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CBT Specific Process in Exposure-Based Treatments: Initial Examination in a Pediatric OCD Sample

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Abstract

Cognitive-Behavioral theory and empirical support suggest that optimal activation of fear is a critical component for successful exposure treatment. Using this theory, we developed coding methodology for measuring CBT-specific process during exposure. We piloted this methodology in a sample of young children ($N = 18$) who previously received CBT as part of a randomized controlled trial. Results supported the preliminary reliability and predictive validity of coding variables with 12 week and 3 month treatment outcome data, generally showing results consistent with CBT theory. However, given our limited and restricted sample, additional testing is warranted. Measurement of CBT-specific process using this methodology may have implications for understanding mechanism of change in exposure-based treatments and for improving dissemination efforts through identification of therapist behaviors associated with improved outcome.

Keywords

Children; OCD; Anxiety; Mechanism of Change; Process; Cognitive-Behavioral Therapy

1. Introduction

Pediatric Obsessive-Compulsive Disorder (OCD) has a prevalence rate of 2–3% (Douglass, Moffitt, Dar, McGee, & et.al., 1995; Rapoport & Inof-Germain, 2000) and is associated with significant impairment in social, academic, and familial functioning (Piacentini, Bergman, Keller, & McCracken, 2003). Left untreated, childhood OCD is often unremitting into adulthood and associated with significant and costly adult disability (Flament, Koby, Rapoport, Berg, & et.al., 1990; Thomsen & Mikkelsen, 1995). Although the core features of OCD are similar across the lifespan, OCD in childhood has unique characteristics in terms of developmental abilities (e.g., limited awareness or insight into cognitions, emotional state, or OCD symptoms), family context (e.g., reliance on parents for guidance, OCD-related family accommodation; (Storch et al., 2007), and OCD phenomenology (e.g., more scrupulosity and “not just right” compulsions,(Garcia et al., 2009)

Cognitive-Behavioral Therapy (CBT) with exposure and response prevention (E/RP) has been shown to be efficacious and is a first line treatment alone or in combination with

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selective serotonin reuptake inhibitor (SSRI) for pediatric OCD (POTS Study Team, 2004). Meta-analysis shows a large average effect size ($d = 1.45$) for CBT across treatment trials (Watson & Rees, 2008). Despite the demonstrated efficacy of combined treatment, concerns remain regarding adverse drug reactions, the use of medication in children under the age of 8, and the unclear impact of medication on exposure-based learning in CBT (Freeman et al., 2007), leading to increased interest in research aimed at improving outcome with CBT alone.

CBT for OCD contains several procedural ingredients, such as psychoeducation, hierarchy building, exposure and response prevention, cognitive strategies, reward programs, family/parent training, and relapse prevention (March & Mulle, 1998; Piacentini, Langley, & Roblek, 2007). Of these ingredients, exposure and response prevention is the procedure thought to be necessary and sufficient for therapeutic change to occur (Tyron, 2005). During this procedure, the individual is taught to approach fear-producing stimuli (exposure) while preventing fear-reducing behaviors, such as compulsions or other avoidance strategies (response prevention; (Himle & Franklin, 2009). Although the precise mechanisms by which exposure and response prevention lead to fear reduction have yet to be empirically confirmed (Tyron, 2005), CBT theory provides a framework for understanding the mechanisms that may be responsible for therapeutic change.

According to CBT theory, the “disorder mechanisms” responsible for the development and maintenance of anxiety and avoidance in OCD are based on Mowrer’s (Mowrer, 1960) two-stage theory. In this model, a conditioned stimulus (e.g., thought, image, object) is paired with an aversive unconditioned stimulus and thereby comes to elicit a conditioned response (e.g., fear, anxiety). Once the conditioned anxiety response is acquired, it serves as a discriminative stimulus that evokes avoidance or escape behaviors (i.e., compulsions), which in turn are negatively reinforced by the reduction of anxiety. In the case of pediatric OCD, a family member may engage in the escape behavior for the child by providing accommodation or reassurance, which also reduces anxiety and thus negatively reinforces both the child and the parent. Therefore, according to this model, the disorder mechanisms involved in OCD are respondent conditioning and negative reinforcement. Although more recent evidence suggests that anxiety may develop for reasons other than respondent conditioning (Menzies & Clarke, 1995), negative reinforcement is a key component of the CBT model of OCD maintenance and forms the foundation of the treatment rationale.

Exposure and response prevention (ERP) is thought to activate particular “treatment mechanisms” that disrupt disorder mechanisms. In this procedure, anxiety is elicited and escape/avoidance behaviors are prevented, thereby activating the treatment mechanisms of habituation and extinction. Habituation refers to decrement of the anxiety response due to sustained contact (within session or trial habituation) and repeated presentation (between-session or trial habituation) of the anxiety-eliciting stimulus (Groves & Thompson, 1970). Thus, the uninterrupted experience of optimal anxious arousal, activated by the procedure of exposure and response prevention, leads to anxiety reduction via the mechanism of habituation. In addition to reducing the anxiety response, habituation within and across trials is also thought to promote the emotional processing of fear by providing the individual with direct, corrective information that disconfirms obsessional fears (Foa & Kozak, 1986). The ERP procedure also activates the mechanism of extinction: by preventing anxiety reducing behavior in the presence of the anxiety response (i.e., the discriminative stimulus), anxiety-reducing behaviors cannot be negatively reinforced. Over time, this reduces the frequency of compulsions/avoidance and alters the function of the anxiety response, such that the discriminative stimulus becomes an extinction stimulus that no longer evokes anxiety-reducing behavior.

Therefore, according to CBT theory, anxious arousal plays a key role in exposure efficacy: an optimal increase in anxiety must occur for therapeutic mechanisms to be activated (Foa & Kozak, 1986). Research examining anxious arousal during exposure therapy supports this notion. For example, Kozak, Foa, and Steketee (1988) examined anxious arousal, within session habituation, and across session habituation during exposure therapy in 14 adults with OCD. Results confirmed that all three processes occurred. Importantly, greater intensity of anxious arousal during exposure and greater habituation across sessions predicated better post-treatment ratings of obsessional fear. In a study of exposure therapy for adult females with PTSD, Foa, Riggs, Massie, and Yarczower ((Foa, Riggs, Massie, & Yarczower, 1995) found that those who displayed more intense facial fear expressions during the first exposure benefited more from treatment than those with less intense fear expressions. However, it is important to note that extreme levels of arousal can obstruct habituation (Foa et al., 1983) and impede the child or parent's ability to refrain from engaging in avoidance or compulsive behavior. Therefore, exposures that elicit a moderate level of anxiety are thought to maximize within-session fear reduction and treatment tolerability, as well as reduce the likelihood of treatment dropout (Norton, Hayes-Skelton, & Klenck, 2011).

Given the importance of anxious arousal in CBT for OCD, it is likely that CBT-specific process variables that influence the amount of anxiety experienced by the child during exposures also influence treatment outcome. Specifically, by "CBT-specific process variables" we are referring to child, parent, or therapist behaviors that may have a functional impact (i.e., increase or decrease) on anxiety during exposure procedures. Indeed, research suggests that processes that function to reduce anxiety are counterproductive, most likely because they prevent activation of treatment mechanisms (Clark, 1999; Himle & Franklin, 2009; Salkovskis, 1996). For example, studies of exposure process in adults with OCD or other anxiety suggest that several anxiety reduction strategies can be detrimental to outcome, such as overt or covert compulsions, behavioral or cognitive avoidance, thought-suppression, distraction, and availability or utilization of a safety aid (Parrish, Radomsky, & Dugas, 2008). Research on family accommodation in pediatric OCD suggests that families who continue to provide accommodation during the course of CBT may be less likely to be treatment responders (Merlo, Lehmkuhl, Geffken, & Storch, 2009). In contrast, anxiety promoting or increasing processes during exposure are thought to be beneficial in achieving optimal activation, such as exposure content that involves contacting or directing focus to feared stimuli (Craske, Street, Jayaraman, & Barlow, 1991; Foa, Steketee, Turner, & Fischer, 1980; Grayson, Foa, & Steketee, 1982).

Despite this evidence that CBT-specific process variables do impact exposure benefit, manualized protocols for CBT with pediatric OCD provide very little guidance as to precisely *how* to achieve and maintain an appropriate level of anxiety during an exposure. For example, protocols vary in terms of the types of tools therapists are directed to use, such as those that encourage (March & Mulle, 1998; Piacentini et al., 2007) versus discourage (Freeman & Garcia, 2008) the use of cognitive strategies during exposures. As such, little is known about what therapists do or say to achieve optimal activation during exposures (therapist CBT-specific process variables). Furthermore, the role of patient behaviors in facilitating or diminishing exposure benefit is also unclear; although anxiety reducing strategies are thought to be counter-productive, little is known about patient and parent behaviors associated with "success" (child and parent CBT-specific process variables) and how therapist, patient, and parent behaviors interact during an exposure trial.

Systematic examination of CBT-specific process variables during exposures may help us identify processes that are most closely associated with therapeutic change. By identifying this relationship, we may come to better understand the mechanism of change in exposure therapy (e.g., confirm or modify existing CBT theory). Furthermore, by focusing on

treatment processes and procedures that most effectively activate the mechanism of change, we may be able to increase potency and simplify CBT for pediatric OCD (Kazdin, 2009). Finally, without explicit examination of CBT-specific process, theoretically-based therapist behavior that likely underlies successful treatment of CBT for OCD may remain "in the heads" of treatment experts and unable to be disseminated to other therapists.

An important first step in understanding mechanism of change during CBT for pediatric OCD is the development of methodology to systematically examine CBT-specific processes during exposures. Although researchers have examined patient-level predictors and moderators of treatment outcome in an effort to understand differential response to treatment (e.g., alliance, (Keeley, Geffken, Ricketts, McNamara, & Storch, 2011) we have been largely unable to study CBT-specific process questions due to lack of appropriate methods.

The current study sought to examine CBT-specific processes that relate to the efficacy of exposure in CBT for pediatric OCD. Given that no previous research has examined process variables in this way, we developed and piloted coding methodology designed to capture observable therapist, child, and parent behaviors. The primary aim of the current study was to develop the coding methodology guided by CBT theory regarding optimal anxiety arousal, and to pilot initial reliability and predictive validity using a sample of children who completed exposures as part of a study examining efficacy of CBT for pediatric OCD.

2. Material and Methods

2.1. Initial development of coding methodology

Authors one, three, and four drafted initial coding items and behavioral descriptions based on cognitive behavioral theory and on clinical expertise. CBT theory suggests that optimal activation of anxiety during an exposure is important for successful outcome (Foa & Kozak, 1986), so authors rationally derived items based on expertise with common therapist, parent, and child behaviors in session that might raise or lower anxiety. Additional items were derived to reflect use of cognitive tools commonly seen in practice, indicated in the manual, or theorized to facilitate learning. Following draft of initial items, the coding variables, using Noldus Observer (*Noldus, The Observer XT*, 2009) software, was piloted in a sample of two children (four sessions) receiving treatment using the manual described below (XXXX) for feasibility and clarity. Items were subsequently revised, particularly for distinctness of coding variables and addition of new coding variables as necessary. This revision yielded the specific coding variables and methods detailed below.

2.2.Coding Methodology Pilot Study

2.2.1 Participants and Original Trial

Participants: were 18 children (N = 10 female), age 4–8 (M = 6.74, SD = 1.25) who previously received CBT as part of a pilot study comparing CBT to relaxation therapy (XXXX). They were primarily Caucasian (77.8%), 5.6% Asian, and 16.7% declining to report race. Parents of these children were primarily educated (66.7% having a college degree or higher; 33.3% with some college or less) and married and living together (89.5%; with 10.5% divorced). Mean baseline CY-BOCS indicated moderate OCD severity (M = 23.0, SD = 4.3). In this sample, 65.2% of children had another internalizing disorder secondary to OCD and 47.8% had an externalizing disorder secondary to OCD. Tics were present in 17.4% of children. Specific comorbidities included Attention Deficit/ Hyperactivity Disorder (n = 4), Generalized Anxiety Disorder (n = 3), Oppositional Defiant Disorder (n = 1), and Separation Anxiety Disorder (n = 3).

Inclusion criteria for the present study were: 1) availability of at least one exposure session that was visible on tape, and 2) randomized to CBT. Of 23 children receiving CBT in the original trial, three were excluded from the present study because they dropped from treatment before receiving exposure and two were excluded because they did not have any exposures on tape. Examination of therapist notes for sessions in which exposures were not on tape revealed that in 71% of cases, exposures were performed out-of-office. In other cases, exposures were not performed due to child resistance/distress (8%), therapist choice to focus on other skills (10%), or difficulty designing an exposure due to nature of symptoms (11%).

Original Trial: Participants were originally part of a randomized pilot study comparing CBT to relaxation therapy. All original participants consented to collection and analysis of videotape data. Original inclusion and exclusion criteria were typical of randomized controlled trials and included requirement of primary diagnosis of OCD, stable or no psychological medications, and exclusion of children with another diagnosis considered primary or likely to interfere with treatment (e.g., Autism). Please see Freeman et al. (2008) for complete details. The CBT treatment protocol used in this trial (XXXXX) contains 12 sessions (two 90-minute and 10 60-minute sessions) and exposure tasks are designed to occur in sessions four through 11. Nine different therapists provided CBT treatment in this study.

2.2.1 Coders and Coder Training—Coders were two therapists (first and second authors) who had extensive experience in the use of manual-based CBT for pediatric OCD (combined 10 years experience) and had previously been trained in the use of the CBT manual being used in the current study. During the coding phase of this project, coders were blind to patient data other than that observed on tapes (e.g., blind to baseline or outcome data) and did not serve any role on the original trial in which these participants were enrolled. Coder training consisted of guided manual reading, observation of the primary coder (first author) during two coding cases, practice coding of two non-study cases, and weekly meetings for review and discussion of coding practices.

2.2.1. Coding Description and procedures

Overview of Coding Variables: The final coding variables were designed to characterize the behaviors and statements of the therapist, child, and parent(s) during an exposure. Coding variables were designed to be marked using Noldus Observer software, allowing their occurrence to be documented as they occur in time. Events may be either a behavior, which was coded for its duration, or a statement, which was coded for its frequency (each occurrence of the statement). In general, coding variables were defined according to hypothesized function of the behavior or statement on the child's anxiety (i.e. as increasing or decreasing anxiety) during an exposure. Though these events very likely occur at other times during a therapy session (e.g., encouraging cognitive statements, discouraging accommodation, teaching talk), they are thought to have unique functions in the presence of an exposure stimulus. For example, therapists using teaching talk prior to an exposure may facilitate later approach behavior, but use of teaching talk during an exposure may serve as distraction from the exposure stimulus. Given ample evidence that exposure is likely a critical element of CBT (e.g., (Olatunji, Cisler, & Deacon, 2010), we are most interested in the function of events during exposure. Table 1 provides an overview of all coding variables, including their hypothesized effect on anxiety level.

The coding manual contains specific observational descriptions, definitions, and examples for each coding variable, as well as guidelines for differentiating coding variables. Coding variables were not designed to be mutually exclusive, that is, some statements containing

elements of two coding variables may be coded twice (e.g., the statement "OCD wants me to stop touching the dirty toilet" is both an externalizing statement and an avoidance statement; see Table 1). The intended purpose of coding such statements twice is to examine dual functions independently. The coding variables are not exhaustive, that is, not every observed behavior or statement type has a corresponding coding variable. The intended purpose of this is to reduce burden in the use of this coding methodology and the ostensible need to only measure functionally relevant behaviors/statements. Finally, if coders are unsure whether a statement or behavior is best categorized as one coding variable vs. another, the manual contains a series of priority rules to prevent over-coding.

Coding Procedure: For the present study, we examined videotape data from the earliest two exposure sessions (sessions 4 and 5 per protocol) that were visible on tape. We chose to examine the earliest exposure sessions to maximize therapist level of involvement in the session and because early exposure sessions represent initial learning opportunities. Due to practical constraints (see *Participants*, above), we were unable to code an exposure in sessions 4 and 5 as planned for all children. Therefore, for most children, the first coded exposure session was either 4 or 5 ($M = 4.78$, $SD = 1.21$) and the second coded exposure session was around session 6 ($M = 6.05$, $SD = 1.02$).

To code videotaped data, tapes were digitized and synched with coding software using Noldus Observer (*Noldus, The Observer XT*, 2009). Only events that occurred during the actual exposure task were coded, as these coding variables were designed to capture events that happen during exposure. The beginning of the exposure task during a session was marked as the first presentation of the exposure stimulus, and the end was marked as either 1) withdrawal of the exposure stimulus with failure to re-present it for the remainder of the session or 2) therapist statement that the exposure is over.

2.2.2. Measures—The coding variables were measured in the present sample at the first two available exposure sessions. Per protocol, these occurred in sessions 4 and 5 but were only available later for some participants for practical reasons (e.g., out of office exposure). Mean first observed exposure session = 4.78 ($SD = 1.21$), Mean second observed session = 6.05 ($SD = 1.02$). All other measures were administered by independent evaluators blind to treatment condition as part of the original treatment trial (XXXX) and are outlined below. All trial measures were completed at baseline, mid-treatment (6 weeks), acute outcome (12 weeks), and follow-up (3 months), with the exception of the K-SADS, which was administered at baseline only.

Kiddie Schedule for Affective Disorders and Schizophrenia for School Age Children (K-SADS: (Chambers & et al., 1985; Kaufman, Birmaher, Brent, Rao, & et al., 1997) was used to assess primary and comorbid diagnoses, and is a semi-structured, clinician-rated interview administered to the caregiver(s) and the child that yields DSMIV diagnoses across the major Axis I domains and possesses favorable psychometric properties.

Children's Yale-Brown Obsessive Compulsive Scale (CY-BOCS) (Scahill et al., 1997): is the gold-standard, 10 item semi-structured clinician rated interview and was used for OCD diagnosis (Y-BOCS, Goodman, Price, Rasmussen, Mazure, Delgado et al., 1989; Goodman, Price, Rasmussen, Mazure, Fleischmann et al., 1989)

Clinical Global Improvement (CGI) (Guy, 1976): The CGI is used to assess overall clinical improvement based on symptoms and impairment (7 point scale). The 7- point clinician rated scale has been used successfully in patients with OCD (Garvey et al., 1999; Perlmutter et al., 1999).

NIMH Global Rating Scales (Murphy et al., 1982; (Insel et al., 1983): These are clinician rated indices of illness severity. Each scale is a single-item composite rating ranging from 1 (normal) to 15 (very severe) with good inter-rater reliability. The NIMH Global Impairment, Depression, Anxiety, and OCD scales have been used in multiple treatment studies.

2.3. Analytic Plan

Reliability was examined between coders for all coding variables using Cohen's Kappa. Frequencies and descriptive data were examined for each coding variable. Although other measures of CBT-specific process during exposure are not available for comparison due to novelty of the construct, we examined the predictive validity of coding variables with treatment outcome at mid-treatment, post-treatment, and follow-up. Previous data suggests the negative effects of events that lower child anxiety (e.g., accommodation, rituals; (Storch et al., 2007; Storch et al., 2010) and some data suggests the importance of fear activation to outcome (e.g., (Foa et al., 1995; Foa & Kozak, 1986; Kozak, Foa, & Steketee, 1988). Therefore, we expected a positive relationship of coding variables hypothesized to increase anxiety with outcome, relative to coding variables hypothesized to decrease anxiety. We examined relationships among individual coding variables and treatment data using Pearson correlation when treatment data were continuous and using t-test or ANOVA when treatment data were categorical. Given the number of analyses conducted, we used a conservative alpha of .01 to avoid type I error. However, given the small sample size and exploratory nature of this study, we elected to avoid a more conservative correction (e.g., Bonferroni) to avoid Type II error.

Unless otherwise indicated, coding variables are presented as an average across the two sessions coded. The two sessions were not significantly different for frequency or duration of any coding variable. Additionally, although descriptive and distribution data are presented in original frequency and duration format, analyses between coding data and treatment data use coding variables calculated as "rate per minute" (frequency coding variables) or "percent of exposure" (duration coding variables) to control for overall length of exposure. These analyses also excluded one coding variable with low frequency and reliability in this sample (therapists discouraging parent accommodation). Finally, several coding variables evidenced significant departure from normality and were transformed (log10) prior to analysis to improve skewness or kurtosis (see Frequency and Distribution of coding variables, below).

3. Results

3.1. Inter-Rater Reliability

Inter-rater reliability was calculated for 28% of the sample (5 cases; 10 sessions) using Cohen's Kappa. Because all items were time-stamped, coders were considered in agreement when items were assigned the same coding variable and occurred within 2 seconds. Results indicated adequate to good inter-rater reliability across coding variables (K = .54–.87; Table 3), with the exception of Address Accommodation (K = .00). Inter-rater reliability of this coding variable was likely reduced due to the very low frequency (twice) with which it was observed in these 10 sessions.

3.2. Frequency and Distribution of Coding Variables

Table 3 presents means, standard deviations, and distribution data for each coding variable by relevant participant (i.e. therapist, parent, or child). Note that data are across participants and across sessions, thus reflecting means for two sessions. Data show that average length of exposures across two sessions was 12.17 min (SD = 5.82; M per session = 6.09), ranging from 2.73 to 28.88 min across two sessions. Most frequently observed coding variables

across sessions included therapists discouraging avoidance (M = 11.50, SD = 7.19), therapist use of externalizing talk (M = 9.56, SD = 9.28), and child avoidance statements (M = 7.94, SD = 8.23). The least frequent coding variables included therapists addressing accommodation (M = 0.44, SD = 1.04) and child verbalization of cognitive strategy (M = 0.83, SD = 1.47). Regarding duration coding variables, children spent an average of 40.18% of exposure time engaging in avoidance (M = 4.89, SD = 5.46). Therapists (M = .06, SD = .25) and parents (M = .54, SD = 1.04) engaged in relatively little accommodation behavior. Examination of skewness and kurtosis statistics indicates one positively skewed and eight positively kurtotic coding variables, revealing a significant departure from normality for eight of 18 coding variables. Therefore, further analysis utilizes coding variables that have been log transformed for normality.

Correlations among coding variables reveal a significant positive relationship between parent externalizing talk with therapists addressing accommodation (r = .98, p < .01), parents discouraging avoidance (r = .94, p < .01), and therapists discouraging avoidance (r = .69, p < .01). There was a significant positive relationship between percentage of time children spent avoiding with parent use of unrelated talk (r = .66, p < .01). Finally, parents discouraging avoidance was positively related to therapists discouraging avoidance (r = .72, p < .01) and to therapists addressing accommodation (r = .90, p < .01). No other relationships among variables were significant at the p < .01 level.[1]3.3. Relationships with patient characteristics and baseline variables

Percent of time children spent avoiding was significantly related to age such that younger children spent more time avoiding (r = −.71, p <.01). There were no other significant relationships among coding data and baseline data, including measures of OCD symptoms, comorbidity, family variables (e.g., income, one vs. two parent household), or child variables (e.g., gender, age of onset).

3.3. Relationships with outcome variables

Mid-treatment (6 week) data—At week 6, therapists encouraging use of cognitive/coping strategies was related to higher anxiety (NIMH Anxiety Scale, r = .60, p < .01) and parent use of accommodation statements was negatively related to global symptom improvement (CGI, r = −.52, p < .01). No other observed behavior, including length of exposures, was related to treatment data at this time point.

Post-treatment (12 week) data—At week 12, parent use of externalizing statements was negatively related to OCD symptoms (NIMH OCD, r = −.60, p < .01) and to global functioning (NIMH global scale, r = −.55, p < .01). Therapist use of unrelated talk was positively related to anxiety symptoms (NIMH Anxiety, r = .59, p <.01) and depression symptoms (NIMH depression, r = .57, p < .01). Both parents (r = −.63, p < 01) and therapists (r = −.64, p < .01) discouraging avoidance was negatively related to anxiety symptoms (NIMH Anxiety). Families dropping from treatment before 12 weeks had a significantly higher percentage of child avoidance behavior observed during exposures (M = .91, SD = .06) compared with treatment completers (M = .36, SD = .62), $t_{\text{unequal variance}}$ (15.98) = −.3.39, p < .01. Length of exposures was unrelated to post-treatment outcome data.

Follow-up (3 month) data—The following three-month follow-up data represent a limited sample of families (N = 10), with 8 families lost to follow-up. In this sample, therapists discouraging avoidance was related to reduced OCD symptoms (Δ CY-BOCS, r

[1]Full correlation table is available from the first author upon request

= .73; NIMH OCD, $r = -.83$, $ps < .01$) and reduced anxiety (NIMH Anxiety, $r = -.91$, $p < .01$). Parents discouraging avoidance was also related to reduced OCD symptoms (Δ CY-BOCS, $r = .84$; NIMH OCD, $r = -.84$, $ps < .01$). Therapist use of exposure comments was related to reduced anxiety (NIMH Anxiety, $r = -.75$, $p < .01$). Length of exposures was unrelated to any follow-up outcomes.

4. Discussion

These results demonstrate the feasibility, reliability, and preliminary validity of a process coding methodology for use during exposures. In particular, coders were able to reliably code the majority of statements and behaviors from parents, therapists, and children. The notable exception was when therapists discourage parents from providing accommodation, which occurred with limited frequency such that coder reliability was also limited.

Descriptive data show variation in the length of exposures (from two to 28 minutes) and that the average exposure was relatively short at about 6 minutes per session. Overall, the most commonly observed events during exposures were therapists discouraging child avoidance, therapists using externalizing talk, and children engaging in avoidance behavior, with children spending around 40% of exposure time engaging in behavioral avoidance. Our data suggested that the amount of time spent avoiding was related to age, with younger children avoiding more. Though this finding may be related to the young age of our sample (e.g., behavioral rather than verbal or cognitive avoidance is most common in young children) it may have implications for therapist and parent skills needed to address this behavior. This idea is supported by the high frequency of therapist statements discouraging child avoidance, which indicates that therapists used this skill frequently in this sample. The least common events during exposure included children using verbal cognitive strategies, therapists addressing parent accommodation of child anxiety, and either therapists or parents engaging in accommodation behavior. While use of cognitive strategy may have been limited by child age (e.g., stronger emphasis on behavioral technique with younger children), observation of some events may have been limited by the frequency of other events (e.g., therapists did not discourage parent accommodation because parents did not engage in it).

In general, our results showed limited correlations among coding variables. Although we did not hypothesize specific correlations among coding variables, we would expect some to be correlated given the general model used in CBT treatments for children. For example, a technique used by a therapist should be related to the same technique being used by a parent if, as in the manual used in the present treatment, the therapist uses principles of modeling or scaffolding to transfer skills to the parent. Our data partially support the idea of skill transfer, with therapists discouraging avoidance being related to parents discouraging avoidance. However, our data are likely limited by use of videotapes from early exposures, in which parents may have not completed sufficient transfer of learning from therapists. This idea is further supported by overall low parent coding variable frequencies, suggesting that parents in these sessions were not as active as therapists or children. Though we observe greater parent involvement in subsequent sessions as a clinical phenomenon, further examination of data in later sessions is warranted to explore this relationship. Additionally, we may not have observed many correlations among therapist coding variables due to the relatively short length of exposures, which may have suppressed the opportunity for one individual to engage in a variety of behaviors and therefore the relationship among coding variables. Exploration of the relationship among coding variables across treatment may further elucidate these relationships, as we would expect CBT consistent coding variables to be positively related to one another.

Coding data were unrelated to baseline treatment data, including symptom severity or other known predictors of attenuated treatment outcome. This finding is surprising, given the hypothesized relationship of coding data to outcome and clinical experience suggesting that some baseline characteristics make CBT more difficult. However, given that predictors are defined as variables having an effect on outcome in multiple types of treatment (e.g. psychotherapy, medication; (Garcia et al., 2010), the mechanism through which predictors have an effect on outcome is unknown. The current coding variables are meant to measure only one aspect of therapeutic process (i.e. CBT-specific), which is a unique process that may or may not be related to the process through which predictors have an effect on outcome. Though our data are preliminary and should be replicated in a larger sample, this finding may have implications for clinicians. For example, patients with increased symptom severity at baseline are sometimes judged too ill to benefit from CBT. However, our findings suggest that all patients engage in a similar process during exposures, regardless of severity.

Examination of treatment outcome data shows the most consistent relationships with therapists and parents discouraging distraction and outcome. Specifically, discouraging distraction was related to improved outcome on the NIMH Anxiety Scale at post-treatment and on the NIMH Anxiety Scale, NIMH OCD Scale, and CY-BOCS at 3- month follow-up. Additionally, therapist use of exposure comments, designed to increase a child's anxiety, was related to improved outcome on the NIMH Anxiety Scale at 3- month follow-up. These results are consistent with CBT theory, which suggests that activating fear should be related to improved outcome. The finding that some coding variables relate to broad anxiety symptoms following treatment may relate to generalization of treatment gains to other anxiety symptoms. At mid-treatment, which was concurrent in time with coding data, therapists encouraging children to use cognitive or coping statements and parent use of accommodation statements were related to reduced global improvement. Though both of these coding variables may indicate events that lower anxiety during an exposure (see Table 1) and could therefore be related to attenuated outcome according to CBT theory (e.g., Parrish, Radomsky, & Dugas, 2008), it is probable that reduced global improvement preceded or co-occurred with coding variables at this time point (see Table 2). This would indicate that the therapist and parent are using accommodation and cognitive tools in response to the child's current level of functioning. Finally, examination of children completing treatment showed that children who did not complete treatment were more likely to show a high percentage of avoidance behavior, with those who dropped spending an average of 91% of exposure time engaged in avoidance compared with 36% for those who completed treatment. Though this finding should be interpreted with caution as the present study includes a small sample, a smaller portion of which dropped from treatment, it has potentially important implications for predicting and preventing early termination. While avoidance behavior in exposures may be a marker for another construct (e.g., inability to tolerate anxiety), it may indicate the need for altering the therapeutic plan for these children (e.g., easier initial exposures, concurrent medication).

We should note several limitations of the current study. First, our sample size is limited, which reduces the ability to find relationships in our data as well as limiting the generalizability of results. Nonetheless, our data show numerous relationships in the hypothesized direction and generally support the reliability and validity of our coding methodology. Second, we used a sample of young children (age 4–8), which may not generalize to older children. However, we anticipate that the general principles guiding CBT and upon which our coding variables are based (i.e. events that increase or decrease anxiety) will remain stable across ages while the relative contribution of parents, therapists, and children may change. In the present study, we desired a younger sample in which parent participation would be consistent enough to measure accurately. Additionally, practical

limitations (i.e. time and financial resources) of the current study constrained the number of sessions for coding. Events occurring in early exposures may not be representative of all exposure sessions, and the distance in time between coding sessions and outcome may have limited findings. However, we selected these sessions to maximize therapist involvement and ability to measure initial learning experiences, and we were able to characterize relationships with outcome at 12 weeks and 3 months. Additionally, although this methodology originally intended to capture verbal reports of subjective anxiety during exposure as a measure of habituation, we were unable to do so given the age range of the sample. Specifically, alternate scales of subjective anxiety (e.g., faces, shapes) were used during sessions and did not correspond to numeric translation. To correct this issue, future use of this method will include an observed measure of anxiety sampled once per minute during exposures. Measurement of anxiety level in this way will facilitate direct test of the relationship between anxiety level and outcome, including the function of the relationship (i.e. linear or curvilinear). Finally, although we anticipate that this and similar methodology will greatly inform detailed and systematic study of CBT-specific process during exposure, the current methodology is unlikely to be of use in clinical settings given the time-intensive nature of observational coding.

Future use of this coding methodology will focus on continued testing of psychometric properties in additional OCD and other anxiety populations with expanded age ranges. Additionally, though the current study focused on establishing initial reliability and validity, use of video synching software (i.e. Noldus Observer) in larger samples will allow exploration of CBT-specific process variables as they occur in time both across and within sessions. For example, therapist contingent use of skills may be more important than overall use of skills. Measuring child or parent behaviors/statements occurring immediately before therapist behaviors/statements will inform our understanding of therapist response to in-session events. Use of this coding methodology along with weekly measures of other constructs (e.g., cognition) in efficacy and effectiveness studies may also allow detailed, theory-based investigation of mechanism of change in exposure treatments. Additionally, given the burdensome nature of this methodology for use in clinical settings, future studies should investigate which coding variables are most useful and aim to develop a practical measure of these variables in those settings (e.g., self- or supervisor-report). Overall, measuring CBT-specific process in efficacious interventions, particularly therapist actions, will inform training and dissemination efforts and has the potential to optimize effectiveness of interventions in community settings.

Overall, results of the present study show that this method for measuring theory-specific process in exposure-based treatments is feasible for use, reliable, and has preliminary predictive validity with treatment data. In particular, results are theoretically consistent in that behaviors and statements that activate anxiety are related to improved outcome. Ability to measure CBT-specific process during exposure has implications for understanding mechanism of change in exposure-based treatments, as well as for training therapists in the most effective implementation of treatment manuals and dissemination of exposure-based treatments.

Highlights

- We study CBT-specific process based on theoretical need for fear activation
- We test this methodology in a sample of young children (N = 18)
- Results support initial reliability and predictive validity
- Future efforts should test CBT-specific process in an expanded sample

- Use of this methodology will benefit mechanism and dissemination research

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Table 1

Coding variables: names and definitions.

Coding Variable	Definition	Example		Hypothesized Effect on Anxiety During Exposure
Therapist				
Address Accommodation	Therapist verbally discourages parents from activities that lower child anxiety level	**1**	"This time I want you to look at the picture without your mom's help."	Increase
		2	"It's important for you to stand next to this spot on the wall without holding your mom's hand."	
Encourage Cognitive Strategy	Therapist prompts child to use anxiety-lowering cognitive strategy	**1**	"What can you say to OCD right now?"	Decrease
		2	"What are the chances that you'll really get cancer from this?"	
Therapist or Parent				
Accommodation Statement	Therapist or Parent make a statement to lower child's anxiety level, such as reassurance	**1**	"I eat this all the time and nothing bad has happened to me."	Decrease
		2	"You'll be ok."	
Discourage Avoidance	Therapist or parent discourage child from decreased mental or actual avoidance of exposure stimulus	**1**	"I noticed you're wiping your hands on your pants."	Increase
		2	"Keep looking at the sink."	
Unrelated Talk	Therapist or Parent engage in conversation/instructions unrelated to exposure task	**1**	"Don't talk that way"	Decrease
		2	"What are you going to choose for a reward today?"	
Exposure Comments	Therapist or Parent make a statement that may increase child's anxiety	**1**	"Maybe something bad *will* happen to your brother."	Increase
		2	"Wow…that was really dirty. I can't believe you touched that."	
Accommodation Behavior	Therapist or Parent engage in behavior that may lower the child's anxiety level, such as helping with avoidance	**1**	Taking child to bathroom	Decrease
		2	Holding child in lap	
Therapist, Parent, or Child				
Externalizing Talk	Therapist, Parent, or Child refer to anxiety as separate from the child	**1**	"Now you're really in charge of OCD!"	Increase (through motivation to approach exposure stimulus)
		2	"Throwing those papers away is really going to show OCD who's boss!"	
Child				
Cognitive Strategy	Child verbalizes the use of cognitive strategy to lower anxiety	**1**	"I know I won't actually hurt anyone because I've never done it before."	Decrease

Coding Variable	Definition	Example		Hypothesized Effect on Anxiety During Exposure
		2	"This isn't that bad."	
Avoidance Statement	Child statement indicating avoidance or distraction from exposure stimulus	**1**	"Is this going to hurt me?"	Decrease
		2	"Can I use the bathroom?"	
Avoidance Behavior	Child displays behavior indicating avoidance or distraction from the exposure stimulus	**1**	Child avoids contact with exposure stimulus	Decrease
		2	Child uses a ritual	

Table 2

Frequency and distribution data by coding variable.

Coding Variable	K[a]	M (SD)[b]	Range	Skewness	Kurtosis
Therapist					
Address Accommodation	.00[c]	.44(1.04)	0–4	2.80	8.23*
Encourage Cognitive strategy	.69	2.44(3.84)	0–15	2.35	6.31
Therapist or Parent					
Accommodation Statement	.75 (T)	3.06(3.95)	0–16	2.20	6.34
	.74 (P)	1.79(3.52)	0–14	2.82	8.78*
Discourage Avoidance	.66 (T)	11.5(7.19)	3–30	1.07	1.17
	.57 (P)	3.72(5.41)	0–23	2.94	10.06*
Unrelated Talk	.54 (T)	2.00(2.85)	0–11	2.85	5.29
Unrelated Talk	.54(P)	1.89(3.32)	0–12	2.21	4.68
Exposure Comments	.54 (T)	4.17(3.75)	0–13	1.36	1.20
	.87 (P)	1.67(2.91)	0–12	2.97	9.93*
Accommodation Behavior	.62 (T)	.06(.25)	0–1.07	4.24*	18.00*
	.65 (P)	.54(1.04)	0–3.18	1.91	2.22
Therapist, Parent, or Child					
Externalizing Talk	.69 (T)	9.56(9.28)	0–26	.72	.56
	.72 (P)	1.89(4.24)	0–18	3.58	13.88*
	.66 (C)	1.72(2.51)	0–7	1.40	−.94
Child					
Cognitive Strategy	.57	.83(1.47)	0–6	2.84	9.50*
Avoidance Statement	.64	7.94(8.23)	1–34	2.08	5.18
Avoidance Behavior	.71	4.89(5.46)	0–16.60	2.94	10.06*

[a]T = therapist code, P = parent code, C = child code

[b]Mean frequency or duration (minutes) of code across both sessions. Note that average length of each exposure was 6.09 minutes.

[c]K=.00 was due to infrequency with which this code was observed (twice) for the 28% inter-rater reliability sample

*p<.05 indicating significant skewness or kurtosis

Table 3

Significant[a] correlations between coding variables by participant and treatment outcome measures.

	Participant Observed				
Coding Variable	**Therapist**		**Parent**		**Child**
Address Accommodation	---		N/A		N/A
Encourage Cognitive strategy	**1**	Mid-treatment NIMH Anxiety (.60)[b]	N/A		N/A
Accommodation Statement	---		**1**	Mid-treatment CGI (−.52)	N/A
Discourage Avoidance	**1**	Post-Treatment NIMH Anxiety (−.64)	**1**	Post-treatment NIMH Anxiety (−.63)	N/A
	2	Follow-up CYBOCS Δ(.73)[c]	**2**	Follow-up CYBOCS Δ(.84)[c]	
	3	Follow-up NIMH OCD (−.83)[c]	**3**	Follow-up NIMH OCD (−.83)[c]	
	4	Follow-up NIMH Anxiety (−.91)[c]			
Unrelated Talk	**1**	Post-treatment NIMH Anxiety (.59)	---		N/A
	2	Post-treatment NIMH depression (.57)			
Exposure Comments	**1**	Follow-up NIMH Anxiety (−.75)[c]	---		N/A
Accommodation Behavior	---		---		N/A
Externalizing Talk	---		**1**	Post-treatment NIMH OCD (−.60)	---
			2	Post-treatment NIMH Anxiety (−.55)	
Cognitive Strategy	N/A		N/A		---
Avoidance Statement	N/A		N/A		---
Avoidance Behavior	N/A		N/A		Treatment Drop Status

[a] $p < .01$

[b] Pearson's R

[c] For follow-up data, analyses were conducted on a reduced sample ($N = 10$), with $N = 8$ families lost to follow-up