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Development of a novel observational measure for anxiety in young children: The Anxiety Dimensional Observation Scale

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Abstract

Background—Identifying anxiety disorders in preschool-age children represents an important clinical challenge. Observation is essential to clinical assessment and can help differentiate normative variation from clinically significant anxiety. Yet, most anxiety assessment methods for young children rely on parent-reports. The goal of this article is to present and preliminarily test the reliability and validity of a novel observational paradigm for assessing a range of fearful and anxious behaviors in young children, the Anxiety Dimensional Observation Schedule (Anx-DOS).

Methods—A diverse sample of 403 children, aged 3 to 6 years, and their mothers was studied. Reliability and validity in relation to parent reports (Preschool Age Psychiatric Assessment) and known risk factors, including indicators of behavioral inhibition (latency to touch novel objects) and attention bias to threat (in the dot-probe task) were investigated.

Results—The Anx-DOS demonstrated good inter-rater reliability and internal consistency. Evidence for convergent validity was demonstrated relative to mother-reported separation anxiety, social anxiety, phobic avoidance, trauma symptoms, and past service use. Finally, fearfulness was associated with observed latency and attention bias toward threat.

Conclusions—Findings support the Anx-DOS as a method for capturing early manifestations of fearfulness and anxiety in young children. Multimethod assessments incorporating standardized

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methods for assessing discrete, observable manifestations of anxiety may be beneficial for early identification and clinical intervention efforts.

Keywords

Anxiety; fear; preschool; observation; attention bias; assessment

Introduction

Preschool anxiety disorders represent a major mental health problem, with prevalence estimates ranging from 9% to 19% (Dougherty et al., 2013; Egger & Angold, 2006). These high rates raise concerns about risk for long-term difficulties and need for treatment in a sizable group of children (Mian, 2014). The potential benefits of intervening in early childhood underscore the importance of early identification and characterization of anxious behaviors in young children (Carter, Briggs-Gowan, & Davis, 2004). Early childhood anxiety assessment is challenging due to the normative and often transient nature of fear behaviors, as well as children's inability to provide self-reports (Spence, Rapee, McDonald, & Ingram, 2001). In this developmental period, multi-method assessments that incorporate observation and parent-reports are considered essential (Carter et al., 2004). Yet, standardized methods for assessing anxiety in young children are lacking; assessment is based largely on information obtained from caregivers. In this study, we investigate the reliability and validity of a novel, observational assessment procedure for preschool-age anxiety symptoms, the Anxiety Dimensional Observation Schedule (Anx-DOS) within a nomological net related to pre-school-age anxiety. We also further investigate the relationship between the Anx-DOS and constructs thought to increase risk for child anxiety disorders, including observed latency to touch novel objects (Pérez-Edgar et al., 2010) and attention bias to threat, a task-based indicator of neurocognitive risk for anxiety (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van Ijzendoorn, 2007).

Importance of observational measures

Observational methods are important supplements for the essential information parents provide about young children's behavior. Multimethod approaches are the gold standard for early identification, but each method introduces unique sources of bias. For example, parent report may be biased by parental dispositional factors (e.g. personality), stress and psychopathology (De Los Reyes, Henry, Tolan, & Wakschlag, 2009; Kassam-Adams, García-España, Miller, & Winston, 2006). Moreover, given the widely recognized challenge of differentiating normative from atypical behavior during early development (Lord et al., 2000; Wakschlag et al., 2005)—a period when anxiety, fears, and separation distress are very common (Spence et al., 2001)—it is unreasonable to rely on parents alone for clinical decision making. Standardized observation methods also offer unique information about qualitative features of behavior, such as intensity and modulation. In the areas of Autism and Disruptive Behavior, observational measures have proven valuable for making these differentiations in a developmentally sensitive fashion (Lord et al., 2000; Wakschlag et al., 2008). They also have been the gold standard for the temperamental construct of behavioral inhibition, a risk factor for anxiety (Buss, 2011; Kagan, 1984). However, while methods for studying behavioral inhibition are valuable, they fall short of assessing clinically meaningful

dimensions of anxiety and fear that reflect affective, behavioral, cognitive, and physiological responses (Weems & Stickle, 2005).

Recognizing the need for a clinically informative observational measure of preschool anxiety we developed the Anx-DOS, building on our work with the Disruptive Behavior Diagnostic Observation Schedule (DB-DOS; Wakschlag et al., 2008), which has demonstrated reliability and incremental and clinical utility. We began by developing an Anx-DOS ‘parent context’ using a parent–child interaction. The context begins with scripted tasks which the mother is instructed to present to the child, including interacting with unfamiliar, novel stimuli that could be perceived as differentially threatening, an audible bell that signals transition between tasks, and a brief separation from the parent at the end. The tasks presented (see Measures) were designed to press for a range of fearful and anxious behaviors. The global coding system was designed to capture a range of anxious responses, including affective and behavioral displays of fear and separation distress, as well as coping responses (seeking proximity to caregiver). In light of growing awareness of early-emergent trauma-related psychopathology (Scheeringa, Myers, Putnam, & Zeanah, 2012), the coding was extended to include hyper-arousal symptoms that might manifest under circumstances of stress.

Present study

The primary objectives of this investigation include assessing the reliability and validity of the Anx-DOS using a multitrait, multimethod approach. As the Anx-DOS is designed to characterize a set of affective displays, behaviors, and reactions in response to acute, proximal threats—a construct for which there is no existing, validated measure—validity was investigated according to a nomological net of associated constructs, as recommended for childhood anxiety (Weems & Stickle, 2005). The ‘net’ includes parent-reported anxiety and trauma symptoms, and service use history. We also conceptualize this net as encompassing indicators of vulnerability for anxiety disorders, including an observational measure of latency to touch (Buss, 2011) and attention bias to threat, a tendency (often observed in anxious individuals) to devote disproportionate attention to even mild threats, such as angry faces (Bar-Haim et al., 2007). We recently reported a preliminary association between Anx-DOS fearfulness and attention bias to threat in 4-6-year-olds (Briggs-Gowan et al., 2015). Here, we expand this by investigating the relationship between attention bias and a more extensive set of behaviors assessed by the Anx-DOS and broadening the age range to include children younger than 4 years.

We hypothesized the following:

1. The Anx-DOS will demonstrate adequate inter-rater reliability and internal consistency.
2. Inter-relations between Anx-DOS codes will demonstrate differentiated patterns of association between: arousal-related symptoms (e.g., fearful affect), symptoms related to parent interaction (e.g., separation distress, parent proximity), and trauma-related symptoms (e.g., hypervigilance).

3. The Anx-DOS will demonstrate convergent validity through association with mother-reported anxiety and trauma symptoms. For example, observed separation distress will be associated with mother-reported separation anxiety symptoms, whereas fear and arousal behaviors will be related to phobia and trauma-related symptoms.
4. The Anx-DOS will demonstrate divergent validity (lack of association with externalizing and depressive symptoms).
5. The Anx-DOS will demonstrate convergent validity through positive associations with observed latency to touch and attention bias to threat, constructs representing vulnerability for anxiety.

Method

Participants

Participants represent a subsample of a survey cohort of 1,857 3- to 6-year-olds who were recruited from pediatric primary care practices (for details see Nichols et al., 2015; Wakschlag et al., 2014). The subsample was selected for an intensive substudy about developmental psychopathology focused on the clinical validation of the Multidimensional Assessment Profile of Disruptive Behavior (MAP-DB; Wakschlag et al., 2014), a novel tool for characterizing preschool disruptive behavior, and examining violence exposure as a mechanism of clinical risk across various disorders. Eligibility criteria required that the respondent was the child's English-speaking biological mother and absence of developmental delays. Children with disruptive behavior above the 80th percentile on the MAP-DB or whose mother reported past-year intimate partner violence were oversampled. A stratified random sample of 746 was drawn (of 1,459 who were eligible) from which 497 completed questionnaires, including 425 who attended the first laboratory visit when the Anx-DOS was administered. Three children with global cognitive delays, one child whose mother came in alone, and 18 with incomplete Anx-DOS data due to administration or technical problems were excluded, resulting in a final sample of 403. The sample was ethnically diverse (51% African American, 28% Hispanic, 20% non-Hispanic White, 1% 'other') and evenly distributed in gender (51% boys). Age ranged from 37 to 87 months (Mean = 55.97 months; 23% 3 years, 45% 4 years, 24% 5 years, 8% 6 years, and one child 7 years) at the time of the visit. Forty-six percent of families were living in poverty. Thirty-six percent of children lived in single parent homes. The analytic sample ($n = 403$) was similar to all sampled for the intensive visit in terms of violence exposure, Hispanic ethnicity, and gender. However, children in the analyzed sample were more likely to be poor (49% vs. 35%, $\chi^2 = 13.62$, $p < .001$), African American (53% vs. 35%, $\chi^2 = 24.52$, $p < .001$), and to have elevated disruptive behavior (43% vs. 36%, $\chi^2 = 4.17$, $p < .05$).

The affective dot-probe was successfully completed by 252 children during a second visit; these children provided usable data and were free of conditions that might affect performance (e.g., epilepsy, mixed language delays). The most common reasons for noncompletion included: 30 children did not attend the visit, 27 exhibited comprehension problems, data were unusable for 61 children (e.g., accuracy <65%, insufficient number of

trials, or technical issues). Children who completed the dot-probe were similar to those who did not in relation to poverty and gender, but tended to be older ($M = 58.52$ months; $SD = 9.46$ vs. $M = 50.18$ months; $SD = 9.23$; $t = 8.21$, $p < .001$). They also had lower scores on the Anx-DOS Fear Composite and Separation Distress items ($p < .01$, *partial* $\eta^2 = .04$ and $.02$, respectively), but not Proximity Seeking.

Procedures

Participants attended two 3-hr laboratory visits. Mothers were compensated for participation and transportation. Study protocols were approved by institutional review boards. Mothers provided informed consent. Parent-report questionnaires were completed online before the visit date. Due to the young age of children, assent was not obtained formally; however, assessments were discontinued if children became overly upset.

Measures

Anxiety Dimensional Observation Schedule—The Anx-DOS employs a variety of presses designed to elicit a broad range of discrete manifestations of anxious emotional responses, behaviors, and coping reactions (Briggs-Gowan, Mian, Carter, & Wakschlag, 2014). Presses are designed to increase the likelihood of observing broad variation in behavioral expression, including clinically salient manifestations. The presses are designed to resemble ecologically valid, anxiety-provoking situations. This initial version of the Anx-DOS employs a parent context only. Mothers are provided instructions for each task via flipcards to avoid interruption by the examiner. Four presses are administered in the following order: 1. *Mystery jar*: the child is asked to reach into an opaque jar to retrieve a prize (pressing for novelty/uncertainty). 2. *Spider*: the child is asked to play with a large, realistic tarantula with movable legs that is first stationary and then remote-controlled from outside the room (novelty/present threat). 3. *Bell*: An electronic bell is used to signal the transition to the next task (startle/uncertainty). 4. *Separation*: the parent separates and leaves the child with study staff (separation distress).

Anx-DOS Codes—Eight codes were developed (see Table S1, available online, for more details and code anchor sample), each rated along a clinical continuum: 0-no evidence, 1-mild/normative, 2-of concern, and 3-atypical. Scores of 2 or 3 indicate clinically concerning behaviors, including the degree to which the child's anxiety interferes with engagement in the task. Codes that reflect arousal and reactions include: *Fear Arousal*: Facial, postural, and verbal expressions of fear; *Physical Avoidance*: Physically moving away from an anxiety-provoking press (e.g., spider); *Exaggerated Startle*: Involuntary and automatic fearful response to unexpected stimulus. Codes that reflect parental interaction include: *Proximity Seeking*: Touching, holding onto, or moving closer to parent; *Separation Distress*: Distress or resistance exhibited during and following separation. Codes that include trauma-related symptoms include: *Hypervigilance*: Appearing 'on edge' or watchful in an overly attentive/reactive way; *Dissociation*: Blank stare, unresponsive, restriction of affect.

Coding procedures—Two bachelors-level and one masters-level research assistants were trained by a criterion coder (the first author). Coders were blind to clinical status and to all study hypotheses. Training involved coding videos and reviewing at weekly meetings to

establish consensus until coders reached 70% agreement on the severity rating (0–3) for all codes. Videos were then coded independently in batches of 8–10 with weekly meetings for establishing consensus for 20% of videos, which were coded by the criterion coder to monitor inter-rater reliability.

Trauma Symptom Checklist for Young Children—The Trauma Symptom Checklist for Young Children (TSCYC), a parent-report checklist of trauma related symptoms in young children (Briere et al., 2001), was included to assess associations with trauma symptoms. The Total Scale—the summary of Arousal, Avoidance, and Intrusion scales—was used (*Cronbach* $\alpha = .92$). TSCYC data are available for a subset of 253 children because it was added late due to concern about underidentification of trauma symptoms in diagnostic interviews.

Preschool-age psychiatric assessment—The pre-school-age psychiatric assessment (PAPA), a DSM-IV-based semistructured diagnostic interview for young children (Egger et al., 2006), was used to assess convergent validity through associations with parent-reported symptoms. This interview was administered by trained research assistants. Reliability of administration and coding was monitored for 20% of interviews by an expert clinical psychologist (*Percent Agreement* = 81%–98%). Common childhood disorders were assessed, including Specific Phobia, Social Phobia, Separation Anxiety, Agoraphobia, Panic, Depression/Dysthymia, Attention-Deficit Hyperactivity, Oppositional Defiant, and Conduct Disorders. Diagnostic criterion symptom counts were used in analyses. Because specific phobias require only two symptom criteria, mean avoidance reaction across multiple phobia types was used instead. The PTSD section was administered, but rates were too low to include in analyses, as in a prior study, (Briggs-Gowan et al., 2010).

PAPA incapacity—The PAPA interview was also used to assess impairment or ‘incapacity’ in the child’s functioning related to specific areas of symptomatology. Incapacity scores for separation anxiety and general anxiety/worries are used in analyses. Inter-rater reliability for overall incapacity was acceptable (*ICC* = 0.95).

Service use—Mothers were interviewed about their child’s receipt of services for behavioral or emotional problems. A categorical variable reflecting lifetime history was created (0: Never; 1: Past services; 2: Currently receiving services).

Affective dot-probe—The computerized dot-probe task was administered to children. Detailed procedures are reported elsewhere (Briggs-Gowan et al., 2015). Each trial began with the presentation of a 500-ms central fixation cross, followed by the 500-ms presentation of a face pair (NimStim, Face Stimulus Set), followed by a target on the left or right. The two photographs appeared to the right and left side of the fixation cross and displayed pairs of emotional expressions (Angry-Neutral, Happy-Neutral, Neutral-Neutral). Bias scores were calculated as the difference between reaction times (RTs) for incongruent (target on the same side as the neutral face) and congruent (target on the same side as the emotion), such that positive bias was toward the emotion and negative was toward the neutral face. Using a button box, children were asked to indicate the side of target presentation as quickly and accurately as possible. Trial level RT data were cleaned by

removing all inaccurate trials and any trials with RT <200 ms or >7000 ms. Trials greater than 2.5 *SD* from an individual child's *M RT* across all conditions were removed. Task data were deemed unusable if there were fewer than nine trials per emotion condition or accuracy was below 65%.

Differential Ability Scales-Second Edition—The Picture Similarities subscale of the Differential Ability Scales-Second Edition (DAS-II) (Elliott, 1983) provided a measure of developmental level. This was included as a covariate in the model testing service use to control for service receipt due to developmental delays.

Latency to touch—Observed latency was used as a measure of convergent validity. A composite was derived from the mean of the latencies (in seconds) to touch the spider and to put a hand into the jar. Never touching the stimulus was coded as the maximum duration of the task (180 for spider; 240 for jar).

Data analytic plan—Item and domain-level reliability were investigated. Inter-relationships between the Anx-DOS codes were investigated using a correlation matrix and principal components analysis with orthogonal rotation. Before investigating validity, sociodemographic variables were explored for potential covariates. All analyses employed sampling weights that accounted for both unequal probabilities of selection and differential nonresponse rates to adjust for the oversampling within specific strata and enhance generalizability. We adopted Kappa and Intraclass correlation coefficients (ICC) criteria of: .40 to .59 fair; .60 to .75 good, .75+ very good/excellent (Cicchetti & Sparrow, 1981). A *p*-value of .01 was used in convergent/divergent validity analyses.

Results

Reliability

As shown in Table 1, Anx-DOS codes generally demonstrated good to excellent inter-rater reliability for severity (0-3). Average single-measures ICC based on consistency across criterion coder pairings ranged from .71 to .84, except for Hypervigilance (.44). All weighted Kappas were above .65, except for Exaggerated Startle which was fair (.58) and Hyper-vigilance which was poor (.37). Hypervigilance was not included in analyses; improving this code will be a focus of future study. The reliability of Dissociation could not be estimated because only 4% were nonzero values.

Intercorrelations across Anx-DOS items are shown in Table 2. All scales were significantly correlated with one another, except for Separation Distress, which was significantly correlated with only Physical Avoidance and Proximity Seeking. A principal components analysis revealed two components. These included one clear component (eigenvalue of 2.59) that included Fear Arousal, Physical Avoidance, and Exaggerated Startle (loadings of 0.92, 0.90, and 0.70, respectively), all with low, negative loadings on a second factor. There was weaker evidence for a second component (eigenvalue of 1.01) driven by Separation Distress (loading of 0.97). Loadings for Proximity Seeking were unclear; this item loaded on both but more highly on the first factor (0.63) compared to the separation factor (0.25). Given this lack of empirical clarity and the *a priori* hypothesis that Proximity Seeking, representing a

coping style, is conceptually distinct from a fear response (especially given the oversampling for family violence in this sample) this item was left separate, along with Separation Distress. The Fear Arousal, Physical Avoidance, and Exaggerated Startle codes were combined to form an Anx-DOS Fear Composite, which demonstrated very good internal consistency (*Cronbach's* $\alpha = .83$).

Preliminary analyses

Relationships between the Anx-DOS and sociodemographic variables are presented in Table 3. The Anx-DOS was negatively associated with child age, such that younger children exhibited higher levels of observed anxious behaviors. Girls were observed to exhibit higher levels of Proximity Seeking. Poverty status was associated with higher scores on the Fear Composite. Means for the Fear Composite also varied significantly across child ethnicity: African American (5.22, $SD = 2.47$), Hispanic (4.03, $SD = 2.42$), White/Caucasian (3.11, $SD = 2.38$), and Other Ethnicity (4.75, $SD = 1.74$). Poverty, child gender, and child age were controlled for in subsequent analyses. Ethnicity was not treated as a covariate, as its effects were highly confounded with poverty ($\chi^2 = 49.0, p < .001$). Observed latency variables were log transformed to correct a positive skew before generating the latency composite.

Convergent validity

Parent-Reported Anxiety and trauma symptoms—Convergent validity analyses are reported in Table 4. Anx-DOS Separation Distress was significantly associated with mothers' reports of PAPA Separation Anxiety and Social Anxiety symptoms. However, the Anx-DOS Proximity Seeking code was not associated with Separation Anxiety symptoms. Both the Anx-DOS Fear Composite and Proximity Seeking were positively associated with PAPA specific phobia avoidance. The Anx-DOS Fear Composite, but not the other codes, was positively associated with the Total Trauma symptoms reported in the TSCYC.

Latency to touch—As expected, the Anx-DOS Fear Composite correlated significantly with longer latency to touch. Latency to touch also was associated with Anx-DOS Proximity Seeking, but not Anx-DOS Separation Distress.

Attention bias to threat—As expected, the Anx-DOS Fear Composite was associated with attention bias toward angry faces on the dot-probe ($b = 9.50, SE = 4.55, \beta = .19; p < .05$). This effect was specific to angry faces. However, neither Proximity Seeking nor Separation Distress were significantly associated with attention bias toward threat ($\beta = .08$ and $.06$ respectively). The same pattern of relationships was found when controlling for PAPA ADHD symptoms.

Clinical impairment—As expected, Anx-DOS Separation Distress was positively associated with clinical impairment related to PAPA separation anxiety ($b = .37, SE = .12, \beta = .15; p < .01$) when controlling for covariates. Neither the Anx-DOS Fear Composite nor Proximity Seeking were associated with impairment due to Separation Anxiety. There were no significant associations between any of the Anx-DOS codes and PAPA impairment due to generalized anxiety/worry.

Service use—The Anx-DOS Fear Composite was positively associated with service use, using ANCOVA controlling for developmental level in addition to identified covariates above and excluding children with known developmental conditions, $F(2, 350) = 4.40; p < .05$. Contrasts revealed that children with past service use ($M = 6.39; SE = 0.69$) had higher levels of observed fear compared to those who never used services ($M = 4.42; SE = 0.18$) and those currently using services ($M = 3.60; SE = 0.80$). Neither Proximity Seeking nor Separation Distress was associated with service use.

Divergent validity—For divergent validity analyses, relationships with externalizing and depressive symptoms were investigated (Table 4), controlling for PAPA General Anxiety symptoms to account for shared method variance. Neither the Separation Distress nor Proximity Seeking items were associated with symptoms in any area. However, the Fear Composite was significantly associated with PAPA ADHD symptoms. As high comorbidity between ADHD and anxiety has been documented in young children (e.g., Sterba, Egger, & Angold, 2007), *ad hoc* analyses were conducted to investigate this further. ADHD symptoms on the PAPA were significantly correlated with PAPA anxiety symptoms across all diagnostic categories (*rs* ranged from .21 to .58).

Discussion

This investigation demonstrated support for the Anx-DOS as a novel, observational measure characterizing a set of anxious and fearful responses to anxiety-provoking situations that reflect novelty, uncertainty, parental separation, and potential threat. Results support the reliability for the majority of codes and provide evidence of validity through associations with established measures, consistent with our hypothesized nomological net. The magnitude of these associations were generally modest, as expected when constructs are compared across methods (Wakschlag et al., 2008). Moreover, associations between the Anx-DOS and mother-reported anxiety and trauma symptoms, combined with evidence that the Anx-DOS Fear Composite also correlated with attention bias toward threat and longer latencies to touch stimuli, suggest that this method may be valuable for capturing meaningful manifestations of anxiety in young children. Findings support this method with children between 36 and 71 months of age, as most children studied fell in this age range; further research will be needed to establish its reliability and validity with children ages 6 or older.

Regarding convergent validity, there was support for the association between the Anx-DOS Separation Distress and mother-reported separation anxiety. The Fear Composite also was related to phobic avoidance and trauma symptoms, suggesting that it was associated with affective dysregulation accompanying perception of acute, proximal threat. The finding that trauma symptoms were associated with higher observed fear is consistent with theoretical models postulating that traumatic experiences negatively affect children's sensitivity to threat and ability to regulate emotional responses when stressed (Pine, 2007).

As expected, the Anx-DOS Fear Composite also was associated with constructs that have been identified as risk factors for child anxiety disorders. First, there were differential relationships with latency across Anx-DOS items. There was a strong association for the

Fear Composite, and no association for Separation Distress, suggesting that latency to touch captures only limited aspects of observable anxiety. The Fear Composite correlated significantly with attention bias toward threat, further supporting its validity and indicating sensitivity to neurocognitive differences (Bar-Haim et al., 2007). This supports the potential role of attention bias to threat for vulnerability of anxiety symptom dysregulation in young children. The lack of associations between attention bias and observed Separation Distress and Proximity-seeking are difficult to interpret, as to our knowledge no studies have specifically investigated how attention bias relates to Separation Anxiety Disorder or proximity-seeking behaviors.

There was little support for the Anx-DOS adequately measuring general anxiety/worries. The construct of worry is especially challenging to assess in young children across methods, as young children lack metacognitive ability and parental reports rely heavily on inferences (i.e., children asking questions that imply worry). Indeed, the generalized anxiety section of the PAPA has lower test–retest reliability than other symptom areas (Egger et al., 2006) and factor analyses of the PAPA have failed to clearly disaggregate generalized anxiety from depression (Sterba et al., 2007). Generalized anxiety also demonstrates substantial comorbidity with other anxiety disorders and ADHD in preschool children (Franz et al., 2013). In the development of the Anx-DOS, we made several attempts to capture observational signs of worry, based on self-soothing/nervous behaviors (e.g., biting nails, fidgeting) and anxious verbalizations (e.g., asking future-oriented questions). However, these codes were dropped due to low preliminary reliability; we will continue to pursue methods for assessing anxiety/worries.

There are several ways in which findings can inform our understanding of the phenomenology of anxiety/fear in young children. The differentiation of Separation Distress is consistent with factor analytic research across studies (Mian, Godoy, Briggs-Gowan, & Carter, 2012). The unexpected finding that Proximity Seeking was not associated with Separation Distress may be partially explained by variation across presses (separation vs. a potential threat), indicating that children with separation difficulties may not appear symptomatic unless specifically pressed for separation. In a similar analysis of observed anxious behaviors, Buss (2011) reported that of 14 items, caregiver proximity was the *only* item that did not load on any composite. In a prior factor analysis, we found some support for proximity and ‘clinging’ behaviors loading on a separate, albeit related, factor (Mian et al., 2012). It is likely that seeking proximity is a normative response for many children, but can indicate problems in others; results suggest this may be true for children with avoidant or inhibited tendencies, and this construct may be helpful in identifying different anxious profiles. Clinically, this finding suggests that diagnosticians should be hesitant to associate clinging behavior specifically with separation anxiety.

Despite demonstrating divergent validity in relation to depression and oppositional symptoms, observed fear was associated with ADHD symptoms. Anxiety is consistently comorbid with ADHD in young children (e.g., Franz et al., 2013; Sterba et al., 2007), so some association here was expected. ADHD symptoms also correlated with anxiety symptoms within the PAPA, indicating this lack of divergence was not unique to the Anx-DOS. Anxiety symptoms in 2-3 year-olds have been found to contain a subfactor that

reflects concentration difficulties and hyperactivity (Mian et al., 2012), again indicating a lack of clear differentiation. This finding suggests that clinicians should be particularly mindful of the relationship between these constructs, noting that reliance solely on either observation or parent report could lead to misclassification.

Regarding clinical impairment, observation demonstrated an association only for Separation Distress, which may be partially explained by the relationship between observed separation difficulties and social anxiety symptoms—not being able to leave a child can lead to impairment in developing relationships. The Anx-DOS Fear Composite was associated with a history of service use, which may suggest that poor emotion regulation is perceived as a marker for necessitating services early in development. That these services were apparently discontinued may indicate that they were unsuccessful or that parents learned to accommodate adequately.

Future directions and limitations

This study also has several limitations. First, the presses included may not be sufficiently broad to assess the full range of anxious behaviors. Other presses, such as simulations of peer interaction or social judgment, were not included in this initial investigation due to time constraints. Investigations are now underway to develop additional presses within the parent context and ultimately in an examiner-child interactional context. We recently demonstrated that children's behavior in the parent and examiner contexts of the DB-DOS are differentially associated with patterns of impairment in home, 'out and about,' and school/day care settings (Petitclerc et al., 2015). Such contextual information may be particularly informative for understanding early anxiety, as associations between parenting behaviors and child symptoms are highly relevant to research and treatment planning. Hence, a companion parenting behavior coding system for the Anx-DOS is underway. In addition, the observed associations between the Anx-DOS and trauma symptoms and attention bias to threat support its use in trauma-exposed samples. Further refinement of the Hyper-vigilance and Dissociation codes may facilitate the development of a traumatic symptom composite. Future investigations also aim to reconceptualize worry-related codes or develop new coding procedures to improve reliability in this area. Finally, there are limitations with the use of observational measures in general. Such measures are time-intensive and only provide a 'snapshot' of the child's functioning; therefore, they are intended as an important component of a multimethod assessment battery, but should not be used alone for diagnostic purposes.

Conclusion

Expanding our understanding of how anxiety is manifested in young children, and doing so in a manner that can identify linkages with neurocognitive substrates, can advance clinical research toward the ultimate goals of improving the effectiveness of early identification and treatment in this key developmental period. Psychometrically sound, developmentally sensitive assessments are essential to achieve this goal. Our findings suggest that standardized clinical observation of anxiety, in concert with caregiver reports, may help to advance these efforts.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Key points

- The Anx-DOS demonstrated modest, positive associations with parent-reported measures of anxiety symptoms, providing evidence that it is an appropriate measure for assessing anxiety in young children.
- This investigation used observation to support the notion that differentiated anxiety symptoms show distinct patterns of associations, and that separation distress may be a distinct clinical phenomenon in young children.
- Observed dimensions of anxiety were not associated with parent-reports of child worry, indicating that this construct continues to be elusive in this age group.
- We found overlap with ADHD symptoms and observed fear, indicating that these constructs are difficult to disaggregate even with observation. It is important to keep in mind that anxiety may be over looked or misunderstood as hyperactivity in young children, warranting careful diagnostic consideration in the clinic.
- Results suggest that the Anx-DOS could add valuable information about a child's risk for later psychopathology and inform research on clinical profiles in young children.

Table 1

Inter-rater reliability for Anx-DOS items and fear composite

Code	Intra-class Correlations		Weighted Kappa	
	Range	Average	Range	Average
Fear composite	.83–.90	.87	.64–.71	.68
Fear arousal ^a	.79–.85	.83	.64–.72	.70
Physical avoidance ^a	.77–.86	.82	.63–.73	.69
Exaggerated startle ^a	.65–.79	.71	.56–.62	.58
Proximity seeking	.82–.86	.84	.70–.75	.73
Separation distress	.70–.91	.83	.61–.84	.76
Hypervigilance	.28–.63	.44	.21–.50	.37

^aItem included in fear composite.

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Table 2

Intercorrelations among Anx-DOS items and fear composite

Code	1	2	3	4	5	6	7
1. Fear Composite	–						
2. Fear Arousal ^a	.91***	–					
3. Physical Avoidance ^a	.89***	.85***	–				
4. Exaggerated Startle ^a	.79***	.54***	.49***	–			
5. Proximity Seeking	.45***	.46***	.45***	.27***	–		
6. Separation Distress	.07	.09	.10*	.01	.13*	–	
7. Dissociation ^b	.08	.11*	.09	.01	.01	-.01	–

* $p < .05$;** $p < .01$;*** $p < .001$.^a Item included in Fear Composite.^b Data not reported in analyses due to low base rate.

Table 3

Distribution of Anx-DOS codes by demographic variables

Code	Mean (SD)	% Cases >1	Child age (r)	Boys, M (SD)	Girls, M (SD)	Gender (t)	Nonpoor, M (SD)	Poor, M (SD)	Poverty status (t)
Fear Composite	4.46 (2.57)	23.3 ^b	-.19***	4.24 (2.55)	4.69 (2.56)	1.76	4.11 (2.49)	4.88 (2.60)	3.01**
Fear Arousal ^a	1.65 (0.93)	57.9	-.20***	1.56 (0.93)	1.74 (0.93)	1.91	1.52 (0.90)	1.79 (0.95)	2.91**
Physical Avoidance ^a	1.79 (0.99)	65.0	-.18***	1.73 (1.04)	1.85 (0.94)	1.16	1.66 (1.02)	1.93 (0.94)	2.71**
Exaggerated Startle ^a	1.02 (1.05)	35.1	-.12*	0.94 (1.00)	1.11 (1.10)	1.60	0.91 (0.99)	1.16 (1.11)	2.26*
Proximity Seeking	0.80 (0.90)	26.4	-.19***	0.68 (0.86)	0.93 (0.92)	2.81**	0.77 (0.88)	0.84 (0.92)	0.79
Separation Distress	0.36 (0.63)	6.1	-.25***	0.35 (0.62)	0.37 (0.65)	0.33	0.37 (0.62)	0.34 (0.65)	0.43
Dissociation ^c	0.04 (0.50)	0.6	.03	0.03 (0.56)	0.06 (0.29)	0.64	0.02 (0.14)	0.07 (0.65)	1.09

* $p < .05$;

** $p < .01$;

*** $p < .001$.

^aItem included in Fear Composite.

^bFor the Fear Composite, a cut-off value of 7 (approximately +1 SD) was used instead of 1.

^cData not reported in analyses due to low base rate.

Table 4

Associations with Anx-DOS scores with other measures

Variable	Range	M (SD)	Fear composite, β (SE)	Proximity seeking, β (SE)	Separation distress, β (SE)
<i>Convergent validity</i>					
PAPA Separation anxiety	0-7	1.11 (1.42)	.04 (.03)	.02 (.09)	.19 (.12) ***
PAPA Generalized anxiety	0-6	1.42 (1.36)	.01 (.03)	-.03 (.08)	.05 (.11)
PAPA Social Phobia	0-2	0.19 (.49)	.03 (.01)	-.05 (.03)	.15 (.04) **
PAPA Specific Phobia Avoidance	0-1.43	0.27 (.28)	.20 (.01) ***	.14 (.02) **	.04 (.02)
Latency to touch	0-2.38	0.70 (.58)	.58 (.18) ***	.26 (.08) ***	-.03 (.05)
TSCYC ^a	40-110	58.85 (14.44)	.18 (.34) **	.06 (1.01)	.09 (1.32)
<i>Divergent validity</i>					
PAPA ADHD	0-17	4.15 (4.02)	.11 (.06) **	.03 (.18)	.05 (.26)
PAPA ODD/CD	0-7.5	1.28 (1.25)	.06 (.02)	-.06 (.07)	.01 (.09)
PAPA Depression/Dysthymia	0-8	1.36 (1.43)	.07 (.03)	-.01 (.07)	-.03 (.10)

** $p < .01$;

*** $p < .001$.

^a $n = 253$. All analyses control for age, gender, and poverty.