings suggest that PCT–A is associated with clinically meaningful and sustained improvement in teens’ panic disorder symptomatology.

An interesting finding of this study was that adolescents’ panic symptoms continued to improve over time, following active treatment with PCT–A. Specifically, the clinical severity of teenagers’ panic continued to improve from posttreatment to the 3-month follow-up and then remained stable at 6-month follow-up. This finding is particularly striking given that many treatment outcome studies report generally waning treatment effects or stable treatment effects over long-term follow-up periods (Barrett, Duffy, Dadds, & Rapee, 2001; Kendall, Safford, Flannery-Schroeder, & Webb, 2004). It is possible that the treatment’s emphasis during the final session on planning for continued, independently conducted exposure practices was effective in encouraging adolescents to continue facing feared situations after treatment ended, thereby further reducing their fear and avoidance. It is also plausible that once adolescents began participating in previously avoided activities, they received more positive reinforcement from their peer group and family, which further boosted their desire to continue to practice nonavoidance. Adolescents may have also had more time to practice approaching new situations in their naturalistic home environments.

Findings also indicated that PCT–A was not only effective in reducing participants’ panic symptoms but also associated with improvement in their anxiety sensitivity, general anxiety symptoms, and depressive symptoms, relative to the self-monitoring control group. Moreover, treatment gains in these three areas were maintained at 3- and 6-month follow-up. The treatment effect on anxiety sensitivity, or physiological reactivity to symptoms of anxiety, is not surprising given PCT–A’s heavy emphasis on educating teens about how the physical feelings associated with panic attacks are not harmful, through interoceptive exposure practice. In contrast, general anxiety and depression were not directly targeted in treatment. It is possible that adolescents learned skills in PCT-A which generalized in ways that improved their overall levels of anxiety and depression. For example, strategies to identify and correct cognitive distortions (taught in PCT–A to correct unrealistic, anxiety provoking thoughts about panic attacks) can be readily applied to the distorted thoughts that engender general worry and dysphoria. In fact, these cognitive restructuring skills are integral components of treatments for other anxiety disorders and depression in children (Kendall et al., 1997, Weisz et al., 2003). Also, decreased avoidance of developmentally appropriate activities, a major treatment goal of PCT–A, may increase teens’ positive activities and behavioral activation, thereby improving their mood. Often teens’ activities are significantly curtailed during panic disorder, and they become socially isolated; when the panic remits, social isolation may decrease, leading to remission in their secondary depression. Future research is needed to explore the mechanisms of treatment effect on participants’ anxiety and depressive symptomatology.

Regardless of the mechanism, however, the sustained improvement observed in participants’ general anxiety and depressive symptoms suggest that PCT–A may exert a lasting positive influence on adolescents’ broader emotional well-being. This finding, together with previous evidence that psychotherapy for child depression is associated with improvements in anxiety (Weisz, McCarty, & Valeri, 2006), suggests that current treatments for particular anxiety and depressive disorders may similarly improve skills for managing the negative affectivity common to both types of syndromes and highlights the potential utility of a unified intervention for all internalizing disorders (Ehrenreich, Goldstein, Wright, & Barlow, 2009).

**Study Limitations**

This study is the first randomized controlled trial of panic disorder treatment for adolescents and provides
Results of the study speak to the feasibility of using a developmental modification of PCT–A presented in an 8-day intensive format is now under way.

Implications for Research, Policy, and Practice

Because this was a pilot study representing the first exploration of whether panic treatment might be effective for adolescents, the sample size was small. Consequently, we were unable to examine mechanisms of treatment effect. In a preliminary examination of the efficacy of individual PCT–A treatment components (e.g., cognitive restructuring, breathing retraining, exposure practice, parent training), Micco, Choate-Summers, Ehrenreich, Pincus, and Mattis (2007) found that psychoeducation about panic preceded notable decreases in panic attacks while cognitive restructuring contributed to sudden improvements in overall anxiety and cognitive errors. These exploratory findings pose interesting hypotheses about mechanisms of treatment effect and highlight the need for more definitive evidence about which treatment components are necessary and sufficient to produce lasting gains. Thus, future studies with larger samples designed to examine the role of each PCT–A treatment component in reducing adolescents’ panic symptoms would represent a significant addition to the field.

Another area for future research is to explore the optimal format for cognitive behavioral treatment of adolescent panic. Although the 11 weekly session format was reported to be acceptable to study participants, some requested a briefer treatment format to enable a more rapid return to developmentally important social and academic activities. In addition, families living outside the catchment area of our clinic were unable to participate. It is possible that a briefer, intensive treatment format might speed teens’ ability to resume their daily activities as well as increase treatment accessibility to a greater number of families from a wider geographic area. Accordingly, a new randomized controlled trial of PCT–A presented in an 8-day intensive format is now under way.

Results of the study speak to the feasibility of using a developmentally sensitive, adolescent version of cognitive behavioral treatment for panic, which has previously been utilized and studied mainly with adults. This developmental adaptation of panic control treatment incorporated adolescent friendly language, used relevant examples for adolescents (e.g., referring to panic arising in classroom settings or social situations rather than at work), and highlighted how teens’ quality of life could improve by returning to developmentally appropriate activities. Overall, the adolescent protocol was adapted to engage adolescents in treatment. This was accomplished through therapists’ attending to stressors most relevant to teens and through altering the presentation of therapeutic content to be understandable and interesting to adolescents while maintaining a treatment focus on panic and anxiety-relevant skills. Acceptability and treatment satisfaction data indicated that most adolescent patients found the treatment to be very helpful at teaching them to use skills for managing panic attacks and anxiety, which is suggestive that developmental modifications were successful. Thus, the results of this study may have positive implications for practicing clinicians who treat teenagers with panic disorder and their families, as the treatment was found to be highly acceptable and helpful to our participants.

Another noteworthy implication for clinical practice and continued research is the potential positive effects of including parents in treatment. One of the highlights of our developmental modification of PCT–A was parental involvement in treatment (via including parents at the end of four different treatment sessions, providing
parents with psychoeducation about panic and anxiety, and teaching parents how to conduct exposures). The positive treatment effects found in this study, along with the informal reports of parents that this parental component of treatment was helpful, suggest that inclusion of parents may have been beneficial to families. Parents generally reported that they found the parent component of the treatment to be especially helpful, as it gave them a common language with their adolescents and provided them with concrete information on the nature and physiology of panic as well as some tools to use “in the moment” when their teenager called on them for help. However, in the current study, we can not directly determine the effects of parental involvement in treatment since we did not randomize patients to treatment conditions with and without parental involvement. This question will be directly explored in future studies of panic disorder in adolescents by our research team.

In sum, this study represents the first randomized controlled trial of a developmental adaptation of panic treatment for adolescents. Results suggest that cognitive-behavioral treatment for panic disorder in adolescence is a feasible and potentially efficacious intervention that is associated with clinically significant improvement in adolescents’ panic disorder that is maintained in at least the six months following active treatment. In addition, sustained benefits were observed on the secondary outcomes of anxiety sensitivity, general anxiety, and depressive symptoms. As panic disorder is highly distressing and interfering in adolescents’ lives, and is associated with poor outcomes into adulthood if left untreated, these findings suggest that PCT–A has the potential to significantly improve the long-term well-being of teens suffering from panic disorder. As such, the present results indicate that further evaluation of this treatment through a large randomized trial using a more representative sample is warranted and more generally supports the utility of continued research to further develop and refine developmentally tailored treatments for panic in youth.

REFERENCES


