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# Threat Appraisal and Pediatric Anxiety: Proof of Concept of a Latent Variable Approach

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## Abstract

Elevated threat appraisal is a postulated neurodevelopmental mechanism of anxiety disorders. However, laboratory-assessed threat appraisals are task-specific and subject to measurement error. We used latent-variable analysis to integrate youths' self-reported threat appraisals across different experimental tasks; we next examined associations with pediatric anxiety and behavioral- and psychophysiological-task indices. Ninety-two youths ages 8 to 17 ($M$ = 13.07 years, 65% female), including 51 with a primary anxiety disorder and 41 with no Axis I diagnosis, completed up to eight threat-exposure tasks. Anxiety symptoms were assessed using questionnaires and ecological momentary assessment. Appraisals both before and following threat exposures evidenced shared variance across tasks. Derived factor scores for threat appraisal were associated significantly with anxiety symptoms and variably with task indices; findings were comparable with task-specific measures and had several advantages. Results support an overarching construct of threat appraisal linked with pediatric anxiety, providing groundwork for more robust laboratory-based measurement.

## Keywords

threat appraisal, anxiety disorders, children and adolescents, latent-variable analysis, fear conditioning, ecological momentary assessment

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Poorly replicated findings in psychological science are increasingly recognized (e.g., Open Science Collaboration, 2015; Tackett et al., 2019). Some have attributed such results to measurement error arising from laboratory paradigms with task-specific "noise" or poor reliability (e.g., Chapman et al., 2019; Lilienfeld & Strother, 2020). Illustrating one potential path forward, in the current article, we integrate multiple measures of self-reported threat appraisal collected across different laboratory tasks. This approach might estimate an overarching latent variable and diminish task-specific impurities. We further investigate how this latent variable compares with single-task variables in capturing associations with anxiety symptoms and psychophysiological- and behavioral-task indices.

Robust, reliable assessment of threat appraisal supports research on anxiety-related mechanisms. Hallmarks of anxiety disorders involve threat responding disproportionate to the likelihood or intensity of

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possible harm (Barlow, 2004). Ample work has shown that individuals with higher, relative to lower, levels of anxiety exhibit heightened subjective, physiological, and neural responses to threat stimuli (reviewed in Chavanne & Robinson, 2021; LeDoux, 2015). "Threat appraisal" is a broad construct referring to stimulus classification in terms of potential for harm and can be measured in multiple ways (Pine, 2007). In this study, we focus on the subjective or self-reported component of threat appraisal. Subjective threat appraisal reflects cognitive and affective processes and is typically operationalized as verbal reports of one's internally experienced fear and anxiety in response to threat stimuli (Britton et al., 2011). We focus on subjective report because of its clinical relevance (LeDoux & Pine, 2016) and because self-report measures tend to intercorrelate across tasks in pediatric anxiety research (e.g., Shechner et al., 2015), particularly ripe for a latent-variable approach. In addition, subjective threat appraisal can be measured both in anticipation of threat and when recovering from the experience (reviewed in Kalisch & Gerlicher, 2014; Narvaez Linares et al., 2020). Heightened threat appraisals and responses are already evident in youths with clinical anxiety (reviewed in Strawn et al., 2020), possibly contributing to the etiology and maintenance of anxiety disorders into adulthood (reviewed in Pittig et al., 2018).

Over the past 4 years, our research group has used eight laboratory tasks to evoke threat responding in youths with and without clinically significant anxiety (see task descriptions below). Each task uses unique techniques to do so. For example, the "screaming lady" task (Lau et al., 2008) involves viewing various facial stimuli with the pairing of an aversive noise (scream) to one stimulus as an unconditioned threat. In contrast, the "virtual public speaking" task (Westenberg et al., 2009) involves a speech performance while ostensibly being evaluated by peers. To date, we have examined these tasks largely in isolation. However, collectively, they may capture common features of subjective threat appraisal in a way that robustly quantifies a construct related to anxiety. Thus, each task included one of two measures assessing subjective threat appraisal: the State Anxiety subscale of the State-Trait Anxiety Inventory for Children (STAI-CH; Spielberger et al., 1970) or a visual analogue scale (VAS; Abend et al., 2014). The STAI-CH and VAS are two of the most commonly administered measures before and after experimental threat (reviewed in Narvaez Linares et al., 2020).

Here, we first examine the coherence of youths' self-reported threat appraisals across tasks using confirmatory factor analysis (CFA). We hypothesized that threat-appraisal ratings for all eight tasks would load significantly on a common latent variable. We next report relations of participants' factor scores for threat appraisal with (a) pediatric anxiety symptoms and (b) psychophysiological- and behavioral-response indices on four tasks. We expected factor scores to positively correlate with anxiety symptoms and task indices more strongly and consistently than would single-task measures of threat appraisal. We report how we determined our sample size, all data exclusions, all manipulations, and all measures in the study.

## Method

### *Participants*

Demographic and clinical characteristics of the sample are presented in Table 1. Ninety-two youths ages 8 to 17 ($M$ = 13.07 years, $SD$ = 2.71; 65.22% female) participated in the current study. Participants were recruited from the greater Washington, D.C., metropolitan area. Recruitment sources included fliers distributed in pediatrician offices, meetings and discussions with local schools and parent groups, and word of mouth in the greater community. Participants were recruited on the basis of the presence or absence of a primary anxiety disorder (generalized, social, and/or separation anxiety disorder). Psychiatric diagnoses were assessed by trained, licensed clinicians using a semistructured diagnostic interview (Kiddie Schedule for Affective Disorders and Schizophrenia—Present and Lifetime; Kaufman et al., 1997). Exclusion criteria for the current study included meeting criteria for any diagnosis other than an anxiety disorder according to the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-5*; American Psychiatric Association, 2013), MRI contraindications (e.g., braces, claustrophobia), IQ below 70, or completing fewer than two (25%) of the eight laboratory tasks described below. To maximize the number of participants in the analyses, all participants who completed at least two tasks were included. All procedures were approved by the National Institute of Mental Health Institutional Review Board. Parents and pediatric participants provided written consent and assent, respectively, and participants received monetary compensation. Participants who met criteria for an anxiety disorder also received treatment following participation.

Of the 92 total participants meeting the above criteria, 51 (age: $M$ = 13.24 years, $SD$ = 2.67; 70.59% female) met *DSM-5* (American Psychiatric Association, 2013) criteria for at least one current anxiety disorder. The remaining 41 (age: $M$ = 12.86 years, $SD$ = 2.79; 58.54% female) did not have any Axis I diagnosis (healthy volunteers). The two groups (participants with an anxiety disorder and healthy volunteers) did not differ in

**Table 1.** Participant Demographic and Clinical Characteristics

| | Anxiety disorder | Healthy volunteer | Total |
|---|---|---|---|
| *M* (*SD*) or *N* (%) | (*n* = 51) | (*n* = 41) | (*N* = 92) |
| Demographic characteristics | | | |
| Age | 13.24 (2.67) | 12.86 (2.79) | 13.07 (2.71) |
| Race | | | |
| White | 35 (68.63) | 25 (60.98) | 60 (65.22) |
| Black/African American | 4 (7.84) | 9 (21.95) | 13 (14.13) |
| Asian/Asian American | 1 (1.96) | 2 (4.88) | 3 (3.26) |
| American Indian/Alaskan Native | 1 (1.96) | 0 (0.00) | 1 (1.09) |
| Multiple races | 6 (11.76) | 2 (4.88) | 8 (8.70) |
| Unknown ethnicity | 4 (7.84) | 3 (7.32) | 7 (7.61) |
| Latino or Hispanic | 11 (21.57) | 3 (7.32) | 14 (15.22) |
| Not Latino or Hispanic | 39 (76.47) | 36 (87.80) | 75 (81.52) |
| Unknown | 1 (1.96) | 2 (3.92) | 3 (3.26) |
| Clinical characteristics | | | |
| SCARED | | | |
| Self-report | 32.84 (13.35) | 8.09 (8.11) | 21.81 (16.73) |
| Parent-report[a] | 30.74 (12.27) | 5.04 (7.20) | 19.44 (16.45) |
| EMA anxiety | | | |
| Self-report | 1.87 (0.61) | 1.09 (0.13) | 1.47 (0.58) |
| Anxiety disorder diagnoses[b] | | | |
| Generalized anxiety disorder | 42 (82.35) | 0 (0.00) | 42 (45.65) |
| Social anxiety disorder | 37 (71.15) | 0 (0.00) | 37 (40.22) |
| Separation anxiety disorder | 8 (15.69) | 0 (0.00) | 8 (8.70) |
| Specific phobia | 10 (19.61) | 0 (0.00) | 10 (10.87) |
| Panic disorder | 3 (5.88) | 0 (0.00) | 3 (3.26) |

Note: EMA = ecological momentary assessment; SCARED = Screen for Child Anxiety-Related Emotional Disorders (Birmaher et al., 1997).
[a]Data were missing for one participant.
[b]Participants could have more than one diagnosis; therefore, values do not sum to 100%.

age, $t(90) = -0.67$, $p = .508$; IQ, $t(90) = -0.363$, $p = .717$; or distribution by gender, $\chi^2(1) = 1.455$, $p = .228$; race, $\chi^2(5) = 6.05$, $p = .301$; or ethnicity, $\chi^2(2) = 3.99$, $p = .136$.

## *Self-reported threat-appraisal measures*

On the basis of the reviewed literature (e.g., Britton et al., 2011; Narvaez Linares et al., 2020; Strawn et al., 2020), we operationalized subjective threat appraisal as self-reported ratings of anxiety during each task. Participants made threat appraisals before each task (acute threat appraisal) and after each task (postthreat appraisal). Three tasks employed the STAI-CH (Spielberger et al., 1970). The STAI-CH is a 20-item questionnaire that queries current behaviors and feelings of anxiety ("at this very moment") on 3-point Likert scales (e.g., 1 = *not upset*, 3 = *very upset*) and is considered a "gold-standard" measure (Kain et al., 1997). Items were summed for a total score, ranging from 20 to 60. Across tasks, average internal consistency of the State Anxiety subscale was strong (acute threat appraisal: $\alpha = .92$; postthreat appraisal: $\alpha = .91$). The other five tasks employed computerized versions of a VAS (Abend et al., 2014). Specifically, participants answered "How anxious do you feel right now?" on a sliding scale (left flank = *I feel calm*, right flank = *I feel anxious*). The VAS has high convergent validity and good discriminant validity (Abend et al., 2014). Generally, the VAS was used for certain tasks because it is less time-consuming to complete than the STAI-CH. Our decision to use both the STAI-CH State Anxiety subscale and VAS in the factor analyses was motivated by the fact that doing so would provide threat-appraisal data for all eight tasks.

For descriptive statistics for threat appraisals for each task, see Table S1 in the Supplemental Material available online. For the purposes of factor analysis, ratings were standardized using $z$ scores within task, within time point (e.g., acute threat appraisal vs. postthreat appraisal).

## Laboratory tasks

The eight laboratory tasks used in the current analyses are described briefly below (see referenced publications for full task details). Over the course of several months (days: $M = 96.14$, $SD = 71.74$), participants completed as many tasks as were able to be scheduled, up to all eight tasks (number of tasks completed per participant: acute threat appraisal, $M = 3.10$, $SD = 1.25$; postthreat appraisal, $M = 3.10$, $SD = 1.20$). This provided a wide range of methodology (behavioral, psychophysiological, neuroimaging), task demands, and stimuli used.

***Peer-observed flanker.*** The peer-observed flanker (Smith et al., 2020), a modified version of a classic Eriksen flanker task (Eriksen & Eriksen, 1974), has participants complete half of the task alone and half of the task while they believe they are being observed by a peer. This task was completed in the functional-MRI (fMRI) environment to examine neural correlates of making an error in the presence of a peer (i.e., social threat). Before and after the task, participants completed the STAI-CH.

***Reversal learning.*** In the reversal-learning (Abend et al., 2021; Michalska et al., 2016) behavioral paradigm, participants learn associations between cues (shapes) and noxious thermal stimulation applied to the arm. This task is used to examine responses to cue-threat associations. Psychophysiological measures, including skin conductance responses (SCRs), were collected throughout the task (see the Supplemental Material). Before and after the task, participants completed the VAS.

***Safety learning.*** In the safety-learning (Harrewijn et al., 2021) fMRI task, participants learn associations between different cues (shapes) and an aversive loud noise delivered through headphones. This task interrogates neural mechanisms of threat and safety learning. Participants completed the STAI-CH before and after the task.

***Scary movie.*** In this version of a naturalistic movie-watching fMRI methodology (Vanderwal et al., 2019), participants watch a 6-min animated movie clip intended to elicit threat anticipation. This task was designed to quantify dynamic neural responses to potential threat. Participants completed the VAS before and after watching the move clip.

***Screaming lady.*** In the screaming-lady task (Abend et al., 2020; Britton et al., 2013), a threat-learning paradigm, participants learn conditioned threat associations between a neutral facial stimulus and a fearful face coupled with an aversive loud scream heard through headphones. Psychophysiological measures, including SCRs, were collected throughout the task (see the Supplemental Material). Participants completed the VAS before and after the task.

***Trier Social Stress Test.*** In this adapted version of the Trier social stress test (Kirschbaum et al., 1993), participants are asked to complete a 5-min speech in front of live confederates. Specifically, participants are asked to come up with an "exciting ending" to a story that was just shared with them. Following the speech, participants complete an unexpected 5-min oral-arithmetic task. This paradigm investigates behavioral and physiological responses to social threat. Participants completed the VAS before and after the task.

***Virtual public speaking.*** This task uses methods from Westenberg and colleagues (2009) and has participants introduce themselves for 1 min in front of a virtual classroom of peers. Participants are then asked to look at the virtual audience members without speaking for 1 min. This task is completed while wearing eye-tracking glasses to continuously monitor gaze fixation and potential avoidance of eye contact. A behavioral measure of avoidance was collected during the task (see the Supplemental Material). Participants completed the VAS before and after the task.

***Yale Interactive Kinect Environment Software behavioral-avoidance task.*** During the Yale Interactive Kinect Environment Software (YIKES; Lebowitz et al., 2015) behavioral-avoidance task, participants stand in front of an LCD screen and move side to side to catch different objects per task instructions. Although participants are catching the falling objects, one threatening (angry face or spider, depending on task block) and one neutral image are presented on respective sides of the screen to assess physical avoidance of threat stimuli. A behavioral measure of avoidance was collected during the task (see the Supplemental Material). Participants completed the STAI-CH before and after the task.

## Pediatric anxiety symptoms

***Screen for Child Anxiety Related Emotional Disorders.*** Throughout participation in the study, participants and parents independently completed the Screen for Child Anxiety Related Emotional Disorders (SCARED; Birmaher et al., 1997) questionnaire to assess severity of anxiety symptoms across the last 3 months. Items are endorsed on 3-point Likert scales (0 = *not true*, 2 = *very true or often true*) and summed upon completion; higher scores indicate greater anxiety. The SCARED has demonstrated strong test-retest reliability and discriminant

validity (Birmaher et al., 1997) and showed strong internal consistency reliability in our sample ($\alpha = .88$).

***Ecological momentary assessment.*** In addition, naturalistically occurring anxiety was measured via ecological-momentary-assessment (EMA; Smith et al., 2019) methodology (Myin-Germeys et al., 2009; Russell & Gajos, 2020). We used a smartphone application in which youths were prompted three times per day (morning, afternoon, evening) over the course of 1 week (for details, see Smith et al., 2019). For the current analyses, we used responses to the following item rated on a 5-point Likert scale: "Since the last beep, I felt worried or scared" (1 = *none of the time*, 5 = *the whole time*; rated at afternoon and evening prompts only). This item was selected as best reflecting anxiety over the course of the day. Ratings were extracted and averaged for each participant across the 1-week response period.

## Data analysis

***Threat appraisal latent variables.*** We ran CFAs to test whether threat appraisals across the tasks loaded on a common latent variable. Each factor loading indexed how strongly the observed variable for that task loaded on the latent variable. Separate CFAs were conducted for acute threat appraisal and postthreat appraisal. Each CFA included participant age, time in days between the first and last task completed, and total number of tasks completed as predictors of the factor of noninterest. All analyses were conducted in Mplus (Version 8.4; Muthén & Muthén, 2019). Because the covariance coverage (proportion of participants in common) was less than 10% between some pairs of tasks, fit indices for the CFAs were not available.

***Associations with pediatric anxiety.*** We extracted participants' factor scores from the CFAs and tested whether individual differences in threat appraisal were associated with pediatric anxiety. We used independent-samples *t* tests to examine group differences (anxiety disorder, healthy volunteer) in factor scores and Pearson's correlations to test associations between factor scores and anxiety symptoms (SCARED, EMA).

***Associations with behavioral- and physiological-task indices.*** We also tested whether individual differences in self-reported threat appraisal were associated with psychophysiological (SCR) and behavioral (avoidance) indices from the four tasks with available data. To further assess the utility of the latent variables, we compared associations of factor scores with anxiety symptoms and task indices with the associations of single-task measures of threat appraisal with anxiety symptoms and task indices. Fisher's *r*-to-*z* transformations were used for statistical comparisons of correlation strength. All tests were two-sided and used a significance threshold of 5%.

# Results

## Threat-appraisal latent variables

***Acute threat appraisal.*** The CFA for acute threat appraisal indicated that ratings for six of the eight tasks loaded significantly on the common latent variable (all $p$s < .001; Fig. 1a). Threat-appraisal ratings before the scary-movie task ($p = .199$) and safety-learning task ($p = .432$) did not significantly load on the latent variable.

***Postthreat appraisal.*** The CFA for postthreat appraisal indicated that ratings for seven of the eight tasks loaded significantly on the common latent variable (all $p$s < .001; Fig. 1b). Again, the safety-learning task did not significantly load on the latent variable ($p = .584$).

## Associations with pediatric anxiety

***Acute threat appraisal.*** As expected, the anxiety-disorder group had significantly higher acute threat-appraisal factor scores than the healthy-volunteer group, $t(90) = 5.63$, $p < .001$. Likewise, there were significant positive associations between acute threat-appraisal factor scores and anxiety severity (SCARED self-report: $r = .54$; SCARED parent report: $r = .42$; EMA: $r = .48$; all $p$s < .001). When examining specific task subsamples, factor scores were comparable in their associations with symptoms of anxiety relative to the single-task threat-appraisal measures (see Table S2 in the Supplemental Material). There were no significant differences in correlation strength when using factor scores versus single-task measures.

***Postthreat appraisal.*** Again, the anxiety-disorder group had significantly higher postthreat-appraisal factor scores than the healthy-volunteer group, $t(90) = 6.14$, $p < .001$. Likewise, there were significant positive associations between postthreat-appraisal factor scores and anxiety severity (SCARED self-report: $r = .60$; SCARED parent report: $r = .50$; EMA: $r = .46$; all $p$s < .001). When examining specific task subsamples, factor scores were comparable in their associations with symptoms of anxiety relative to the single-task threat-appraisal measures (see Table S2 in the Supplemental Material). There were no significant differences in correlation strength when using factor scores versus single-task measures.

## Associations with psychophysiological- and behavioral-task indices

***Acute threat appraisal.*** There were significant positive associations between acute threat-appraisal factor scores and SCRs on the reversal-learning task ($r = .33$, $p = .044$) but not on the screaming-lady task ($r = -.02$, $p = .896$). There were notable nonsignificant positive associations between acute threat-appraisal factor scores

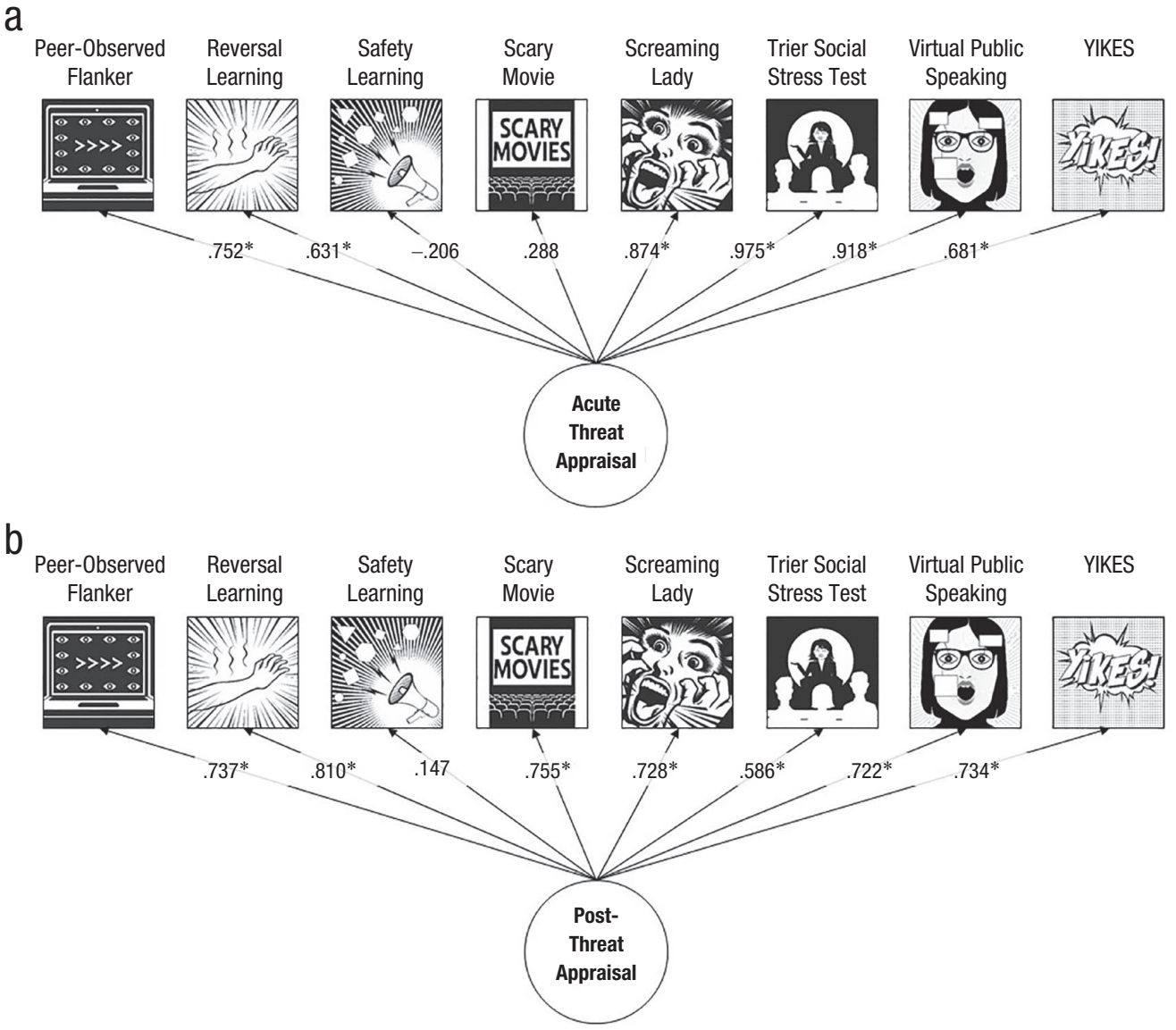


**Fig. 1.** Standardized loadings presented. Asterisk indicates significance level at $p < .001$.

and avoidance behaviors on the virtual-public-speaking task ($r = .42$, $p = .060$) but not on the YIKES task ($r = .19$, $p = .174$). Depending on the task, factor scores were uniquely significant or comparable in their associations with task indices relative to the single-task threat-appraisal measures (see Table S3 in the Supplemental Material). However, there were no significant differences in correlation strength when using factor scores versus single-task measures.

***Postthreat appraisal.*** There were significant positive associations between postthreat-appraisal factor scores and SCRs on the reversal-learning task ($r = .35$, $p = .033$) and notable nonsignificant associations on the screaming-lady task ($r = .31$, $p = .058$) and between postthreat-appraisal factor scores and avoidance behaviors on the virtual-public-speaking task ($r = .40$, $p = .072$) and YIKES task ($r = .24$, $p = .082$). Depending on the task, factor scores were uniquely significant or comparable in their associations with task indices relative to the single-task threat-appraisal measures (see Table S3 in the Supplemental Material). However, there were no significant differences in correlation strength when using factor scores versus single-task measures.

## Discussion

This proof-of-concept study used a latent-variable approach to integrate experimental research on threat appraisal and anxiety. First, findings evidenced significant commonality among acute threat appraisals in six of the eight tasks and among postthreat appraisals in

seven of the eight tasks. That is, subjective threat appraisals evoked by most tasks appeared to reflect a latent construct. Next, when using factor scores, higher acute threat and postthreat appraisals related to pediatric anxiety-disorder diagnoses and symptom severity measured using both lab questionnaires and EMA. Finally, factor scores were comparable in their associations with anxiety symptoms and behavioral- and psychophysiological-task indices relative to task-specific measures, underscoring the potential added value of integrating measures across tasks. Potential implications of these findings are discussed below.

The results of the CFAs affect views on threat responding. The finding that threat appraisals across diverse tasks loaded onto a common factor indicates important shared variance across different contexts, such as social threat and physical threat, which may inform understanding of broad-based vulnerability to anxiety disorders in youths. In contrast, acute-threat ratings for two tasks (safety learning and scary movie) and postthreat ratings for one task (safety learning) did not significantly load on the respective common latent variables. That is, the measured variables from these two tasks did not share as much common variance with the measured variables from the other tasks. Although not predicted, this finding suggests that in some contexts, participants might appraise their anxiety less similarly than with the other tasks. These two tasks shared several features with other tasks (e.g., fMRI environment, rating scale used) and had similar levels of ratings as the other tasks. It is possible that participants' acute threat appraisals before the scary-movie task were differentially affected by previous experiences watching these types of movies. Other tasks all exhibited strong factor loadings (standardized values > .50) despite differences in the nature of the threat stimuli and experimental methodology.

Recent perspectives have articulated establishing a latent construct, or shared variance among measures, as an important first step in testing for between-subjects differences on that construct (e.g., Cooper et al., 2017). Here, analyses demonstrated higher threat-appraisal factor scores in youths with versus without anxiety disorders and as a function of higher versus lower anxiety symptoms measured via lab questionnaires and naturalistically. Comparing associations based on the latent variables versus single-task measures was also a necessary step in examining the utility of the latent-variable approach. As noted in the results, factor scores were correlated as consistently with anxiety as were the single-task measures, regardless of the task subsample and despite the fact that factor scores were derived by combining data across subsamples.

A similar pattern was observed in relation to task performance. Factor scores were significantly associated with greater psychophysiological arousal on the reversal-learning task and variably or marginally associated with psychophysiological arousal or avoidance behavior on the screaming-lady, virtual-public-speaking, and YIKES tasks. Relative to the single-task measures, these associations were uniquely significant or comparable. A body of literature in adults demonstrates that the subjective, psychophysiological, and behavioral channels of threat responding do not consistently intercorrelate (reviewed in e.g., Kozak & Miller, 1982; LeDoux & Pine, 2016; Rachman & Hodgson, 1974). However, research on this topic is limited in youths (Clarkson et al., 2020; Kaurin et al., 2022). The low intercorrelations reported in the literature informed our decision to limit the latent variable observed measures to self-report and to subsequently test the associations of factor scores with psychophysiological- and behavioral-task performance indices. The current findings add to the literature by suggesting that a latent-variable approach may improve the ability to detect associations across response channels. In addition, a reduction in the number of statistical tests conducted and the ability to incorporate subsamples or allow missing data (e.g., if a participant was unable to complete a threat task) are advantages of a latent-variable approach.

This evaluation helps build comprehensive, testable models of anxiety-related processes. For instance, researchers in executive functioning have taken similar approaches to evaluating paradigms and subsequently building data-driven models to understand individual differences (Friedman et al., 2011; Miyake & Friedman, 2012). Separately, important efforts have been made in leveraging latent-variable approaches for symptom reports to model the structure of psychopathology (e.g., Hierarchical Taxonomy of Psychopathology, Conway et al., 2019; tripartite model, Clark & Watson, 1991). The novelty of the current approach lies in the focus on self-reported threat appraisal in different threat contexts and its application in pediatric anxiety. Interrogating a latent construct of threat appraisal may improve the reliability and robustness of findings in studies of pediatric anxiety; in turn, this could aid the development of biobehavioral models of pediatric anxiety that incorporate other levels of analysis such as neural circuitry. Note, however, that attempts at integration across domains or levels of analysis within factor analysis have produced mixed results, and further work is needed (e.g., Eisenberg et al., 2019; Peng et al., 2021; Venables et al., 2018).

There are also important limitations to this approach that should be discussed. First, using multiple tasks may not always be feasible for researchers. Even in the current study, only about half of participants who completed at least one of the tasks completed a number (two) that met our threshold for use in the latent-variable models. Second, the decision to include as many participants

as possible (i.e., participants who completed two or more of the eight tasks) decreased the number of participants in common between tasks, affecting the CFAs. We also combined two different measures of threat appraisal in the CFAs. However, the availability of large data sets and emphasis on collaborative, multisite studies with common measures may make this approach more viable. When possible, findings in smaller studies could also be examined in larger data sets with respect to replication. Third, there was a substantial time window between experimental tasks in this study. When working with emotionally evocative tasks, it can be challenging or unethical to complete multiple tasks in the same study session and potentially problematic in terms of carryover effects. Nevertheless, we believe that the strengths of this approach outweigh such limitations.

Where do we go from here? First, we hope that these findings encourage the use of more than one threat-appraisal task or measure whenever possible. Furthermore, because some threat-based paradigms appear to elicit appraisals more similarly to one another, this information could be used to inform task selection in future studies. In working toward increased replicability of findings, latent-variable approaches complement continued efforts to improve the psychometric properties of laboratory-based measures.

## Transparency

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**Rachel A. Bernstein:** Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Writing – original draft.

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**Kalina J. Michalska:** Investigation; Methodology; Writing – review & editing.

**Daniel S. Pine:** Conceptualization; Funding acquisition; Methodology; Project administration; Writing – original draft.

**Katharina Kircanski:** Conceptualization; Formal analysis; Methodology; Writing – review & editing.

*Declaration of Conflicting Interests*

The author(s) declared that there were no conflicts of interest with respect to the authorship or the publication of this article.

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## Supplemental Material

Additional supporting information can be found at http://journals.sagepub.com/doi/suppl/10.1177/21677026231190349

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