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Mediators of Exposure Therapy for Youth Obsessive-Compulsive Disorder: Specificity and Temporal Sequence of Client and Treatment Factors

Brian C. Chu
Rutgers, The State University of New Jersey
Daniela B. Colognori
Kean University
Guang Yang
Data Insight Analytics, D&B
Min-ge Xie
Rutgers, The State University of New Jersey
R. Lindsey Bergman
John Piacentini
UCLA Semel Institute for Neuroscience and Human Behavior

Objective: **Behavioral engagement and cognitive coping have been hypothesized to mediate effectiveness of exposure-based therapies. Identifying which specific child factors mediate successful therapy and which therapist factors facilitate change can help make our evidence-based treatments more efficient and robust. The current study examines the specificity and temporal sequence of relations among hypothesized client and therapist mediators in exposure therapy for pediatric Obsessive Compulsive Disorder (OCD).** *Method:* **Youth coping (cognitive, behavioral), youth safety behaviors (avoidance, escape, compulsive behaviors), therapist interventions (cognitive, exposure extensiveness), and youth anxiety were rated via observational ratings of therapy sessions of OCD youth (*N* = 43; ages = 8 – 17; 62.8% male) who had received Exposure and Response Prevention (ERP). Regression analysis using Generalized Estimation Equations and cross-lagged panel analysis (CLPA) were conducted to model anxiety change within and across sessions, to determine formal mediators of anxiety change, and to establish sequence of effects.** *Results:* **Anxiety ratings decreased linearly across exposures within sessions. Youth coping and therapist interventions significantly mediated anxiety change across exposures, and youth-interfering behavior mediated anxiety change at the trend level. In CLPA, youth-interfering behaviors predicted, and were predicted by, changes in anxiety. Youth coping was predicted by prior anxiety change.** *Conclusions:* **The study provides a preliminary examination of specificity and temporal sequence among child and therapist behaviors in predicting youth anxiety. Results suggest that therapists should educate clients in the natural rebound effects of anxiety between sessions and should be aware of the negatively reinforcing properties of avoidance during exposure.**

Keywords: exposure and response prevention; mediators of change; child and adolescent; Obsessive Compulsive Disorder

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Address correspondence to Brian C. Chu, Ph.D., Department of Clinical Psychology, Graduate School of Applied and Professional Psychology, Rutgers University, 152 Frelinghuysen Road, Piscataway, NJ 08854; e-mail: BrianChu@rci.Rutgers.edu.

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Obsessive-compulsive disorder (OCD) is a debilitating disorder that affects between 1% and 4% of children and adolescents and contributes to significant impairment (Barrett, Farrell, Pina, Peris, & Piacentini, 2008). Exposure and Response Prevention (ERP) is well-documented as efficacious for OCD (Abramowitz, Whiteside, & Deacon, 2005; Barrett et al., 2008; Pediatric OCD Treatment Study [POTS] Team, 2004; Sanchez-Meca, Rosa-Alcazar, Iniesta-Sepulveda, & Rosa-Alcazar, 2014). However, even the most rigorously conducted interventions produce relatively low remission rates (39.3% remission rate in POTS, 2004). Identifying the critical mechanisms and essential strategies within ERP can help improve the effectiveness of ERP (Barrett et al., 2008).

Clinical trials have identified pretreatment factors that either predict (pretreatment severity, academic and social functioning, family dysfunction and accommodation) or fail to predict (age, gender, baseline medication status) outcomes (Barrett, Farrell, Dadds, & Boulter, 2005; Garcia et al., 2010; Merlo, Lehmkuhl, Geffken, & Storch, 2009; Piacentini et al., 2011). Aspects of treatment delivery have also been found to be important, such as exposure schedule (e.g., flooding versus gradual exposure; Boersma, Den Hengst, Dekker, & Emmelkamp, 1976) or its evocative medium (e.g., imaginal versus in vivo; Foa, Steketee, & Grayson, 1985). However, few studies have examined within-treatment patient and therapist factors that improve treatment during delivery. This research is unique in its ability to provide specific recommendations for increasing the efficiency and effectiveness of empirically supported therapies (Kazdin & Nock, 2003).

Cognitive behavioral therapy (CBT) for OCD is comprised of both exposure and cognitive restructuring, but ERP is the cornerstone of effective treatment (Barrett et al., 2008). ERP involves exposing patients to stimuli that trigger obsessive fears while encouraging the patient to resist the associated compulsive behaviors (Foa & Kozak, 1986). The most commonly proposed mechanism for ERP is that, across repeated exposures, obsession-triggered anxiety dissipates through the process of emotional processing, typically reflected by autonomic habituation. In addition, as the individual's fears dissipate, she or he comes to learn that the feared consequences of not ritualizing do not materialize. The cognitive component of CBT aims to help individuals challenge unrealistic distortions, such as inflated sense of responsibility for harm, excessive self-doubt, and thought-action fusion (Salkovkis, 1996). Treatment protocols for youth often include cognitive therapy techniques presented in developmentally sensitive language to increase the child's sense of personal efficacy, predictability, and controllability (Franklin, Freeman, & March, 2010). However, cognitive strategies are typically included to support and complement ERP, rather than replace it, and the unique contribution of cognitive mechanisms has not been demonstrated in youth (Barrett et al., 2008; Franklin & Foa, 2008).

Based on cognitive behavioral theory, we have certain expectations about the characteristics of successful ERP. First, the course of anxiety would be expected to decline over the course of treatment after repeated exposures to feared stimuli (autonomic habituation). However, the exact trajectory of anxiety reduction is unknown. Early theories predicted slow, gradual decline in anxiety as habituation occurred. Recent experimental research demonstrates that sustained excitation during exposures enhances the effectiveness and generalizability of treatment (Craske et al., 2008). If ERP is done correctly, where excitation levels are maintained, we might expect short-term increases in anxiety (within exposure or within session) in the service of achieving longer-term anxiety decreases (across sessions). Likewise, if sustained excitation is critical to ERP success, then the degree to which a therapist increases exposure intensity should be important. As the therapist orchestrates challenging exposures and encourages patients to remain in an exposure despite wishes to escape, the patient reaches critical levels of excitation.

Second, cognitive processes should play a role. When a client's anticipated negative consequences fail to occur, the client's distorted expectation of harm would be expected to dissipate (Foa & Kozak, 1986). For example, a youth who believes, "I will contract a deadly disease," after touching a sticky substance might be asked to touch a hand to an unknown substance, resist cleaning the hand, and use a coping statement to counter anxiety. When the youth does not contract a disease, the youth gains direct evidence that counters the unrealistic, catastrophic fear. Successful ERP should display evidence of the therapist employing cognitive restructuring and a client utilizing coping statements to push through exposures. Alternatively, habituation during ERP may occur through cognitive distancing (i.e., tolerating distress in the presence of anxious thoughts) as the youth learns to identify the inconsequential nature of intrusive thoughts as part of anxiety's "false alarm/message."

Third, it has been theorized that client safety behaviors during exposures interfere with optimal doses of exposure, diminishing treatment effectiveness. Safety-seeking behaviors can be either overt or covert and function to help youth avoid or cope with a perceived threat (Salkovskis, 1996). The broadest and most common class of safety behavior

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is avoidance, which may be behavioral (avoiding or escaping specific situations/stimuli) or cognitive (e.g., mental distraction) in nature. Safety behaviors may also cater to specific idiosyncratic obsessions or compulsions (e.g., carrying wet naps to sterilize hands after touching foreign surfaces). These behaviors may maintain anxiety by interfering with disconfirming evidence (i.e., providing an alternate explanation to noncatastrophic outcomes; Salkovskis, 1996) or because they redirect attentional resources away from the threat, reducing activation of the fear network that would permit emotional habituation (Foa & Kozak, 1986). In sum, the overall success of ERP depends on: (a) the dosage (extensiveness) of essential ERP techniques (cognitive restructuring, intensive exposures) and (b) the degree of change in critical processes (e.g., reduced maladaptive cognitions and safety behaviors, increased approach behaviors).

The current study makes use of observational coding of youth coping and safety behaviors as well as therapist interventions to examine the specificity and temporal relations among treatment techniques and putative mediators of ERP to pinpoint processes that may enhance treatment efficacy. Participants were youth with OCD enrolled in a randomized controlled trial and assigned to a structured exposure-based CBT plus a family intervention protocol (FCBT; Piacentini et al., 2011). Youth randomized to the comparison treatment, structured psychoeducation plus relaxation training (PRT), were not included in this study.

Few studies have taken advantage of observational coding to evaluate treatment mediators and processes despite its advantages in examining behaviors naturally occurring in treatment. Hedtke, Kendall, and Tiwari (2009) used observational coding of CBT with non-OCD anxious youth to examine relations among youth coping, safety behavior, and treatment outcome. Results indicated that safety behavior, but not coping, during exposure-based sessions was significantly associated with poorer outcomes. Morgan and colleagues (2013) investigated pretreatment predictors of within-session treatment adherence in ERP for OCD youth. Audiotapes from a single ERP session of 20 youth were coded using a 3-item scale to code willingness to confront anxiety-provoking stimuli, ability to refrain from compulsive behavior during an exposure, and within-session habituation. Results suggested that higher pretreatment family accommodation and OCD symptom severity were associated with poor within-session adherence. Thus, prior research has successfully used observational coding to operationalize important predictors and proximal outcomes in therapy.

In the closest parallel to the current study, Benito, Conelea, Garcia, and Freeman (2012) developed coding methodology to measure CBT-specific processes during exposures, focusing on child, parent, and therapist statements and behaviors that functioned to increase or decrease anxiety during exposure exercises. Frequency and duration of multiple types of avoidance-encouraging or -discouraging events were coded in the first two exposure sessions of CBT for 18 young children (4–8 years old) with OCD. In general, few correlations were found between session behaviors and treatment outcomes, but avoidance-discouraging therapist and parent behaviors were correlated with decreased distress at posttreatment and 3-month follow-up. Encouraging cognitive/coping strategies was surprisingly related to higher anxiety at midtreatment. Child behaviors were not related to treatment outcome at any time point, although treatment noncompleters displayed a significantly higher percentage of child avoidance behaviors than treatment completers. These findings support the feasibility of coding exposure behaviors with younger children; however, research with older children who comprise the largest share of treatment-seeking youth with OCD is warranted.

The present study makes important methodological advances over previous literature. Morgan et al. (2013) coded one construct with three items, and Hedtke et al. (2009) coded two broad youth behaviors (safety seeking and coping). The current study refines and expands this coding scheme to assess five categories of youth behaviors, including therapy-interfering behaviors (avoidance, escape, compulsive acts) and youth coping behaviors (cognitive and behavioral), and two therapist variables (cognitive strategies, exposure extensiveness). Second, Morgan et al. evaluated one session, and both Hedtke et al. and Benito et al. used substantial aggregation procedures in analyzing data. Hedtke et al. randomly selected three sessions from each youth, rated safety and coping scores for each exposure session, and then calculated average scores for the entire case. Average safety and coping scores were then regressed on posttreatment diagnostic and symptom outcomes. Benito et al. coded the first two exposure sessions and averaged frequency and duration of events to predict outcomes. Although aggregating data simplifies analysis, averaging scores typically reduces score variance and risks missing meaningful relationships where they actually exist (Singer & Willet, 2003). Further, each study correlated session events with relatively distal outcomes (e.g., posttreatment). Such temporal distance between predictor and outcome leaves room for multiple influences to impact outcome. In the current study, independent ratings of youth and therapist behaviors

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and youth anxiety were rated for each exposure task in four sampled sessions for youth receiving FCBT. The analytic plan then employed multilevel longitudinal analysis to examine youth-therapist-outcome relations within and across exposure tasks and treatment sessions. Finally, prior studies did not attempt to establish the temporal sequencing of effects among predictors and outcome.

The aims and hypotheses of the current study follow this multilevel data structure. The first aim was to establish anxiety trajectory across exposures both within and across sessions. Given the debate regarding the role of habituation in exposure treatments, we expected to see one of two patterns: (a) a slow gradual decrease in anxiety over the course of exposures and across sessions or (b) stable or intensified anxiety within sessions, but gradual decreases across sessions. The second aim was to identify specific youth/therapist behaviors that predicted and mediated anxiety change. It was hypothesized that youth cognitive and behavioral coping and therapist cognitive strategies and exposure extensiveness would significantly predict and mediate reductions in youth anxiety. In contrast, youth-interfering behaviors (compulsive rituals, avoidance, escape) would negatively predict anxiety change. Finally, cross-panel design analysis was conducted to determine sequence of effects. It was hypothesized that therapist interventions and youth coping would precede positive changes in anxiety and that improved anxiety would precede subsequent decreases in youth interfering behaviors.

Methods

PARTICIPANTS

Forty-nine youth who received FCBT as part of a randomized clinical trial (Piacentini et al., 2011) were eligible. Forty-three (N = 43) had videotapes available for observational coding. All youth (62.8% male; M_{age} = 12.6 years; SD = 2.6; range: 8 – 17) received a principal DSM-IV-TR diagnosis of OCD. Thirty-three (76.7%) identified as White/Caucasian, five (11.6%) as Latino, one (2.3%) as African-American, one as Asian, and three (7%) as other. Mean Child Yale-Brown Obsessive Compulsive Scale total score (CYBOCS; Goodman et al., 1989) was 24.60 (SD = 4.89), placing youth in the clinical range of OCD symptoms.

Original RCT inclusion criteria were: (a) ages 8 – 17, (b) DSM-IV criteria of OCD, (c) baseline CY-BOCS score ≥ 15, (d) Wechsler IQ ≥ 70, (e) English-speaking parent and youth, (f) not taking anti-OCD medication at study entry and agreement to refrain from initiating such medication during treatment, (g) informed consent/assent from parents/youth. Exclusion criteria included any medical/psychiatric conditions contraindicating study participation (e.g., prominent suicidality, psychosis, pervasive developmental disorder, mania, or substance dependence).

Measures

CLINICAL MEASURES

The Anxiety Disorders Interview Scale-DSM-IV-TR – Parent/Child (ADIS-IV-TR; Silverman & Albano, 2004) was administered prior to study entry in the original RCT to document that diagnostic inclusion criteria (OCD) were met. It is a semistructured interview consisting of independent but comparable parent/youth interviews that have demonstrated good interrater and retest reliability (Silverman & Eisen, 1992). The CY-BOCS was used to assess OCD severity at baseline. It is a semistructured interview that includes a 10-item clinician rating (range: 0 – 40), psychometric properties are well established, and it is the gold standard for pediatric OCD research (Gallant et al., 2008). Coefficient alpha in the current sample was 0.89. Doctoral-level clinical psychology interviewers achieved reliability on the ADIS-IV-TR and CY-BOCS by coding videotaped interviews, co-rating live interviews with trained diagnosticians, and conducting at least one evaluation under the observation of a trained diagnostician. Independent reliability ratings of randomly selected CY-BOCS audiotapes at baseline and posttreatment indicated excellent interrater reliability (ICC = .96; Piacentini et al., 2011).

EXPOSURE RATING SCALE FOR EXPOSURE AND RESPONSE PREVENTION (ERS-ERP)

The ERS-ERP is an observational coding scheme based on Hedtke et al.'s (2009) scale for non-OCD anxiety disorders. The original scale enabled coders to identify several exposure characteristics (e.g., number of trials, type of exposure [imaginal, in vivo], location, length, parental presence) and three youth behaviors (safety seeking, coping, peak observed anxiety), rated on a 1 (*none*) to 6 (*great deal*) scale. Hedtke et al. demonstrated excellent interrater reliability across undergraduate and graduate psychology students (κ > .80 for categorical; ICC > .80 for continuous variables).

The ERS-ERP adapted Hedtke et al.'s (2009) scale to reflect safety-seeking and coping behavior unique to OCD and added two therapist intervention items. Three youth-interfering behaviors were coded. *Avoidance* was defined as any behavior used to prevent or delay perceived danger before engaging in an exposure task. *Escape* was defined as any behavior used to flee perceived danger during an exposure. Avoidance and Escape were distinguished solely on the basis of the timing of occurrence in

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relation to a particular exposure. Avoidant behavior occurred in the preparation time leading up to an exposure; escape occurred during an exposure. Avoidance and Escape included fleeing the room, interruptions due to crying/tantrums, procrastination, delays, partial participation, oppositionality, distraction, etc. *Compulsive behavior* was coded when youth evidenced compulsions or rituals before or during an exposure.

Two youth coping behaviors were coded. *Cognitive Coping* was defined as self-statements/coping thoughts used to help enter or tolerate an exposure and initiated by the youth. These included coping thoughts (e.g., "I can do it"), verbal challenges (e.g., "What's the worst that can happen?"), re-labeling obsessive thoughts, or attempts to "fight" OCD (e.g., "It's just my OCD talking"). *Behavioral Coping* included behaviors or strategies used to get through an exposure. These included breathing or relaxation, problem solving, discussing or agreeing to rewards/contingencies, or using ritual-preventing competing response (e.g., if a youth's ritual was to touch both hands to a table, and he put his hands in his lap instead). Youth-interfering and coping behaviors were rated on a 0 (*No usage*) to 5 (*Great deal of usage*) scale.

The dependent variable, *Youth Anxiety,* was coded at each exposure on a scale from 0 (*Not at all*) to 5 (*Extremely Anxious*) and was based on observations of anxious verbalizations (e.g., "I can't do this," "I probably look stupid"), behavioral signs of distress (e.g., tearing, crying, visible sweating, screaming), or stereotypic movements (e.g., repetitive hand or legs movement, shaking, tapping, body rocking, swinging arms).

Two therapist interventions were coded. *Cognitive Strategies* were therapist attempts to teach or elicit youth coping thoughts during an exposure or using cognitive restructuring (e.g., challenging unrealistic assumptions). These were rated on a 0 (*No cognitive strategies*) to 5 (*Core component of exposure*) scale. *Therapist Extensiveness* was the degree to which therapists pushed a youth during an exposure; that is, how much therapists provided guidelines, structure, and prompting to encourage youth engagement in difficult tasks. Extensiveness was rated on a 0 (*No guidance/effort*) to 5 (*Remarkable efforts*) scale. A low score was given when a therapist "let a youth out" of an exposure after mild complaints or reluctance. A "5" was given if the therapist provided multiple prompts, without which the exposure would have likely stopped. Even if the youth ultimately escaped, the therapist was given credit if substantial efforts were made to encourage task completion, if modifications were made to improve chances for success, or if the therapist was able to convince the child to engage in a similar exposure task.

Procedure

ORIGINAL RCT PROCEDURES

FCBT consisted of 12 ninety-minute therapy sessions, delivered over the course of 14 weeks in a large medical center outpatient clinic. The initial two sessions emphasized psychoeducation and creation of a symptom hierarchy. For the remaining 10 sessions, the first 60 minutes were spent on exposure-based CBT with the youth and the second 30 minutes included family members and focused on psychoeducation about OCD and how members can facilitate exposure treatment (Piacentini, Langley & Roblek, 2007a; 2007b).

Therapists, all female, were doctoral-level clinical psychologists and saw an average of 5.0 cases (*SD* = 4.27; range: 1 – 12). Study therapists had previous training and experience in delivering ERP with OCD youth and all participated in weekly group supervision. All sessions were videotaped and structured review of approximately 10% of taped sessions indicated good therapist adherence (mean score = 88.2; range: 0–100) and treatment quality (mean score = 8.1; range 0–10; Piacentini et al., 2011). All RCT and secondary coding procedures received approval from the Institutional Review Boards of each investigative institution involved.

SAMPLING PROCEDURE

Given the focus on exposure processes in the current study, we randomly selected two sessions from the early exposure phase (sessions 4–7) and two sessions from the later exposure phase (sessions 8–12). This approach is supported by research showing slope differences between exposures early and later in treatment (Chasson et al., 2010). Less than four sessions were coded only if the case had insufficient videotapes available, due to early termination from therapy, equipment malfunction, or exposures occurred outside therapy room. Thus, a maximum of four sessions were coded for each case, and, for longitudinal growth analysis, sessions were relabeled as 1, 2, 3, 4 to represent their relative order for each case.

OBSERVATIONAL CODING PROCEDURES

Reliability Training

Four undergraduate and postbaccalaureate coders received 3 months of training on OCD, CBT, ERP, and the ERS-ERP coding manual. Practice codes of video sessions were completed independently and discussed to form consensus. To establish reliability, trainee ratings on eight sets of three sessions

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were compared to expert consensus ratings (the ERS-ERP developers). All coders achieved excellent reliability (Cicchetti et al., 2006) on all ERS-ERP items except Compulsions. Two-way mixed, single measure ICC (3, 1) reliabilities were: Anxiety (M = 0.83; range: .70–.91), Avoidance (M = 0.90; range: .80–.97), Escape (M = 0.90; range: .83–1.00), Compulsions (M = 0.41; range: .04–.80), Cognitive Coping (M = 0.93; range: .85–.98), Behavioral Coping (M = 0.85; range: .82–.87), Therapist Cognitive (M = 0.93; range: .74–1.00), and Therapist Extensiveness (M = 0.77; range: .59–.86).

Coding and Reliability

All sessions were then double coded to increase stability and reliability of ratings. Final scores for all process variables were calculated as the average of the two ratings. One-way random, average measure ICC (1, k) for study data were good to excellent: Anxiety = 0.69 (95% CI: .62–.74), Avoidance = 0.88 (95% CI: .85–.90), Escape = 0.77 (95% CI: .72–.81), Compulsions = 0.78 (95% CI: .73–.82), Cognitive Coping = 0.73 (95% CI: .68–.78), Behavioral Coping = 0.97 (95% CI: .96–.97), Therapist Cognitive = 0.81 (95% CI: .76–.85), and Therapist Extensiveness = 0.80 (95% CI: .76–.84).

Analytic Overview

Descriptive data and zero-order bivariate correlations were first calculated at the level of exposure, collapsing across participants, sessions, and exposures, using *SPSS 20.0*. Multilevel regression analysis was conducted using *gee* and *geeglm* packages in *R version 2.11.1* to estimate individual anxiety growth curves to account for dependencies across and within participants, sessions, and exposures. The Generalized Estimation Equations (GEE) method was used to handle multilevel data and estimate growth curves. A random effects approach was also completed and produced similar results. Results from GEE are presented because GEE estimates are more robust than standard regression models in the face of nonnormal data and batch correlated measurements, which is common in longitudinal panel studies of low base-rate events like therapeutic processes (Diggle, Heagerty, Liang, & Zeger, 2002). Analyses were also performed with log-transformed data and produced nearly identical results; results with nontransformed data are presented to ease interpretation. Missing data (5.7% of expected sessions) was minimal and related to absence of videotapes for coding and considered missing at random. Under these conditions, GEE estimators are consistent (Liang & Zeger, 1986).

To establish mediation, the predictor variable temporally precedes the mediator and outcome variables, and the joint significance of the two effects comprising the mediator effect is significant (Baron & Kenny, 1986; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). Growth modeling can be used to examine such relations within persons over time (Kenny, Korchmaros, & Bolger, 2003) and research has demonstrated using lower-level mediation analysis to determine mediator effects within a single treatment condition (e.g., Smits et al., 2006). In the current study, time (session number, exposure trial) was the predictor variable, youth and therapist factors were hypothesized mediators, and youth anxiety was the outcome variable. For mediation and cross-lag analysis, hypothesized mediators were summed into three conceptual groups (e.g., interfering behaviors equaled the sum of avoidance, escape, and compulsions; youth coping was the sum of behavioral and cognitive coping; therapist interventions was the sum of therapist cognitive and therapist extensiveness).

We coded two classes of time effects: *within-session effects* (changes in anxiety across exposures) and *between-session effects* (change in anxiety in the first exposure between any two sessions). Number of exposures varied within sessions, so within-session effects were coded as the cumulative number of exposure trials (range: 1 – 9). Between-session effects were coded as session number (1 – 4) to model potential rebound effects across the four sampled sessions.

Three phases of analyses were conducted. First, we conducted individual growth analysis to determine mean anxiety trajectory within and across sessions. Second, we evaluated the relative contributions of hypothesized mediators (youth coping and interfering behaviors, therapist interventions) to anxiety change across exposures using the joint effects approach (MacKinnon et al., 2002). Finally, we used a within-person, autoregressive cross-lagged panel analysis to examine the temporal and reciprocal relations between each of the hypothesized mediators and youth anxiety.

Results

DESCRIPTION OF SESSIONS AND EXPOSURES

The average treatment protocol lasted 12.1 (SD = 2.9) sessions and attrition was low (16% terminated prior to the final session). A total of 138 sessions (M = 3.21 per case, SD = 0.89, range: 1 – 4) were coded. Across the 138 coded sessions, 317 total exposure exercises were identified (M = 2.3 exposures per session, SD = 1.49, range: 1 – 9). Mean number of exposures over the four sampled sessions for each case was 7.37 (SD = 3.9, range: 2 – 21), demonstrating a range of exposures from each case

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Table 1
Psychometric Properties for Youth and Therapist Process Variables per Exposure (N = 43 cases)

Variable	*n*	*M*	*SD*	Min	Max
Anxiety Rating	317	1.15	0.88	0.00	4.00
Avoidance	307	0.55	1.10	0.00	5.00
Escape	306	0.77	1.09	0.00	4.00
Compulsions	309	0.31	0.69	0.00	4.00
Cognitive Coping	310	0.40	0.74	0.00	3.50
Behavioral Coping	310	0.10	0.43	0.00	3.50
Therapist Cognitive	300	0.75	1.00	0.00	4.00
Therapist Behavioral Extensiveness	306	2.69	0.79	0.00	4.50

(≤4 sessions resulted from unavailable sessions to code).

DESCRIPTIVES AND CORRELATIONS AMONG PROCESS VARIABLES AND ANXIETY

Descriptives for youth anxiety, interfering behavior (avoidance, escape, compulsions), coping behavior (cognitive, behavioral), and therapist interventions (cognitive, behavioral extensiveness) are summarized in Table 1. Most variables demonstrated a similar distribution pattern: a positive skew with low mean scores (Skewness range = −1.61 − 5.12), typical of low incident observational coding. Therapist extensiveness approximated a normal distribution.

Bivariate zero-order correlations are summarized in Table 2. Interfering behaviors (avoidance, escape, compulsions) were positively associated with anxiety, but coping (cognitive, behavioral) was not. Avoidance and escape were positively correlated with each other, but the effect size was small, suggesting these were not completely overlapping variables. Compulsions were positively related to escape, but were not correlated with avoidance, suggesting compulsions were more related to escape during exposures than to preexposure avoidance.

Regarding therapist factors, cognitive strategies were positively associated with youth cognitive coping, and to a lesser extent, with behavioral coping. Counter to expectations, therapist cognitive strategies were positively related to youth anxiety and escape. Therapist extensiveness was positively associated with youth cognitive coping, but not with behavioral coping. As expected, therapist extensiveness was strongly negatively associated with youth avoidance prior to engaging in exposure, but contrary to predictions, therapist extensiveness was positively associated with youth anxiety and compulsions.

MEDIATION STEP 1: CHANGE AS A FUNCTION OF TIME

GEE was used to analyze individual growth curves for youth anxiety across exposures both between and within sessions. Within-session slopes were estimated with exposure trial as the measure of time. Between-session intercepts and slopes were estimated by coding three dummy variables to allow for discontinuities in the starting point between the four sampled sessions. Two approaches were used to determine the initial time trend model: in the first, within-session slopes were allowed to vary across sessions; in the second, within-session slopes were set as equal (parallel slopes across sessions). A comparison of these two models produced nonsignificant differences in deviance (−2LL) at $p = 0.90$, and the variable slopes model produced nonsignificant slope coefficients. The equal slopes model was thus adopted as the basis for all subsequent analyses: $\text{Anxiety}_{ti} = \beta_{00} + \Sigma_j \beta_{1j}{}^*(\text{session}_j)_{ti} + \beta_2{}^*(\text{exposure})_{ti} + e_{ti}$. Anxiety ratings significantly declined by exposure trial, $b = -0.06$ (0.03), $z = -2.37$, $p < .01$, indicating significant anxiety reduction across exposures within sessions (Table 3). Between-session effects proved nonsignificant. Here, betas represented the difference in starting points for anxiety between each session and session 1. The nonsignificant betas suggested the

Table 2
Zero-Order Bivariate Correlations Among Child and Therapist Variables at the Exposure Level (N = 317 Exposures)

Variable	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1. Anxiety	0.69							
2. Avoidance	.17**	0.88						
3. Escape	.29**	.16**	0.77					
4. Compulsions	.28**	.03	.19**	0.78				
5. Cognitive Coping	.09	-.10	.04	-.01	0.73			
6. Behavioral Coping	.004	-.06	.00	.30**	.04	0.97		
7. Therapist Cognitive	.28**	-.06	.17**	.10	.66**	.13*	0.81	
8. Therapist Extensiveness	.13*	-.46**	.10	.13*	.17**	.10	.22**	0.80

Note. One-way random, average measure ICC (1, k) for double-coded items are presented on the diagonal.
* $p < .05$, ** $p < .01$.

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Table 3
Step 1: Mean Anxiety Trajectory (Unconditional Growth)

	b	Robust *SE*	Robust *z*
(Intercept)	1.21	0.11	11.25
Session 2	0.15	0.12	1.25
Session 3	0.15	0.10	1.51
Session 4	−0.07	0.10	−0.63
(Intercept plus all sessions)			
Exposure trial	−0.06	0.03	−2.37*

Note. * $p < .05$.

presence of rebound effects between sessions (anxiety started at relatively the same starting point across sessions). Figure 1 illustrates the mean anxiety trajectory, demonstrating significant anxiety reduction across exposures within sessions and rebound effects between sessions.

MEDIATION STEP 2: JOINT EFFECTS TEST TO EVALUATE MAGNITUDE OF INDIRECT EFFECTS

Results of Step 1 indicated anxiety declined over the course of treatment. We hypothesized that this relation of time to anxiety reduction was mediated by interfering behaviors (avoidance, escape, compulsions), coping behavior (cognitive, behavioral), and therapist interventions (cognitive, extensiveness). A joint effects approach (Mackinnon et al., 2002) was used to evaluate the joint significance/magnitude of the two effects reflecting the relations between time and hypothesized mediators (Fig. 2, path a) and mediators and outcomes (Fig. 2, path b). To estimate path a, three separate GEE were performed to predict

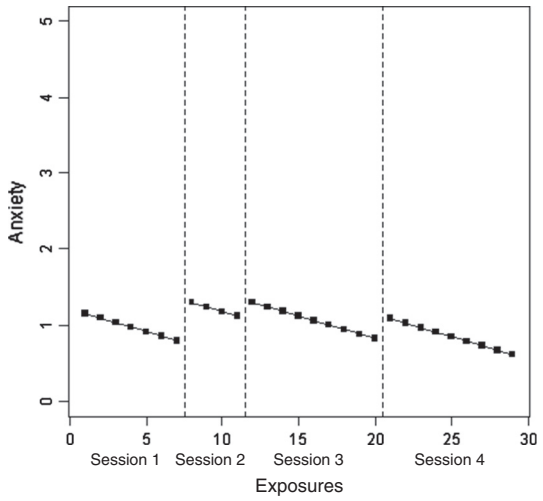

FIGURE 1 Time trend model of anxiety across exposure tasks and sessions. Sessions 1, 2, 3, 4 refer to the relative order of the four sampled sessions.

three groups of mediators (interfering behaviors, coping behavior, therapist interventions) from session number and exposure trial. Sex was also entered as time-invariant covariate. Table 4 summarizes results from these analyses. Exposure trial was significantly associated with reductions in youth-interfering behavior ($\alpha = -0.10$, $p = .09$), coping ($\alpha = -0.12$, $p < .001$), and therapist interventions ($\alpha = -0.16$, $p < .001$).

To estimate path b, a single GEE was performed where anxiety was the dependent variable, session number and exposure trial were entered as predictors, and the three groups of mediators were added simultaneously as time-varying covariates at Level 1 (TVCs; Singer & Willett, 2003). Youth sex was also added as a time-invariant covariate. Table 5 reports the outcome of this analysis. All three mediator groups significantly predicted anxiety after adjusting for time and sex: youth-interfering behavior ($\beta = 0.18$, $p < .001$), youth coping ($\beta = -0.15$, $p < .001$), and therapist interventions ($\beta = 0.22$, $p < .001$).

Table 6 summarizes the results of the joint significance test, using Sobel (1982) standard errors, and reporting the proportion (P_M) of each total effect that was accounted for by each mediator group (Shrout & Bolger, 2002). Youth-interfering behavior accounted for 30% of the variance between exposure trial and anxiety, but the joint effects test was only significant at the trend level ($z = -1.64$, $p < .10$). Youth coping and therapist interventions significantly mediated exposure trial and anxiety (within-session change), and therapist intervention accounted for 59% of the total effect (see Table note about interpreting P_M for youth coping). In addition, therapist interventions significantly mediated the total effect of between-session anxiety change.

MEDIATION STEP 3: DIRECTION OF RELATIONS BETWEEN MEDIATORS AND ANXIETY

Step 3 investigated the causal interplay between hypothesized mediators and anxiety. Cross-lagged panel designs help assess direct effects of one variable on another over time, examining both unidirectional and reciprocal relations (Burns et al., 2003; Smits et al., 2006). Figure 3 illustrates the design for the current study. Cross-lagged panel analysis (CLPA) involves comparing the relation between a predictor at one time (e.g., exposure 1; time "*t*") with the outcome at a subsequent time (e.g., exposure 2; time "*t + 1*"), represented by path c_1, with the relation between the outcome at *t* and predictor at *t + 1* (path c_2). This analysis adjusts for autocorrelations of the predictors (path a_1) and

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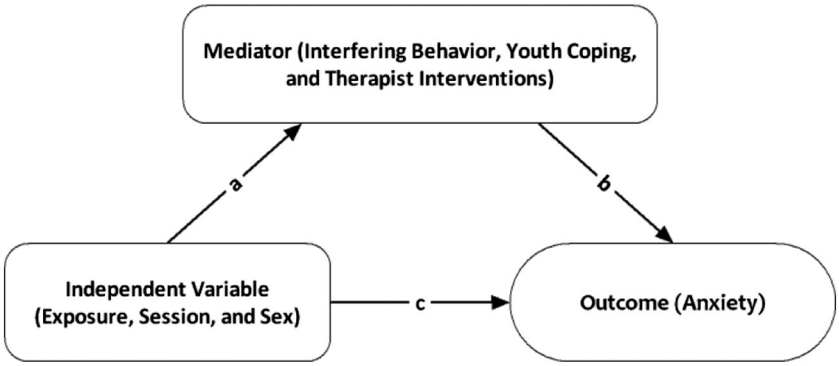

FIGURE 2 Conceptual model of mediated pathway between time and youth anxiety, reflecting the hypothesized roles of youth interfering behavior, youth coping, and therapist interventions.

outcomes (path a_2) between *t* and *t + 1*. It can also adjust for the synchronous correlation between the predictor and outcome at *t + 1* (path b_2). Auto- and synchronous correlations represent extraneous variance in this design. In total, CLPA examines direction of effects while adjusting for extraneous variance common in repeated measurement (Burns et al., 2003; Kenny, 1975).

Forward Lag

To assess the prospective relation between anxiety and each conceptual group of mediators: youth-interfering behaviors (avoidance, escape, compulsions), youth coping behaviors (cognitive, behavioral), and therapist interventions (cognitive, extensiveness), GEE was conducted using youth anxiety as the dependent variable, and anxiety, exposure trial, and the three mediator groups (interfering behavior, youth coping, therapist interventions) as the TVCs (predictors). Youth sex was also included. Table 7 reports the results of this analysis. Beta values reflect the relation between each mediator at *t* with anxiety at *t + 1* (Fig. 3, path c_1), controlling for the autocorrelation between anxiety at *t* and *t + 1* (path a_2) and the mediators at *t + 1* to adjust for the synchronous correlation between mediators and outcome at *t + 1* (path b_2). Of the mediators, only youth-interfering behaviors (avoidance, escape, compulsions) prospectively predicted anxiety significantly, $b = -0.09$, $SE = 0.03$, $z = -2.83$, $p < .001$. Greater youth interference predicted lower anxiety from one exposure to the next.

Reverse Lag

Three GEE analyses were conducted to determine if anxiety prospectively predicted each group of mediators. In each, anxiety at *t* (exposure x) was entered as the predictor and the mediator at *t + 1* (exposure x + 1) was entered as the dependent variable (Fig. 3, path c_2). Each analysis controlled for the autocorrelation between mediators at *t* and *t + 1* (path a_1) and the synchronous correlation between the mediator and outcome at *t + 1* (path b_2). Table 8 summarizes the results of the three reverse lag analyses. Anxiety at *t* prospectively predicted youth-interfering behavior at *t + 1*, $\beta = -0.61$, $p < .001$, and youth coping at the trend level, $\beta = 0.21$, $p = .07$. Anxiety at *t* did not prospectively predict therapist interventions, $\beta = 0.15$, $p = .37$. Greater anxiety in prior exposures predicted decreased youth-interfering behaviors in

Table 4
Path a: Summary of Three GEE Analyses Predicting Interfering Behavior, Youth Coping, or Therapist Interventions From Session, Exposure Trial, and Sex

	Interfering Behavior			Youth Coping			Therapist Interventions		
	α	*SE*	*p*	*α*	*SE*	*p*	*α*	*SE*	*p*
(Intercept)	1.65	0.28	0.00	0.88	0.11	0.00	4.28	0.19	0.00
Sex	0.17	0.31	0.59	−0.01	0.10	0.95	−0.33	0.18	0.07
Session 2	0.25	0.24	0.29	−0.28	0.12	0.02	−0.54	0.21	0.01
Session 3	−0.02	0.29	0.95	−0.18	0.13	0.16	−0.41	0.18	0.02
Session 4	−0.19	0.28	0.51	−0.14	0.13	0.29	−0.81	0.25	0.00
Exposure trial	−0.10	0.06	0.09	−0.12	0.02	0.00	−0.16	0.03	0.00

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Table 5
Path b: Prediction of Anxiety From Between-Session, Within-Session (Exposure Trials), and Hypothesized Mediators

	β	SE	z	p
Intercept	−0.02	0.17	−0.09	0.93
Sex	0.35	0.15	2.38	0.02
Session 2	0.14	0.11	1.22	0.22
Session 3	0.21	0.09	2.16	0.03
Session 4	0.26	0.09	2.84	0.00
Exposure Trial	−0.01	0.02	−0.62	0.54
Interfering Behavior	0.18	0.02	7.99	0.00
Youth Coping	−0.15	0.05	−2.86	0.00
Therapist Interventions	0.22	0.04	5.88	0.00

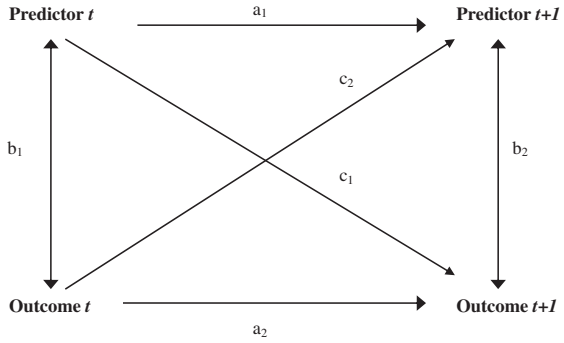

FIGURE 3 Cross-lagged panel design. a_1 = autocorrelation between predictor at time, "*t*" (exposure x), and "*t* + *1*" (exposure x + 1); a_2 = autocorrelation between outcome at *t* and *t* + *1*; b_1/b_2 = synchronous correlations between predictor and outcome at *t* and *t* + *1*, respectively; c_1/c_2 = cross-lagged correlations between predictor and outcome and outcome and predictor, respectively.

subsequent exposures (or less anxiety preceded greater interfering behaviors) and prior anxiety predicted greater subsequent youth coping.

Discussion

ERP has established treatment efficacy but research on its critical mediators and active "ingredients" is absent. The current study used observational coding and advanced methods to establish the specificity and temporal sequence of client coping and interfering behaviors and therapist interventions in relation to anxiety reduction. Results from correlation and mediation analysis suggest important mediating roles for youth coping, therapist interventions, and potentially youth-interfering behavior. Lag analysis provides novel findings on the specific direction and sequence of effects of mediators and anxiety change, particularly for youth-interfering behavior. Each level of analysis is discussed.

Bivariate correlations (where data were collapsed across participants, sessions, and exposures) produced several interesting relations. As expected, youth anxiety was positively related to avoidance, escape, and compulsive behaviors during exposures. As youth engaged in interfering behaviors, they demonstrated greater visible anxiety. However, use of cognitive or behavioral coping did not appear to ameliorate anxiety. Therapist cognitive strategies and exposure extensiveness were positively associated with youth anxiety, suggesting that increased therapist activity increased anxiety in the short-term. At the same time, therapist extensiveness was associated with reduced youth avoidance during exposures whereas cognitive strategies were related to increased youth escape. Was this contrary to expectations? Theories that focus on physiological habituation (Foa & Kozak, 1986) imply that desirable interventions promote continued gradual anxiety reduction within and across exposures. Theories that emphasize sustained

Table 6
Step 2: Joint Effects Test to Evaluate Magnitude of Mediation for Interfering Behavior, Youth Coping, and Therapist Interventions

	Interfering Behavior				Youth Coping				Therapist Interventions			
	α	β	Sobel z	P_M	α	β	Sobel z	P_M	α	β	Sobel z	P_M
(Intercept)	1.65				0.88				4.28			
Session 2	0.25	0.18	1.03	.30	−0.28	−0.15	1.84†	.28	−0.54	0.22	−2.33*	–
Session 3	−0.02	0.18	−0.07	–	−0.18	−0.15	1.26	.18	−0.41	0.22	−2.11*	–
Session 4	−0.19	0.18	−0.68	.49	−0.14	−0.15	1.01	–	−0.81	0.22	−2.78**	–
Exposure trial	−0.10	0.18	−1.64†	.30	−0.12	−0.15	2.68**	–	−0.16	0.22	−3.83***	.59

Note. All analyses adjusted for sex. The alphas in this table are the regression coefficients in which the mediator is the dependent variable and the predictors are the within- and between-session effects (Table 4). The betas are the regression coefficients in which anxiety is the dependent variable and the predictors are the mediators and within- and between-session effects (Table 5). P_M = (α * β) / (c^) [Shrout & Bolger, 2002]. P_M should be interpreted cautiously when $N < 500$ and can only be interpreted when there is no evidence of suppression effects or when the mediated effect (a*b) and direct effect (c') are the same sign. A hyphen (–) is denoted where mediated and direct effects had opposite signs or a suppression effect was detected.
† p < .10, * p < .05, ** p < .01, *** p < .001.

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Table 7
Mediation Step 3 (Forward Lag): [a] Youth Anxiety and Mediators at time t Predicting Youth Anxiety at t + 1

Variable at time *t*	Anxiety at *t + 1*			
	b	*SE*	*z*	*p*
Sex	0.12	0.10	1.14	0.26
Session 2	0.42	0.09	4.84	0.00
Session 3	0.14	0.14	0.97	0.33
Session 4	0.22	0.12	1.86	0.06
Exposure trial	0.18	0.13	1.38	0.17
Anxiety	0.03	0.02	1.46	0.14
Interfering Behavior	−0.08	0.03	−2.61	0.01
Youth Coping	0.05	0.05	0.98	0.33
Therapist Interventions	−0.02	0.05	−0.48	0.63

Note. [a] Forward lag: anxiety and mediators at *t* predicting anxiety at *t + 1*, controlling for the autocorrelation of mediators between *t* and *t + 1* and synchronous correlation between outcome and mediator at *t + 1* (path c_1, controlling for a_2 and b_2).

excitation in learning (Craske et al., 2008) favor interventions that prevent avoidance even at the expense of short-term anxiety. In the current study, when a therapist behaviorally "pushed" a youth to confront feared stimuli, greater short-term anxiety resulted, but youth avoidance was limited. Thus, compared to cognitive interventions, behavioral extensiveness may promote greater long-term gains because it resulted in maintaining youth focus on the exposure task at hand.

Multilevel mediation analysis accounts for dependencies within and across individuals and sessions that correlation analysis does not. In mediation step 1, mean anxiety trajectory was estimated across exposures and sessions. Analysis confirmed that anxiety decreased linearly across exposures and provided evidence for a rebound effect across sessions, consistent with Foa and Kozak (1986). Significant rebound effects suggest that observable anxiety did not change across sessions, counter to expectations. However, it would be yet another step to test if across-session anxiety predicts posttreatment functional outcomes. This pattern may also reflect the intentional intensification of exposures as a youth moves up the challenge hierarchy with each successive success.

Mediation step 2 demonstrated that all three groups of predictors (youth-interfering behavior, youth coping, therapist interventions) were significantly associated with anxiety levels across exposures (path b), but joint effects testing demonstrated that only youth coping and therapist interventions significantly mediated the relation between time (exposure trial) and anxiety. Youth-interfering behavior mediated only at the trend level. Therapist interventions also mediated anxiety change both across and within sessions, while the other mediators only mediated change within session (across exposures).

Youth and therapist factors mediated change in anxiety as expected. Youth cognitive (identifying and challenging anxious thoughts) and behavioral (relaxation, problem solving, adhering to contingencies, employing competing responses) coping was associated with lower anxiety accounted for a significant proportion of the relation between time and anxiety. Likewise, therapist interventions (cognitive restructuring, extensive exposures) were associated with higher anxiety scores, accounting for substantial proportions of within-session anxiety change ($P_M = 0.59$). Youth-interfering behavior (avoidance, escape, compulsions) was associated with higher scores in anxiety and accounted for a substantial proportion of the total effect between time and anxiety ($P_M = 0.30$), but the mediating effect was not statistically significant. Mediation analysis was consistent with earlier correlations and provides strong evidence that youth efforts to cope and therapist efforts to extensively use behavioral and cognitive interventions explain change in anxiety over time. These findings are generally consistent with the literature. Benito et al. (2012) found therapist encouragement of cognitive/coping strategies to be related to higher anxiety at midtreatment (even as such strategies did not predict posttreatment or follow-up outcomes), similar to our finding for therapist interventions. Hedtke et al. (2009) found safety behaviors to be associated with poorer posttreatment outcome, similar to our findings with youth-interfering behaviors. However, Hedtke et al. also found coping behaviors (including behavioral and cognitive coping) did not predict treatment

Table 8
Step 3 (Reverse Lag):[a] Youth Anxiety at time t Predicting Mediators at t + 1

	Interfering Behavior at *t + 1*				Youth Coping at *t + 1*				Therapist Interventions at *t + 1*			
	β	*SE*	*z*	*p*	*β*	*SE*	*z*	*p*	*β*	*SE*	*z*	*p*
Anxiety at *t*	−0.61	0.17	3.52	0.00	0.21	0.12	1.80	0.07	0.15	0.17	0.90	0.37

Note. [a]Reverse Lag: Anxiety at *t* predicting mediators at *t + 1*controlling for the autocorrelation of mediators at *t* and *t + 1* and the synchronous correlation between the mediator and outcome at *t + 1* (path c_2, controlling for path a_1 and b_2).

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outcome, whereas our results suggest they are associated with lower anxiety.

Also in step 2, therapist interventions were associated with increases in anxiety, contrary to expectations. Consistent with our interpretation of the bivariate correlations, therapist extensiveness could have contributed to increased youth anxiety by reducing avoidance. This was not directly tested in our analyses. Future research could examine if the relation between therapist interventions and anxiety are, in fact, mediated by other youth processes (avoidance, escape, coping). As it stands, cognitive and behavioral interventions appear to serve more general roles in mediating anxiety.

Cross-lagged panel analysis evaluates direction and sequence of effects whereas mediation analysis does not. Mediation step 3 revealed that only youth-interfering behaviors prospectively predicted later anxiety, and that youth anxiety prospectively predicted interfering behavior and youth coping in later exposures. Therapist interventions neither predicted later anxiety nor were predicted by earlier anxiety. Here, greater interference behaviors predicted less anxiety in subsequent exposures, and reduced anxiety predicted greater subsequent interference behaviors. This sequence makes sense from a negative reinforcement perspective, as a child experiences greater relief as s/he avoids or escapes distressing stimuli; and subsequently, a greater likelihood of interference behavior is expected to follow the decreased distress. Hedtke et al. (2009) also found a significant relation between safety behaviors and posttreatment outcome, but greater safety behaviors were associated with higher symptom score. One should be careful in comparing results across studies as each assessed different time frames. In the short term (exposure to exposure), escape appears an effective strategy in reducing anxiety. However, in the long-run (by posttreatment), continued escape may lead to poorer functioning and greater anxiety overall. Therapists would be wise to highlight this difference for clients, noting that an individual's immediate experience (i.e., "escape works") might be a poor indicator of longer-term success. Together, these studies highlight how safety behaviors, such as avoidance, escape, and compulsive rituals, might impact exposure success in the short and long term.

It is unclear why youth coping followed anxiety change, but coping did not predict subsequent anxiety. Greater anxiety prompted youth to employ more coping strategies, which is a desirable outcome. However, greater use of coping did not appear to have subsequent impact on anxiety. It should be noted that youth coping consisted of both cognitive and behavioral coping, which may have blurred distinctions. Further, behavioral coping included relaxation, which may serve avoidance functions in some circumstances (see Benito et al., 2012). Future research should examine the lagged sequence of specific coping strategies in response to, and in prediction of, anxiety.

Therapist interventions were nonsignificantly related to anxiety in CLPA. This could suggest that therapists may need training in proactive decision-making or trained to be responsive to important within-session client behaviors (Chu & Kendall, 2009). Alternatively, these findings may reflect desirable attempts on the part of the therapist to maintain high levels of anxiety across exposures. Consistent with the "desirable difficulties" model (Craske et al., 2008), therapists may see reductions in exposure anxiety as occasions to intensify the exposure to maintain optimal levels of excitation. Likewise, if a youth's anxiety is already at a high level, the therapist may hold exposure intensity constant. The better that therapists are at achieving this delicate balance between exposure intensity and optimal anxiety, the more we might expect beta coefficients around zero (reflecting neither positive nor negative relations), at least from exposure to exposure. This kind of dynamic moment-to-moment responding may also explain why therapist interventions was a significant mediator of session and exposure anxiety change but was not a significant predictor in lag analysis. Mediation analysis may be detecting the relative importance of therapist intervention, even as the direction of effect cannot be established.

The reader is cautioned against comparing the direction of effects across mediation analysis and CLPA. For example, step 2 mediation analysis indicated positive relations between interfering behavior and anxiety, but lagged analysis indicated negative relations between these two constructs in both forward and reverse lags. These apparent discrepancies are the result of different control variables used in the different models as well as the different dependent variables. In mediation analysis, anxiety at t is the dependent variable; in lagged analysis, anxiety (or mediator) at $t + 1$ is the dependent variable. Mediation analysis provides assessment of the direction of relations among variables at one time (within exposure), whereas lag analysis provides direction of effects across exposures.

The present study addresses important limitations of existing research and provides a methodologically rigorous test of ERP mediators. Multiple assessments of mediator and outcome are required to determine temporal precedence, but most mediator studies overrely on limited assessments (Kazdin & Nock, 2003). Studies also tend to employ simple aggregation strategies to summarize data (e.g., summing or

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averaging youth alliance over multiple sessions), obscuring results and producing inconsistencies across studies. Further, few studies assess more than a single mediator, failing to address the specificity of the mediator to the specific treatment effect (Smits et al., 2006). The current study assessed multiple youth and therapist mediators during a specific phase of ERP (exposures), resisted simple aggregation procedures, and conducted CLPA to determine temporal order of effects: all advances. Others have also suggested within-subjects designs may be more accurate than traditional between-subjects designs in estimating the magnitude of predictor-mediator-outcome relations (Smits et al.).

As any study, this investigation has limitations. Despite the established efficacy of ERP for youth OCD, the absence of a no-treatment control condition leaves open the possibility that changes in anxiety and mediators were impacted by external factors. Control conditions help isolate observed effects to factors specific to the experimental condition. Future research will want to fit growth models and conduct mediator analysis in comparison to no-treatment and active control conditions to determine more definitively if the specific relations identified here are specific to ERP, to treatment in general, or uncontrolled factors (time, cohort effects, nonspecific processes). This limitation does not mitigate the major conclusions. The observed mediating effects are not dependent on treatment as the cause of change (Smits et al., 2006). They explain how ERP results in change if ERP is a causative agent; if not, they provide an explanation of how change in youth coping (and interfering) behaviors relates to change in anxiety (and vice versa) over time.

A second limitation is the study's sole reliance on observational data to rate youth and therapist mediators and youth outcome. Observational data has been shown to be comparable, and in some cases superior to, self-report assessment approaches (Hedtke et al., 2009). Independent raters were not informed of the study's hypotheses, and it seems implausible that observer biases could account for both the forward and reverse lag analyses we conducted. Still, future research will benefit from incorporating multiple forms of assessment, including independent observer, client-report, and expert evaluation. The sample size is relatively small but is quite larger than prior observational coding studies of OCD youth (Benito et al., 2012 [N = 18]; Morgan et al., 2013 [N = 20]).

The study is the first to model individual growth trajectories in anxiety across exposures and sessions within youth ERP. The current study takes a comprehensive, rigorous approach to identifying the specificity and temporal sequence of hypothesized mediators in a multilevel structure. Clinically, findings provide guidance for which interventions (exposure extensiveness) may be most helpful in promoting change (sustained short-term anxiety) while minimizing interfering behaviors (avoidance). Therapists will want to educate clients about rebound effects in anxiety across sessions and that change may not occur in a straight descent. Therapists will also want to highlight how interfering behavior can be negatively reinforced, but that sustained exposure may aid longer term relief even if it contributes to short-term distress. Future research should link individual growth curves to long-term treatment outcomes and to determine how mediators affect both short- and long-term objective outcomes. Replicating these studies across a range of OCD and non-OCD samples can help identify specific and nonspecific mediators of change. Such research will help to provide experimental evidence for our hypothesized theories of change and recommendations for enhancing the efficacy of exposure-based treatment for youth.

Conflict of Interest Statement

The authors declare that there are no conflicts of interest.

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