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A multiple levels of analysis examination of the performance goal model of depression vulnerability in preadolescent children

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Abstract

If performance goals (i.e., motivation to prove ability) increase children's vulnerability to depression (Dykman, 1998), why are they overlooked in the psychopathology literature? Evidence has relied on self-report or observational methods and has yet to articulate how this vulnerability unfolds across levels of analysis implicated in stress–depression linkages; for example, hypothalamic–pituitaryadrenal axis (HPA), sympathetic nervous system (SNS). Utilizing a multiple-levels-of-analysis approach (Cicchetti, 2010), this experimental study tested Dykman's goal orientation model of depression vulnerability in a community sample of preadolescents ($N = 121$, $M_{age} = 10.60$ years, *Range* = 9.08–12.00 years, 51.6% male). Self-reports of performance goals, attachment security, and subjective experience of internalizing difficulties were obtained in addition to objective behavioral (i.e., task persistence) and physiologic arousal (i.e., salivary cortisol, skin conductance level) responses to the Trier Social Stress Test (TSST) and two randomly assigned coping conditions: avoidance, distraction. Children with performance goals reported greater internalizing difficulties and exhibited more dysregulated TSST physiologic responses (i.e., HPA hyperreactivity, SNS protracted recovery), yet unexpectedly displayed greater TSST task persistence and more efficient physiologic recovery during avoidance relative to distraction. These associations were stronger and nonsignificant in the context of insecure and secure attachment, respectively. Findings illustrate a complex matrix of in-the-moment, integrative psychobiological relationships linking performance goals to depression vulnerability.

Keywords: coping, cortisol, depression, goal orientation, preadolescence

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Introduction

The ways children respond to stressful events in their daily lives is implicated in the development of psychopathology (e.g., depression; Grant et al., 2003; Zimmer-Gembeck & Skinner, 2016). Goal orientation theory suggests that the adaptiveness of a particular way of responding to stress in academic settings is determined in part by the kinds of goals (i.e., motivating reason) children adopt (Kaplan & Maehr, 2007). That is, children's responses to stressors and vulnerability to depressive problems may have less to do with *what* they are trying to achieve in academic settings and more to do with *why* (Dweck, 1999; Dykman, 1998). Evidence that goals and individual differences therein contribute to depressive problems for preadolescents (hereafter referred to as "children") is, however, limited. If children's goals increase vulnerability to depression, then this should be observable at *levels of analysis* (Cacioppo et al., 2000) with established links to depressotypic functioning (e.g., Cicchetti, 2016; Hankin, 2012). However, studies of this phenomenon are scarce and tend to examine different scales of goal-based vulnerability in isolation (cf. Sideridis, 2007). Research integrating information across levels of analysis (e.g., subjective experience, objective behavior, physiologic reactivity) may illustrate if and how such motivational vulnerability colors children's stress perceptions, manifests in despressotypic behavior, or takes hold in arousal function. Thus, the current study adopted a multiple-levels-of-analysis approach (Cicchetti, 2010) to test Dykman's (1998) goal orientation model of depression vulnerability in a community sample of children.

Performance goals and vulnerability to depression

Children's behavior in academic settings is driven by different goals, or higher-order motivating reasons that help guide behavioral efforts to manage stressors in education settings (Elliot & Thrash, 2002; Maehr & Zusho, 2009). Some children are driven by *mastery goals*, or the desire to *develop* competence and *improve* ability by learning new skills. Other children are driven by *performance goals*, or the desire to *demonstrate* competence and *prove* ability by showing others their aptitude. Dykman (1998) proposes that depression proneness associated with performance goals[1]

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[1]Performance goals in Dykman's (1998) model are referred to as "validation" goals and reflect a general preoccupation with demonstrating ability across domains. Some

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stems from the fundamental need to validate one's basic self-worth. Goal strivings of this sort are argued to result from excessively critical or conditionally approving caregiving experiences that contribute to a sense of uncertainty about one's self-worth. Performance goals are, thus, thought to be a compensatory attempt to solidify this fractured self-worth by striving to perform well in domains that hold promise for direct or symbolic praise or approval from others. For children in educational settings, these domains are often academic and social in nature. Attempts to validate self-worth take the form of seeking out external indicators of achievement (e.g., grades) and acceptance from others (e.g., friendships), indicators reflective of ability that forms the basis of self-worth (e.g., intelligence, likeability). To protect self-worth, children with performance goals narrow the focus of these attempts to arenas where success is likely (e.g., well-versed subjects, old friendships) and avoid situations or self-handicap (e.g., less persistence, withdraw effort) in arenas where success is uncertain (e.g., unfamiliar classwork, new friendships). As children with performance goals often feel their ability in a domain reflects their self-worth, they concern themselves with convincing others they are capable and avoid looking like they are incapable (Hong, Chiu, Dweck, Lin, & Wan, 1999).

Preadolescence may be a particularly ripe age for examining performance-goal-based vulnerabilities to depression. As students advance through grade school, they are increasingly exposed to new curricular content and classmates. As such, children are not always able to restrict performance to well-versed domains or familiar settings. Doubts about ability and, thus, self-worth are at times unavoidable. Preadolescence is a developmental window where this may particularly be the case, given that children typically face a litany of new academic and interpersonal stressors during this period (Spear, 2000). For children with performance goals, the prospect of experiencing academic or interpersonal setbacks may be particularly daunting. Evidence that performance-oriented individuals tend to experience internalizing problems (e.g., low self-esteem, sense of inadequacy) following novel stressors supports this claim (Dweck & Leggett, 1988; Lindsay & Scott, 2005; Robins & Pals, 2002; Turner, Thorpe, & Meyer, 1998).

Dykman's (1998) model is not unlike cognitive vulnerability models (e.g., Hankin & Abramson, 2001). As noted by Rothbaum, Morling, and Rusk (2009), each propose a set of vulnerable self-beliefs (e.g., stable/fixed views, self-worth implications) that give rise to involuntary stress responses (e.g., self-deprecating thoughts, rumination) in the wake of stressors with negative outcomes. There are, however, notable points of divergence. First, unlike cognitive vulnerability, performance goal vulnerability is *reinforced* (e.g., "I am valuable") by stressors with *positive* outcomes (e.g., passing a test), making it particularly insidious and pernicious in educational settings. That is, stressors with positive outcomes inadvertently strengthen the tie between ability and self-worth. Thus, while successes help children with performance goals appear healthy to others, they also covertly render them more vulnerable to depression when eventual difficulties navigating novel academic and interpersonal stressors arise. Second, cognitive vulnerability lies latent until triggered by stressors, while performance goal vulnerability is operative (i.e., "in motion") *prior to* stressors (Dykman, 1998). Thus, early identification may inform prevention efforts and support the design of more effective interventions for these vulnerable children.

argue that performance goals *are* validation goals, yet for a specific domains of ability (Baer, Grant, & Dweck, 2008; Dweck, 1999). Indeed, performance and validation goals are believed to stem from the same set of core vulnerable self-beliefs (e.g., ability is fixed and key to self-worth; Rothbaum, Morling, & Rusk, 2009).

Performance-goal-based vulnerability at multiple levels of analysis

If performance goals contribute to depression vulnerability, then this should be evident across levels of analysis with demonstrated links to depression in children (Cummings, El-Sheikh, Kouros, & Keller, 2007; Greaven, Santor, Thompson, & Zuroff, 2000; Lopez-Duran, Kovacs, & George, 2009; Owens et al., 2019). Objective behavioral evidence in support of this claim suggests that performance goals are associated with observed helpless responses (e.g., withdrawal of effort, less persistence, self-handicapping) to academic tasks (Anderman, Griesinger, & Westerfield, 1998; Elliot & Dweck, 1988; Grant & Dweck, 2003; ; Urdan, 2004; Urdan, Midgley & Anderman, 1998). However, despite theoretical premise (Dykman, 1998; Sideridis, 2005), evidence that performance goals contribute to physiologic hyper-arousal in response to stressors in academic settings is limited. Such information could help identify mechanisms by which performance goals contribute to vulnerability, given the well-established role stressor-induced physiologic dysregulation plays in risk for depression. Indeed, studies utilizing salivary cortisol and skin conductance level as indices of hypothalamic–pituitary–adrenal axis (HPA) and sympathetic nervous system (SNS) activity implicate hyper-reactivity in children's risk for depression (Cummings et al., 2007; Lopez-Duran et al., 2009).

The Trier Social Stress Test (TSST; Kudielka, Hellhammer, & Kirschbaum, 2007) is a laboratory-based stressor that may be useful in examining performance goals at multiple levels. The TSST resembles a school-based task that challenges children to show their academic (i.e., how smart they are) and social (i.e., how good a friend they are) skills in a novel context, ostensibly evaluating abilities that children with performance goals hold to be the basis of self-worth (e.g., intelligence, likeability). Second, in line with theory and the limited adult evidence that *normative* (i.e., "do better than the others") goals exert the most debilitating effects on physiologic arousal and performance (Grant & Dweck, 2003, Sideridis, 2008; Sideridis, Antoniou, & Simos, 2013), children are informed that a "panel of experts" (i.e., confederates unknown to the child) will judge how well they do relative to others in their grade. Being judged induces *socio-evaluative threat* (e.g., concern that some self-aspect could be negatively viewed), which elicits physiologic responses for children in general (Gunnar, Talge, & Herrera, 2009). For those with performance goals, knowing that this judgement (i.e., key to self-worth) will be made relative to others in their grade (i.e., normative goal induction) could contribute to dysregulated responses beyond socio-evaluative threat alone. Third, in line with views about *uncertainty* (i.e., not knowing how well one is doing relative to others) as a central feature of normative goal debilitating effects (Darnon, Harackiewicz, Butera, Mugny, & Quiamzade, 2007; Lambird & Mann, 2006; Sideridis et al., 2013), children are not given any evaluation criteria or feedback. That confederates withhold reassurance helps create the *uncontrollability* (e.g., cannot sway evaluation) element known to produce physiologic responses for the average child (Gunnar et al., 2009). For those with performance goals, not knowing how to sway the judges or how well

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they perform relative to others may particularly hinder engagement and increase arousal.

As per Dykman (1998), in the face of a stressor that casts doubt on ability to perform at desired levels, individuals with performance goals display cognitive (e.g., rumination), behavioral (e.g., withdraw effort), emotional (e.g., negative affect), and physiological (e.g., hyperarousal) responses to stress[2] associated with risk for depression. Thus, we anticipated that children with performance goals would exhibit depressotypic function across similar levels of analysis. At the subjective experience level, we expected children with performance goals to report greater internalizing problems and more predominant involuntary stress responses. We also expected that children with performance goals would view the TSST as more stressful and distressing and, thus, report greater subjective stress and negative affect in response to the TSST. At the objective behavior level, we expected children with performance goals to exhibit helpless responses to the TSST (i.e., withdrawing effort) in the form of less behavioral persistence[3] (i.e., less time speaking, fewer math responses). At the physiologic arousal level, we expected that performance goal driven concerns about demonstrating ability would manifest as HPA (i.e., salivary cortisol) and SNS (i.e., skin conductance level) hyperreactivity to the TSST.

Regulatory fit

Following a stressor, children rely on effortful coping (i.e., voluntary emotional, cognitive, and behavioral responses) to help them feel better (Connor-Smith et al., 2000). Children vulnerable to depression tend to use fewer engagement (e.g., active, approach-related) coping skills and rely more on disengagement (e.g., passive, avoidance-related) coping for this purpose (Compas et al., 2001). Yet, research suggests that engagement coping skills, like distraction, help children re-engage attention away from the source of stress towards productive or soothing activities, while disengagement coping strategies, like avoidance, inadvertently refocus their attention to the source of stress and contribute to negative thoughts and rumination that exacerbate and prolong (i.e., protracted recovery) rather than alleviate (i.e., efficient recovery) stress (Connor-Smith et al., 2000; Wenzlaff & Wegner, 2000). Indeed, negative thoughts and rumination are known to contribute to protracted physiologic recovery (Shull et al., 2016; Zoccola & Dickerson, 2012), a pattern implicated in children's risk for depression (Ji, Negriff, Kim, & Susman, 2016; Lopez-Duran et al., 2015).

If the above postulation is true, why do children vulnerable to depression tend to rely more on avoidance and less so on distraction? Several theories and programs of research implicate *regulatory fit* between children's goals, the vulnerable self-beliefs that back them, and resulting strategies (Higgins, 2005; Rothbaum et al., 2009). As per Dykman (1998), individuals with performance goals attempt to prove self-worth (e.g., show ability) when they are certain they are able and choose to protect self-worth (e.g., avoid showing inability) when they are uncertain if they are able. Thus, following stressors that cast doubt on their abilities, avoidance may provide optimal regulatory fit for children with performance goals. By helping these children evade potential demonstrations of incompetence, avoidance may help sustain, satisfy, and serve their motivation to protect self-worth. Avoidance for these children may also be egosyntonic and, thus, self-affirming because it aligns with the vulnerable self-beliefs that undergird their performance goals: ability is fixed, key to self-worth, and must be guarded in times of uncertainty. Still further, avoidance-related, inadvertent refocusing of attention towards the source of stress (e.g., negative thoughts, rumination) may also present certain benefits to these children. Specifically, avoidance-related rumination in the context of performance goals has been conceptualized a defensive form of self-handicapping that aligns with vulnerable self-beliefs and serves goals to protect self-worth (Higgins, Snyder, & Berglas, 1990; Rhodewalt & Vohs, 2005; Rothbaum et al., 2009). That is, rumination may permit children with performance goals to build a "mountain of evidence" that justifies the cessation of additional action and affirms how unlikely it is that further action will help prove self-worth (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008).

Conversely, following a stressor that brings ability into question, distraction may provide poor regulatory fit for children with performance goals. Distraction requires additional approach-related effort and engagement in productive or soothing activities in order to be effective and may, therefore, be at odds with these children's goals to avoid potentially showing any additional inabilities or further ineptitude (i.e., protect self-worth). Distraction may also be egodystonic, and, thus, self-alienating because it invalidates real concerns about appearing incompetent and feeling worthless. Additionally, distraction may limit how consumed these children may become in rumination (i.e., distraction's intended purpose) and ironically interfere with rumination's self-protective functions. Alternatively, rumination may hamper how subsumed these children may become in productive and soothing distraction activities (i.e., *regulatory interference*; Bendezú, Perzow, & Wadsworth, 2016) and inadvertently contribute to "backfire" effects (e.g., guilt, sense of failure) following difficulties with distraction (Compas et al., 1999; Kelly & Kahn, 1994).

If avoidance and distraction make differential contributions to regulatory fit as described, then this should be evident in the rate at which children's stress biomarkers return towards baseline (i.e., physiologic recovery). Wadsworth et al. (2018) extended the TSST methodology to test this proposition. According to Responses to Stress (RTS) theory (Connor-Smith et al., 2000), children's coping manifests in the recovery period following stressor exposure and influences physiological recovery efficiency. Relatedly, if performance goals are cognitive forms of regulation involved in the generation of overt behavior beyond biologically based responding (Elliot &Thrash, 2002), they may provide focus to children's effortful coping, guide attempts to manage involuntary stress reactivity, and therefor also be relevant to physiologic recovery. In the current study, children were primed with either distraction (e.g., engaging with toys, art supplies) or avoidance (e.g., children told to "Try your best not to think about your performance") coping immediately after the TSST. Given their tendency to ruminate and question self-worth in the wake of stressors that call ability into question (Grant & Dweck, 2003), we expected children with performance goals to display HPA (i.e., salivary cortisol) and SNS (i.e., skin conductance level) protracted recovery following the TSST. However, we also expected that their rates of

[2]These resemble involuntary engagement stress responses (e.g., rumination, intrusive thoughts, emotional/physiologic arousal, impulsive action) in Responses to Stress (RTS) theory (Connor-Smith et al., 2000).

[3]Behavioral persistence is often assessed in observational studies as time spent working on tasks which are, by design, impossible to accomplish (e.g., perfect circles, locked box; Ramsook, Benson, Ram, & Cole, 2019). In the current study, time spent speaking and completing mental arithmetic during the TSST arguably indexes behavioral persistence given that, by design, it was impossible for children to sway judges' evaluations or to know how well they performed.

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recovery would vary by coping condition, with avoidance contributing to optimal regulatory fit and efficient physiologic recovery and distraction contributing to poor regulatory fit and protracted physiologic recovery.

The moderating role of attachment security

Attachment theory may lend developmentally sensitive insight into performance-goal-based vulnerability and individual differences therein. Stressful events activate children's attachment system and trigger mental representations of themselves (i.e., *internal working models*; Vaughn et al., 2007) as worthy of being cared for by their attachment figures (Bowlby, 1973). Although each is independently associated with depression, it is possible that performance goals and attachment security synergistically contribute to depression vulnerability vis-à-vis their shared links to beliefs about self-worth (Lee & Hankin, 2009; Park, Crocker, & Mickelson, 2004). For children with performance goals and insecure attachment, demonstrating ability may function as regulatory attempts to seek reassurance of their self-worth *and* worthiness of care while concomitantly defending against an internalized sense of being worthless *and* unworthy of care. These children may also lack a secure base (i.e., responsive caregiver support) to fall back on to help repair damage to self-worth resulting from difficulties demonstrating competence.

Attachment theory may also help clarify why performance goals at times predict salutary outcomes in academic settings (Church, Elliot, & Gable, 2001; Elliot & McGregor, 1999; Harackiewicz, Barron, Carter, Lehto, & Elliot, 1997). When children receive the unconditional acceptance and care associated with secure attachment, their self-worth is generally less contingent across domains; i.e., *noncontingent self-worth* (Cassidy & Shaver, 2008; Crocker & Park, 2004). Thus, secure attachment may buffer performance-goal-related vulnerability by loosening the cognitive tie between ability and self-worth. Integrating Bowlby's (1979) and Dykman's (1998) positions, children with performance goals and secure attachment may be less susceptible to depression because demonstrations of competence are less reflective of their basic self-worth but also because they feel worthy of care when questions about competence rise.

The current study

The following aims and hypotheses are organized by level of analysis examined. Aim 1 examined performance goal to subjective experience associations. $\mathbf{H_{1a}}$: Performance goals will be positively associated with self- and parent-reported internalizing problems and involuntary stress responses. $\mathbf{H_{1b}}$: Performance goals will be positively associated with subjective stress and negative affect response to the TSST. $\mathbf{H_{1c}}$: Aim 1 associations will be weaker and stronger in the presence of secure and insecure attachment, respectively. Aim 2 examined performance goal to objective behavior associations. $\mathbf{H_{2a}}$: Performance goals will be negatively associated with behavioral persistence (operationalized as the length of time speaking and number of numeric responses given). $\mathbf{H_{2b}}$: Aim 2 associations will be weaker and stronger in the presence of secure and insecure attachment, respectively. Aim 3 examined performance goal to physiologic (i.e., HPA, salivary cortisol; SNS, skin conductance level) arousal associations. $\mathbf{H_{3a}}$: Performance goals will be positively associated with physiologic hyperreactivity (operationalized as strong positive linear change) to the TSST, and that this association would be weaker and stronger in the presence of secure and insecure attachment, respectively. $\mathbf{H_{3b}}$: Performance goals will be positively associated with physiologic protracted recovery (operationalized as weak negative linear change) after the TSST, and that this association would be weaker and stronger in the context of secure and insecure attachment, respectively. $\mathbf{H_{3c}}$: Children with performance goals will display more protracted (i.e., weaker negative) recovery in distraction and less protracted (i.e., stronger negative) recovery in avoidance, with weaker (i.e., less protracted in distraction, more protracted in avoidance) and stronger (i.e., more protracted in distraction, less protracted in avoidance) associations found in the context of secure and insecure attachment, respectively.

Methods

Participants

Fourth and fifth grade children ($N = 121$, $M_{age} = 10.56$ years, $SD = 0.68$, $Min = 9.08$, $Max = 12.00$, 51.6% male) and a parent (90.1% mothers) were recruited from suburban schools in the northeastern US. Median annual household income was $66,000.00; *Min* = $13,638.84, *Max* = $245,000.00. Most children (90.1%) and parents (92.6%) identified as White. The rest of the sample either identified as Asian (child = 2.5%, parent = 1.7%), American Indian/Alaska Native (child = 1.7%, parent = 0.0%), African American (child = 0.8%, parent = 0.0%), Other (child = 1.7%, parent = 0.0%), or declined to respond (child = 3.3%, parent = 5.8%).

Procedures

As outlined in Wadsworth et al. (2018), interested parents enrolled their child, provided consent, and completed questionnaires online: e.g., Behavior Assessment System for Children, 2nd Edition (BASC-2; Reynolds & Kamphaus, 2004), Pubertal Development Scale (PDS; Petersen, Crockett, Richards, & Boxer, 1988), Early Adolescent Temperament Questionnaire (EAT-Q; Capaldi & Rothbart, 1992). Children were then scheduled for their 95 min in-person experiment which took place one to two weeks following parents' online enrollment, consent, and questionnaire completion. Parents were instructed to arrive five minutes early for assenting procedures and to have their children refrain from brushing their teeth, consuming a large meal, dairy, or sugary and acidic foods within an hour of their scheduled arrival time. Parents were reminded of these instructions via phone call and email the day before their appointment. To minimize time-of-day effects and related diurnal variation in cortisol (e.g., Perry, Donzella, Parentau, Desjardins, & Gunnar, 2019), appointments were scheduled in the afternoon within 30 min of each other (i.e., 3:30 pm, 4:00 pm, 4:30 pm). A timeline of the experimental procedure is depicted in Figure 1. At each of seven time points (T1–T7), saliva samples were collected via passive drool into vials and electrodermal activity (EDA) time stamps were created via button press on a wireless sensor. Upon arrival, families were greeted by an experimenter (i.e., doctoral student of child clinical psychology) assigned to work with the child for the duration of the protocol. This experimenter escorted family to a "home base" data collection room. The child briefly rinsed their mouth with bottled water and provided assent while the parent reviewed the online consent. Afterward, the parent walked to the lobby and remained there for the duration of the visit. Then, the experimenter placed a wireless sensor on the child's nondominant ankle, collected a saliva sample, and

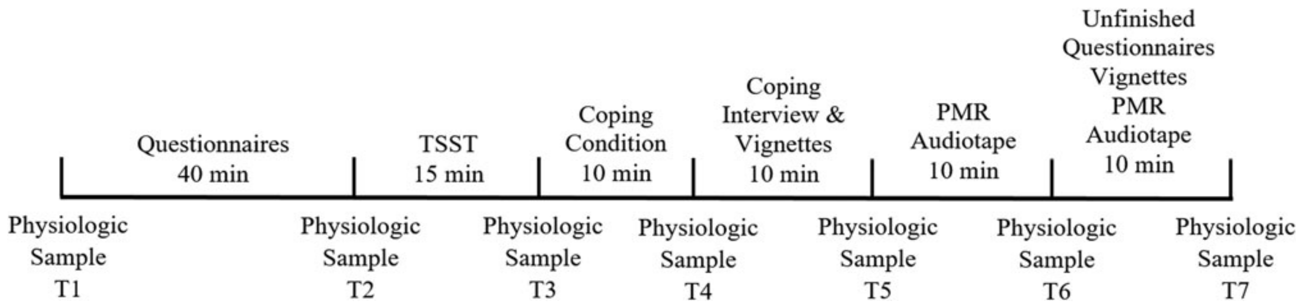

Figure 1. Annotated timeline of the 95 min experimental protocol. TSST denotes the Trier Social Stress Test. PMR denotes the audiotaped progressive muscle relaxation exercise.

created a time stamp (T1). Next, the experimenter administered questionnaires to the child in the following order: BASC-2 (Reynolds & Kamphaus, 2004), Responses to Stress Questionnaire (RSQ; Connor-Smith et al., 2000), Security Scale (Kerns, Klepac, & Cole, 1996), and Patterns of Adaptive Learning Survey (PALS, Midgley et al., 2000). Afterward, the experimenter collected/ created a second sample/time stamp (T2). Children were then escorted by the experimenter to a separate room (15 s) to complete a videotaped TSST, where children were instructed to prepare (5 min) and verbally deliver (5 min) a speech (i.e., describing themselves and why they should be liked to an imaginary audience of new teachers and classmates on the first day of school) as well as count backwards by 3 from 301 (5 min) in front of a "panel of experts" (i.e., confederates unknown to participants and unaware of coping condition). As recommended (Kudielka et al., 2007), confederates remained unresponsive (i.e., maintained neutral affect, no facial or verbal feedback) and limited interactions to (a) prompting the child if their speech ended before 5 min (e.g., after 20 s of silence, "Please continue your speech as there is still time left") and (b) interrupting the child each time they made a math error (e.g., "That's incorrect. Please start at 301"). Afterward, children walked back to home base with their experimenter (15 s). A third sample/ time stamp was collected/created (T3). Children were then escorted (15 s) to one of two rooms (10 min): a distraction room ($n = 62$) with musical instruments, art supplies, and toys placed on a table where they were asked to sit and invited to play with the materials if they wished, and an avoidance room ($n = 59$) free of distractions where they were prompted to sit at a table and try not to think about their performance.[4] Children were randomized to coping condition within gender.[5] Study staff were not privy to the results of this process. After the coping condition, children walked back to home base with their experimenter (15 s) and a fourth sample/time stamp was collected/created (T4). Children were then interviewed (i.e., 10 Likert-type items, six free response questions) by the experimenter about their TSST and coping experiences (5 min) and responded to three coping vignettes (5 min). A fifth sample/time stamp was collected/created (T5). Next, children and their experimenter sat, listened, and moved to a progressive muscle relaxation (PMR) audio tape (10 min).[6] A sixth sample/time stamp was collected/created (T6). Next, the experimenter administered remaining questionnaires or vignettes,[7] after which the child was invited to listen to the PMR tape (10 min). Then, a seventh saliva sample/time stamp was collected/recorded (T7). Children were debriefed and families received $50 for participating.

Measures

Child performance goal orientation

Children completed selected subscales (n items = 14) of the PALS (Midgley et al., 2000). The measure contains scales for performance-approach (e.g. "One of my goals is to look smart in comparison to the other students in my class") and performance-avoidance goal orientation (e.g. "One of my goals is to keep others from thinking I'm not smart in class") with items measured on a 1 (*not at all true*) to 5 (*very true*) scale. Performance-approach and performance-avoidance factor scores were strong positively correlated ($r = .57$). In keeping with study aims and theoretical premise (Dykman, 1998), we created a robust index of performance orientation by aggregating both performance factor scores (Mesa, 2012; Murdock, Miller, & Goetzinger, 2007).[8] The resulting performance goal orientation factor demonstrated adequate internal consistency ($\alpha = 0.83$).

Child attachment security

Children completed the Security Scale (Kerns et al., 1996), a 15-item measure assessing children's perceptions of (a) their mother as responsive and available, (b) their tendency to rely on her for help in the face of stress, and (c) their ease of communicating thoughts and feelings to her. For each item, children rated one of two statements (e.g., "Some kids find it easy to trust their mom BUT other kids are not sure if they can trust their mom") as either sort of true or really true. Items scores

[4]Coping conditions were developed by one of the founders of RTS theory and designed to reflect the distraction (e.g., "I keep my mind off stressors by doing something I enjoy") and avoidance (e.g., "I try not to think about the stressor, to forget all about it") subscale factors in the RSQ (Connor-Smith et al., 2000).

[5]Demographic and study variables did not significantly vary across conditions (all $p > .05$).

[6]PMR helped minimize potential risks to psychological well-being as per our Institutional Review Board (IRB) and ensure the TSST and/or coping manipulation did not have linger effects on children. Prior TSST studies utilizing recovery-phase manipulations (e.g., rumination, distraction) have used similar post coping condition methods (e.g., 35-min calming movie, Shull et al., 2016; 45-min relaxing reading, Zoccola, Figueroa, Rabideau, Woody, & Benencia, 2014).

[7]One child completed unfinished questionnaires and three children completed unfinished coping vignettes during this period. Removing these children from analyses did not alter study conclusions. Thus, these children were retained in final analyses.

[8]The decision to create a performance goal composite was also guided by theoretical reconceptualization (Grant & Dweck, 2003) and supporting physiologic evidence (e.g., electroencephalographic, electromyographic, and blood volume pulse; Sideridis et al., 2013) that the pernicious effects of performance goals may be more attributable to their association with normative evaluations and less so to the approach-avoidance distinction (Elliot & Church, 1997).

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(1–4) were averaged, with higher scores indicating greater secure attachment. This composite demonstrated adequate internal consistency ($\alpha = 0.88$).

Child internalizing problems

The BASC-2 (Reynolds & Kamphaus, 2004) was used to assess child depressive problems. The BASC-2 is a multidimensional assessment that measures both clinical and adaptive aspects of behavior and personality. Children completed the Self Report of Personality—Child (SRP-C, ages 8–11 years, n items = 139) and parents completed the Parent Rating Scales—Child (PRS-C, ages 6–11 years, n items = 160).[9] The SRP and PRS are reliable and valid measures of psychopathology and problem behavior with internal consistency ranging from 0.83 to 0.90 and 0.76 to 0.95 for the SRP and PRS, respectively. In an effort to use multiple informants and reduce the number of tests performed, the SRP and PRS Internalizing broadband scales were used as robust indices of depressotypic function of interest to the current investigation (e.g., depression, low self-esteem, inadequacy). T-scores with combined gender norms were used to ensure the scale integrity.

Child involuntary engagement stress responses

Children (i.e., self-report) and parents (i.e., parent-report of child) completed the RSQ—Social Stress (Connor-Smith et al., 2000). The RSQ has 57 items and 19 subscales, which are often combined to form three effortful coping and two involuntary stress response factors. In an effort to use multiple informants and reduce the number of tests performed, the child- ($\alpha = 0.92$) and parent-reported ($\alpha = 0.88$) involuntary engagement stress response factors were used as robust indices of depressotypic involuntary stress responses: rumination (e.g., "I can't stop thinking about how I feel or what happened"), intrusive thoughts (e.g., "I keep remembering what happened"), emotional (e.g., "I feel upset right away, my thoughts start racing") and physiologic arousal (e.g., "Heart races, breathing speeds up, muscles get tight"). Connor-Smith et al. (2000) noted that children often endorse either high or low overall levels across items. To control for this variation in item endorsement base rates, factor scores were divided by the sum of all five factors (Connor-Smith et al., 2000), with final ratio scores reflecting the proportion of children's responses to social stress allocated to involuntary engagement stress responses.

TSST negative affect

Prior to (T2) and following (T3) the TSST, subjective emotion ratings were collected to assess whether the TSST successfully induced negative affect. Children were asked to rate the extent to which they presently identified with six feeling items (i.e., Nervous, Sad, Angry, Happy, Excited, Surprised) using a scale ranging from 1 (*not at all*) (1) to 5 (*very*). Negative affect scores were computed by aggregating nervous, sad, and angry ratings ($\alpha = 0.70$). A difference score was computed by subtracting T2 from T3 negative affect scores.

TSST perceived stressfulness

During the coping interview, three items were used to assess children's perceptions of the stressfulness the TSST: "How stressful was it to prepare the speech, knowing that you then had to give it in front of an audience?", "How stressful was it to be giving the speech in front of the video camera and panel of experts?", "How stressful was it to be doing subtraction in front of the video camera and panel of experts?". Children rated perceived stress on 5-point scale from 1 (*not at all stressful*) to 5 (*very stressful*). TSST total perceived stressfulness was captured with a composite formed by aggregating scores on all three items.

TSST behavioral persistence

Children's behavior during the TSST was video-recorded. Subsequently, children's speech delivery was coded in 5-s epochs (e.g., 0 = *criteria not met*, 1 = *criteria met*). Children's numeric responses when completing the mental subtraction task were also coded. The total time spent delivering the speech as well as total number of numeric responses to the subtraction task were considered indices of behavioral persistence.

Salivary cortisol

Seven saliva samples were collected via passive drool (Davis, Bruce, & Gunnar, 2002), stored at −20° C in a medical grade ultra-low temperature freezer, and transported on dry ice to the Biomarker Core Lab at Penn State University (Biobehavioral Health Department). Cortisol levels were determined using a commercial expanded-range high-sensitivity enzyme immunosorbent assay kit. Cortisol extraction was run in duplicate and batched in the same order as random assignment. The intra-assay and inter-assay coefficients of variation were 2.0% and 10.2%, respectively.

Skin conductance level

EDA was assessed during the experimental procedure using Affectiva technology (Q Sensor, Affectiva Inc., Waltham, MA). The Q Sensor is a wireless sensor designed to continuously assess EDA in naturalistic settings. As an ambulatory assessment tool, the Q Sensor also collects continuous motor movement (tri-axial accelerometer) data permitting adequate statistical control. The Q Sensor sample rate was 8 Hz and results are provided in microSiemens (mS). Tonic skin conductance level was calculated using Mindware EDA 3.1, with rolling filter (block size = 16) applied, for seven phases: T1 to T1 + 1 min, T1 + 1 min to T2, T2 to T3, T3 to T4, T4 to T5, T5 to T6, T6 to T7.

Covariates

Child gender (0 = male, 1 = female) and family income-to-needs ratio (INR) were included as covariates in all analyses. INR is an index of annual household income relative to national poverty norms. INR between 2.0 and 4.0 and an INR of 1.0 indicates middle-income and poverty, respectively (Evans & Marcynyszyn, 2004). In this sample, median INR was 3.01. Given their established associations with HPA and SNS function, pubertal status (Susman et al., 2010; van den Bos, de Rooij, Miers, Bokhorst, & Westenberg, 2014) and medication use (Granger, Hibel, Fortunato, & Kapelewski, 2009; Rohleder & Nater, 2009) were included as covariates in Aim 3 analyses. Pubertal status was assessed with the Pubertal Development Scale—Parent (Petersen et al., 1988). Girls' status was indexed by menarche, height, body hair growth, and breast growth ($\alpha = 0.71$). Boys' status was indexed by voice changes, height, body and facial hair growth ($\alpha = 0.34$).[10] As suggested (Granger et al., 2009; Rohleder & Nater, 2009), medications were rated (e.g., 0 = *not*

[9]One child (12.00 years of age) was outside the BASC-2 age range. Removing this child from the BASC-2 analyses did not alter study conclusions. Thus, the child was retained in final analyses.

[10]Male indicator values were low relative to those reported in Petersen et al. (1988): voice deepening ($M = 0.13$, $SD = 0.43$), growth spurt ($M = 1.19$, $SD = 0.80$), facial hair

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plausible, 1 = *plausible*, 2 = *very plausible*) across a series of identified pathways by which they may have influenced the HPA, SNS, and/or their assessment. The total score across all medication ratings was used.[11] For SNS analyses, movement (i.e., sum of absolute values of change in tri-axial motion over the course of the experimental protocol; O'Haire, McKenzie, Beck, & Slaughter, 2015) was also covaried. To maintain consistency across models within their respective study aims and given their conceptual and empirical associations with outcome variables of interest, covariates were retained despite statistical nonsignificance.

Data preparation

Preprocessing

Of the 1,694 possible physiologic samples (i.e., 121 participants with up to seven samples each across two physiologic variables), 35 values (cortisol, $n = 17$; skin conductance level, $n = 18$) were ± 3 *SD*s from the sample mean, removed, and set to missing (Hill-Soderlund et al., 2008; van den Bos et al., 2014). Children missing greater than 85% data on a given physiologic indicator (cortisol, $n = 3$; skin conductance level, $n = 8$) were excluded from analyses. Excluded children did not significantly differ from the final analysis sample ($N = 110$) on any study variables (all $p > 0.05$). Of the 110 participants, 104 had complete cortisol data, three with five samples, and three with four samples. Also, 102 participants had complete skin conductance level data, two with six samples, three with five samples, and one with four samples. Physiologic variable values remained positively skewed and fourth-root transformations helped normalize that data (Miller & Plessow, 2013). Log_{10} or *ln* transformations were used to normalize skewed subjective experience and objective behavior data (Mosteller & Tukey, 1977).

Manipulation check

During the coping interview, children were asked eight open-ended questions about what they did in their coping rooms to make the situation or themselves feel better, even if they felt it did not work. Using the *Responses to Stress Coding Manual for In Vivo Coping* (Wadsworth, 2013), raters masked to coping condition coded the free responses (yes/no) for distraction (e.g., "I drew a tiger and colored", "I played with the keyboard and Legos") and avoidance (and/or associated intrusive thoughts) strategies (e.g., "Tried to get the speech out my head", "Tried not to think about how I did but I kind of did anyways"). Two raters' coding of 20% of these responses were used to establish reliability ($\kappa = 0.91$). The relationship between children's coping condition and reported strategies was significant, χ^2 (1, 109) = 52.52, $p < 0.05$, suggesting that children complied with the distraction (91%) and avoidance (78%) prompts.

Missing data

Missing value analysis was conducted for all key demographic and study variables in the final sample. Little's (1988) missing completely at random (MCAR) test was nonsignificant; $\chi^2(888) = 938.27$ $p = 0.12$. Thus, the data could be MCAR. Markov Chain Monte Carlo (MCMC) multiple imputation methods (PROC MI, SAS 9.4) were used to avoid power loss related to listwise deletion and maintain consistency of both missing data methods and the analysis sample across the study aims.[12] As only 2.22% of total data values were missing, the standard five imputations were performed which included all variables used across the three study aims. Pooled parameter estimates were generated using PROC MIANALYZE (SAS 9.4).

Overview of analyses

Aims 1 and 2

Fisher's *Z*-adjusted partial correlations (PROC CORR, SAS 9.4) were used to examine performance goals, subjective experience (H_{1a}, H_{1b}), and objective behavior (H_{2a}) bivariate effects. Multiple regression (PROC REG, SAS 9.4) was used to test performance goal by attachment security interactive effects on subjective experience (H_{1c}) and observed behavior (H_{2b}). Interactions were computed and probed (Johnson–Neyman technique) as per Hayes (2013).

Aim 3

Fisher's *Z*-adjusted partial correlations (PROC CORR, SAS 9.4) were used to examine bivariate associations between performance goals and physiologic arousal indices. Physiologic reactivity (H_{3a}) and recovery (H_{3b}) patterning were analyzed with piecewise growth (i.e., linear reactivity–linear recovery) multilevel models (MLM) (PROC MIXED, SAS 9.4). Baseline indices for SNS (T1) and HPA (T2) biomarkers differed as SCL reactivity can be observed within moments of stress exposure, whereas the appearance of SC in saliva is typically delayed by 15–20 min (De Kloet, Joëls, & Holsboer, 2005). For this reason, T3 SCL (15 min after the TSST start time—hence, indexing SNS reactivity during the 15 m TSST) and T4 SC (25 min after the TSST start time—hence, indexing HPA reactivity 5–10 min into the TSST) indexed peak reactivity, whereas T3-T7 SCL and T4-T7 SC reflect recovery and children's coping efforts (De Kloet et al., 2005). First, within-child variation in Level 1 physiologic response was modeled as a function of intercept, linear reactivity phase sample time, linear recovery phase sample time, and error variance. Second, likelihood ratio chi-square difference tests comparing random intercept, random intercept and linear reactivity slopes, and random intercept and linear reactivity and recovery slopes models were conducted in order to determine the significance of person-specific variation in within-person physiologic response patterns. Third, identified significant between-child variation in Level 1 intercept, linear reactivity, and linear recovery (i.e., cross-level interactions) for the physiological variable of interest was modeled as a function of Level 2 covariates, performance goals, attachment security, performance goals by attachment security interaction, and residual unexplained person-specific deviations (i.e., random effects). To test regulatory fit predictions (H_{3c}), between-child variation in Level 1 linear recovery was modeled as a function of Level 2 coping condition, performance goal by coping condition, attachment security by coping condition, and performance goal by attachment security by coping condition terms. Models were conducted with Kenward–Rogers corrected degrees of freedom. Covariates and predictors (except coping condition) in the cross-level interactions were grand-mean centered.

growth ($M = 0.08$, $SD = 0.28$), body hair growth ($M = 0.43$, $SD = 0.64$). Removing scale items did not improve α levels.

[11]Four parents reported their child took steroid-based medication. Removing these participants from analyses did not alter conclusions. Thus, these children were retained in the final analyses.

[12]When deleted listwise in Aims 1 and 2, discrepancies in the number of participants included in each study aim analysis sample were noted: Aim 1 ($N = 96$), Aim 2 ($N = 82$), Aim 3 ($N = 110$).

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Nonsignificant higher order interaction terms (e.g., for reactivity, performance goals by attachment security; for recovery, performance goal by attachment security by coping condition) were trimmed to examine lower order main and interactive effects that may have been masked.

Results

Results are ordered by the study aims and hypotheses. Descriptive statistics and bivariate associations are presented in Tables 1 and 2. Multiple regression results are presented in Tables 3 and 4. MLM results are presented in Tables 5 and 6. When performance goals, attachment security, and/or coping condition interacted to predict the outcome of interest, we interpreted the contribution of lower order effects within the context of the significant higher-order interaction.

Aim 1: Performance goals and subjective experience

H_{1a}: As expected, performance goals were positively associated with self-reported internalizing problems, $r = .45$, $p < .05$, and involuntary engagement stress responses, $r = .42$, $p < .05$ (Table 1). Contrary to expectation, no significant bivariate performance goal to parent reported internalizing problems and involuntary engagement stress responses emerged. **H_{1b}:** As expected, performance goals were positively associated with subjective stress, $r = .22$, $p < .05$, and negative affect, $r = .19$, $p < .05$, in response to the TSST (Table 1). **H_{1c}:** As expected, performance goal by attachment security interactions predicting subjective experience indices were significant or trended towards significance (Tables 3 and 4): self-reported internalizing problems, $B = -1.37$, $SE = 0.67$, $p < .05$, parent-reported internalizing problems, $B = -2.55$, $SE = 1.20$, $p < .05$, TSST perceived stressfulness, $B = -0.63$, $SE = 0.32$, $p < .05$, TSST negative affect, $B = -0.10$, $SE = 0.06$, $p = .08$. Johnson–Neyman (J–N) plots (Hayes, 2013) revealed a similar pattern for each interaction (Figures 2 and 3). Specifically, increases in the strength of the positive association between performance goals and subjective experience indices were observed at incrementally lower levels of attachment security. At higher levels of attachment security, the association between performance goals and subjective experience indices became nonsignificant. Contrary to expectation, no significant performance goal by attachment security interactions predicting self- or parent-reported involuntary stress responses emerged. For covariates, family INR was negatively associated with TSST perceived stressfulness, $B = -16.04$, $SE = 6.27$, $p < .05$. Also, girls reported greater TSST negative affect response, $B = 0.23$, $SE = 0.10$, $p < .05$.

Aim 2: Performance goals and objective behavior

H_{2a}: Contrary to expectation, the performance goal to TSST math persistence bivariate association was nonsignificant. Also, performance goals were positively associated with TSST speech persistence,[13] $r = .36$, $p < .05$ (Table 1). **H_{2b}:** Contrary to expectation, the performance goal by attachment security interaction predicting TSST speech persistence was nonsignificant. Also, though a significant performance goal by attachment security interaction predicting TSST math persistence emerged as anticipated, $B = -5.58$, $SE = 2.18$, $p < .05$ (Table 4), the direction of the effect was opposite that expected (Figure 3c). The J-N plot showed increases in the strength of the positive relation between performance goals and TSST math persistence at incrementally lower levels of attachment security. At higher attachment security levels, the association between performance goals and TSST math persistence became nonsignificant. To better understand this effect, performance goals were plotted as the moderator of the attachment security and TSST math persistence relation (Figure 3d). The J–N plot showed increases in the strength of the positive association between attachment security positive effects on TSST math persistence at incrementally lower performance goal levels. To better illustrate this effect, simple slopes point estimates for a hypothetical child ("A") with 90th percentile performance goal and 10th percentile attachment security scores and a hypothetical child ("B") with 10th percentile performance goal and 90th percentile attachment security scores were examined.[14] Compared to hypothetical child "A", *simple slope* = 5.43, $SE = 1.89$, $p < .05$, hypothetical child "B" gave nearly four times as many responses during the math segment of the TSST, *simple slope* = 21.60, $SE = 7.98$, $p < .05$.

Aim 3: Performance goals and physiologic arousal

The Level 1 model of within-person change for both cortisol and skin conductance levels yielded significant main effects for linear reactivity (cortisol, $B = 0.03$, $SE = 0.01$, $p < .05$; skin conductance level, $B = 0.15$, $SE = 0.01$, $p < .05$) and linear recovery (cortisol, $B = -0.02$, $SE = 0.01$, $p < .05$; skin conductance level, $B = -0.03$, $SE = 0.01$, $p < .05$), suggesting that cortisol and skin conductance levels increased and decreased in linear fashion during reactivity and recovery phases, respectively. For cortisol and skin conductance level, models with random intercepts, linear reactivity, and linear recovery slopes best fit the data, relative to models with random intercepts only (cortisol, χ^2 (5) = 289.46, $p < .05$; skin conductance level, χ^2 (5) = 493.16, $p < .05$) and random intercepts and linear reactivity slopes (cortisol, χ^2 (3) = 65.92, $p < .05$; skin conductance level, χ^2 (3) = 109.14, $p < .05$). For cortisol and skin conductance level, significant random variance in intercepts (cortisol, $\sigma_0^2 = 0.01$, $SE = 0.01$, $p < .05$; skin conductance level, $\sigma_0^2 = 0.06$, $SE = 0.01$, $p < .05$), linear reactivity (cortisol, $\sigma_1^2 = 0.01$, $SE = 0.01$, $p < .05$; skin conductance level, $\sigma_1^2 = 0.01$, $SE = 0.01$, $p < .05$), and linear recovery (cortisol, $\sigma_2^2 = 0.01$, $SE = 0.01$, $p < .05$; skin conductance level, $\sigma_2^2 = 0.01$, $SE = 0.01$, $p < .05$) slopes emerged. Thus, we modeled variation in these parameters as a function of Level 2 predictors.[15]

H_{3a}: A significant performance goal, attachment security, and linear time interaction emerged, $B = -0.01$, $p < .05$ (Table 5), explaining 6% of the variance in cortisol linear reactivity. As expected, children with performance goals and insecure attachment displayed more hyperreactive cortisol trajectories, characterized by a stronger positive linear pattern (Figure 4a). In contrast, cortisol reactivity for children with performance goals and secure

[13]To control for contributions child extraversion may have made to TSST speech behavioral persistence, three subscales from the parent-reported Early Adolescent Temperament Questionnaire (EAT-Q; Capaldi & Rothbart, 1992) were additionally covaried in regression models: Surgency, Affiliation, and Shyness (reverse-coded). Statistical significance was retained.

[14]Percentiles help depict moderator effects within the range of the observed data (Hayes, 2013).

[15]For cortisol, nonsignificant intercept–linear recovery and linear reactivity–linear recovery covariance estimates emerged. Constraining these to zero did not change results or conclusions.

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Table 1. Descriptives and partial correlations for performance goals, subjective experience, and objective behavior

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Performance goals	—									
2. Attachment security	−.09	—								
3. BASC self-report internalizing problems	.45*	−.44*	—							
4. BASC parent-report internalizing problems	.05	.03	.24*	—						
5. RSQ self-report involuntary stress response	.42*	−.38*	.64*	.25*	—					
6. RSQ parent-report involuntary stress response	.03	.06	.20*	.60*	.22*	—				
7. TSST perceived stressfulness	.22*	−.01	.31*	.31*	.12	.34*	—			
8. TSST negative affect	.19*	.13	.17	.32*	.07	.21*	.35*	—		
9. TSST speech behavioral persistence	.36*	.12	.15	.07	.12	.03	.07	.17	—	
10. TSST math behavioral persistence	.15	.09	.11	.02	.16	−.07	−.06	.17	.25*	—
M	6.14	3.34	45.97	52.63	0.23	0.26	10.76	0.49	41.06	26.22
SD	1.84	0.48	7.45	11.17	0.04	0.05	3.09	0.52	12.47	18.69
Min	2.00	1.87	36.00	31.00	0.12	0.13	5.00	−0.25	1.00	0.00
Max	10.00	4.00	81.00	92.00	0.34	0.41	15.00	2.33	60.00	72.00

Note. $N = 110$; BASC = Behavior Assessment System for Children; RSQ = Responses to Stress Questionnaire, TSST = Trier Social Stress Test.
*$p < .05$.

attachment was characterized by a weaker positive linear pattern (Figure 4b). To better understand this effect, simple slopes point estimates for a hypothetical child ("A") with 90th percentile performance goal and 10th percentile attachment security scores and a hypothetical child ("B") with 10th percentile performance goal and 90th percentile attachment security scores were examined. Compared to hypothetical child "A", *simple slope* = 0.07, $SE = 0.02$, $p < .05$, child "B" exhibited more moderate positive linear cortisol reactivity, *simple slope* = 0.04, $SE = 0.01$, $p < .05$. No significant performance goal on skin conductance level reactivity effects emerged (Table 6).

H_{3b}: A significant performance goal, attachment security, and linear time interaction emerged, $B = -0.01$, $p < .05$ (Table 5), explaining 6% of the variance in cortisol linear recovery. Cortisol recovery trajectories for children with performance goals and insecure attachment were characterized by a strong negative linear pattern (Figure 4a). In contrast, cortisol recovery trajectories for children with performance goals and secure attachment were characterized by a weak negative linear pattern (Figure 4b). As attachment-security-based individual differences in performance goal to cortisol reactivity associations were observed, it was necessary to gauge cortisol protracted recovery with respect to those observed in reactivity. To do so, we calculated the difference in absolute magnitude of reactivity and recovery simple slopes at 10th and 90th performance goal and attachment security percentile values, with lower and higher difference scores signaling less and more protracted recovery, respectively. Children with performance goals and insecure attachment displayed more protracted recovery (i.e., difference score = 0.04) relative to children with performance goals and secure attachment (i.e., difference score = 0.00).

For skin conductance level, a significant performance goal by linear time interaction emerged, $B = 0.01$, $p < .05$ (Table 6), explaining 5% of the variance in skin conductance level linear recovery. As predicted, children with higher performance goal orientation displayed more protracted skin conductance level recovery, characterized by a weaker negative linear pattern (Figure 5). Conversely, skin conductance level recovery for children with lower performance goal orientation was less protracted, characterized by a stronger, negative linear pattern.

H_{3c}: A significant interaction between performance goals, coping condition, and linear time emerged, $B = 0.01$, $p < .05$ (Table 6), explaining 6% of the variance in cortisol linear recovery. As expected, children with higher performance goal orientation demonstrated more protracted cortisol recovery (i.e., weaker negative linear pattern) in the distraction condition and less protracted cortisol recovery (i.e., stronger negative linear pattern) in the avoidance condition (Figure 6a). The opposite was true for children with lower performance goal orientation, with less protracted cortisol recovery (i.e., stronger negative linear pattern) in the distraction condition and more protracted cortisol recovery (i.e., weaker negative linear pattern) in the avoidance condition (Figure 6b). No significant skin conductance level regulatory fit effects emerged.

Discussion

Utilizing an innovative experimental design, the current study examined Dykman's (1998) goal orientation model of depression vulnerability at multiple levels of analysis (Cicchetti, 2010) in a community sample of preadolescent boys and girls. A summary of the study aims, hypotheses and results are presented in

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Table 2. Descriptives and partial correlations for performance goals and physiologic arousal

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	*M*	*SD*	*Min*	*Max*
1. Performance goals	—	−.07	−.05	.12	.05	.12	.10	.10	.19*	.20*	—	—	—	—
2. Attachment security	−.07	—	.16	.04	.11	−.02	−.01	−.02	−.04	−.04	—	—	—	—
3. Coping condition[a]	−.05	.16	—	.01	−.04	.02	.10	.10	.09	.06	—	—	—	—
4. Physio Sample T1	.03	.22*	.01	—	.74*	.65*	.59*	.57*	.56*	.56*	0.21	0.28	0.01	1.32
5. Physio Sample T2	−.08	.13	.03	.62*	—	.84*	.80*	.79*	.77*	.76*	0.52	0.53	0.01	2.47
6. Physio Sample T3	−.03	.18	.14	.59*	.78*	—	.93*	.88*	.84*	.85*	0.73	0.64	0.01	3.10
7. Physio Sample T4	.03	.01	.09	.25*	.40*	.61*	—	.95*	.87*	.87*	0.68	0.63	0.01	2.61
8. Physio Sample T5	.04	.01	.08	.29*	.39*	.56*	.94*	—	.93*	.89*	0.52	0.47	0.01	2.17
9. Physio Sample T6	.06	.02	.10	.34*	.43*	.60*	.86*	93*	—	.97*	0.48	0.42	0.01	2.01
10. Physio Sample T7	.05	.04	.11	.38*	.45*	.65*	.80*	.87*	.94*	—	0.49	0.45	0.01	2.18
M	6.14	3.34	0.49	0.09	0.08	0.09	0.13	0.12	0.10	0.09				
SD	1.84	0.48	0.50	0.07	0.07	0.06	0.09	0.11	0.09	0.08				
Min	2.00	1.87	0.00	0.01	0.01	0.01	0.02	0.01	0.01	0.01				
Max	10.00	4.00	1.00	0.36	0.37	0.46	0.42	0.49	0.59	0.62				

Note. $N = 110$; Coping condition coded 0 (avoidance) and 1 (distraction). T = Time. Coefficients above the diagonal reflect correlations for skin conductance level. Coefficients below the diagonal reflect correlations for cortisol. Descriptives to the right of the correlation matrix correspond to skin conductance level. Descriptives underneath the correlation matrix correspond to cortisol.

[a] = Spearman's rho.

*$p < .05$.

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Table 3. Parameter estimates (standard errors) for multiple regressions predicting subjective experience of internalizing problems and involuntary engagement stress responses

	Self-report		Parent-report	
Independent variables	BASC internalizing problems	RSQ involuntary engagement stress response	BASC internalizing problems	RSQ involuntary engagement stress response
Covariates				
Child gender (0 = boys, 1 = girls)	0.91 (1.22)	0.01 (0.01)	3.16 (2.17)	−0.01 (0.01)
Family income-to-needs ratio	−0.72 (12.93)	0.05 (0.08)	41.38 (22.53)	−0.07 (0.11)
Predictors				
Performance goals	1.47* (0.33)	0.01* (0.01)	0.40 (0.60)	0.01 (0.01)
Attachment security	−6.42* (1.31)		0.66 (2.35)	
Performance goals × attachment security	−1.37* (0.67)		−2.55* (1.20)	
R^2	0.38	0.15	0.10	0.01
F	11.02	5.28	1.93	1.03

Note. $N = 110$; BASC = Behavior Assessment System for Children; RSQ = Responses to Stress Questionnaire.
$^*p < .05$.

Table 4. Parameter estimates (standard errors) for multiple regressions predicting subjective experience of and objective behavior in response to the Trier Social Stress Test (TSST)

Independent variables	TSST perceived stressfulness	TSST negative affect	TSST speech persistence	TSST math persistence
Covariates				
Child gender (0 = boys, 1 = girls)	0.98 (0.58)	0.23* (0.10)	4.40 (2.49)	−3.11 (3.94)
Family income-to-needs ratio	−16.04* (6.27)	−0.59 (1.10)	0.15 (23.63)	58.08 (46.21)
Predictors				
Performance goals	0.23 (0.16)	0.05 (0.03)	1.83* (0.69)	1.37 (1.01)
Attachment security	0.39 (0.63)	0.16 (0.11)		6.77 (4.56)
Performance goals × Attachment security	−0.63* (0.32)	$-0.10^{\dagger}$ (0.06)		−5.58* (2.18)
R^2	0.14	0.14	0.27	0.14
F	3.21	2.84	4.81	3.13

Note. $N = 110$; TSST = Trier Social Stress Test.
$^*p < .05$. $^{\dagger}\ p = .08$.

Table 7. Significant performance goal to subjective experience associations emerged, which varied by children's attachment security perceptions as anticipated. Interactive performance goal by attachment security effects were observed as well when predicting objective behavior, though the direction of these effects was opposite that expected. Preliminary evidence that children's performance goals impact physiologic arousal systems implicated in stress–illness linkages (e.g., HPA, SNS; Doom & Gunnar, 2013) also emerged. As physiologic arousal effects also varied by attachment security and our coping experimental manipulation, findings suggest that children's attachment views and coping each work in concert to contribute to and buffer against performance goal-driven physiologic response patterns (e.g., hyperreactivity, protracted recovery) known to confer risk for depression (Lopez-Duran et al., 2009; Ji et al., 2016). As we discuss, this study illustrates a complex matrix of integrative psychobiological relationships over multiple levels of analysis that link children's performance goals to depression vulnerability (Dykman, 1998).

Performance goals and subjective experience

As expected, children's performance goals were significantly associated with their subjective experience of internalizing problems (e.g., depression, low self-esteem, inadequacy) and involuntary stress responses (e.g., rumination, intrusive thoughts, emotional/physiologic hyperarousal). These findings are consonant with Dykman's (1998) proposal that striving to demonstrate competence, and thus, self-worth contributes to depression proneness. They also complement evidence of performance-goal-based contributions to depressive problems (Cury, Elliot, DaFonseca, & Moller, 2006; Turner et al., 1998; Sideridis, 2005, 2007). That performance goals were associated with involuntary stress responses

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Table 5. Parameter estimates (standard errors) for piecewise growth multilevel models predicting physiologic arousal via salivary cortisol concentrations

	Intercept *B* (*SE*)	Linear reactivity *B* (*SE*)	Linear recovery *B* (*SE*)
Covariates			
Child gender	−0.02 (0.02)	0.01 (0.01)	0.01 (0.01)
Child puberty	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
Family INR	−0.10 (0.16)	0.18 (0.11)	−0.02 (0.04)
Child medication use	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
Predictors			
Child performance goal orientation	−0.01 (0.01)	0.01 (0.01)	−0.01 (0.01)
Child perceived attachment security	0.02 (0.02)	−0.01 (0.01)	−0.01 (0.01)
Coping condition			0.01 (0.01)
Child performance goal orientation × Child perceived attachment security	0.02* (0.01)	−0.01* (0.01)	0.01* (0.01)
Child performance goal orientation × Coping condition			0.01* (0.01)
Child perceived attachment security × Coping condition			
Child performance goal orientation × Child perceived attachment security × Coping condition			
Random effects			
Intercept	0.01* (0.01)	−0.01* (0.01)	—
Linear reactivity slope		0.01* (0.01)	—
Linear recovery slope			0.01* (0.01)

Note. $N = 110$; INR = income-to-needs ratio. Child gender coded 0 (boys) and 1 (girls). Coping condition coded 0 (avoidance) and 1 (distraction).
*$p < .05$.

Table 6. Parameter estimates (standard errors) for piecewise growth multilevel models predicting physiologic arousal via skin conductance levels

	Intercept *B* (*SE*)	Linear reactivity *B* (*SE*)	Linear recovery *B* (*SE*)
Covariates			
Child gender	0.09 (0.05)	−0.04 (0.02)	0.01 (0.01)
Child puberty	−0.01 (0.01)	0.01 (0.01)	−0.01 (0.01)
Family INR	−0.08 (0.47)	−0.18 (0.20)	0.04 (0.06)
Child medication use	−0.03 (0.02)	0.01 (0.01)	0.01 (0.01)
Child movement	−0.19 (0.19)	−0.04 (0.18)	0.01 (0.06)
Predictors			
Child performance goal orientation	0.01 (0.03)	−0.01 (0.01)	0.01* (0.02)
Child perceived attachment security			
Coping condition			0.01 (0.01)
Child performance goal orientation × Child perceived attachment security			
Child performance goal orientation × Coping condition			
Child perceived attachment security × Coping condition			
Child performance goal orientation × Child perceived attachment security × Coping condition			
Random effects			
Intercept	0.06* (0.01)	−0.01* (0.01)	−0.01* (0.01)
Linear reactivity slope		0.01* (0.01)	−0.01 (0.01)
Linear recovery slope			0.01* (0.01)

Note. $N = 110$; INR = income-to-needs ratio. Child gender coded 0 (boys) and 1 (girls). Coping condition coded 0 (avoidance) and 1 (distraction).
*$p < .05$.

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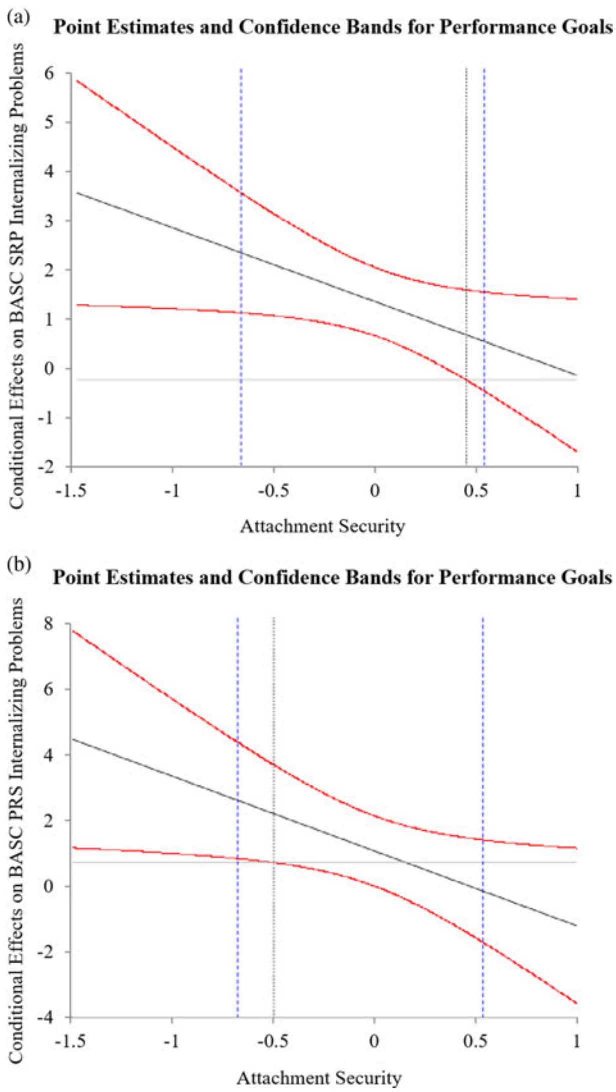

Figure 2. Point estimates (thick black lines) and 95% confidence bands (red lines) of the conditional effects of performance goals on Behavioral Assessment System for Children (BASC) (a) child self-reported internalizing problems and (b) parent-report of child internalizing problems across the range of attachment security scores. Purple vertical dashed lines represent 10th and 90th percentile attachment security scores.

to interpersonal stress specifically (e.g. "I don't have as many friends as I want"; "I often feel left out") supports Dykman's contention that performance goals reflect preoccupation with likeability that gives rise to negative thoughts and rumination when social setbacks (e.g., trouble making friends, being left out by peers) arise. Still further, and consonant with Dweck's (1986) and Dykman's (1998) positions, children with performance goals perceived the TSST to be more stressful and responded to the TSST with greater self-reported negative affect. This finding extends a rather limited evidence base of trait performance goal contributions to in-the-moment subjective stress reactivity (Sideridis, 2005).

The strength of the positive relation between children's performance goals and subjective experiences (i.e., self- and parent-reported internalizing, TSST stressfulness and negative affect) increased as attachment security decreased. Interactive subjective experience effects emerged for self- and parent-reported internalizing, suggesting that performance goal vulnerability is not limited to children's perceptions. Findings suggest that children with performance goals and insecure views may be especially vulnerable to depression, as they may wrestle with concerns about being worthless (Dykman, 1998) but also unworthy of care (Bowlby, 1979) when their ability comes under scrutiny. For children with secure views, the effect of performance goals on subjective experience was nonsignificant. Secure attachment is thought to foster *noncontigent self-worth*; i.e., self-worth less tied to functioning across domains (Crocker & Park, 2004; Cassidy & Shaver, 2008). By loosening the tie between demonstrating ability and self-worth, secure attachment may change the way these children view challenging situations, so that setbacks trigger fewer negative self-beliefs, less ruminative concern about ability, and less perceived stress and negative-affect-related distress when they occur (Dweck, 1999).

Performance goals and objective behavior

Children with performance goals unexpectedly displayed greater speech persistence (i.e., total time speaking) and those with insecure views unexpectedly displayed greater math persistence (i.e., total math responses). These findings contribute to the lively debate regarding performance goal costs and benefits (Elliot & Moller, 2003; Midgley, Kaplan, & Middleton, 2001). Performance goals are not always associated with depression (Elliot & Church, 2003; Kuroda & Sakurai, 2011) and, at times, are positively associated with effort (Elliot, McGregor, & Gable, 1999) and academic achievement (Church et al., 2001; Elliot & McGregor, 1999). To this end, the findings illustrate potential costs to adopting performance goals at the subjective experience level and point to possible benefits at the objective behavioral level.

Several considerations with respect to these findings are worth noting. First, while normative goal and uncertainty aspects of the TSST were hypothesized to contribute to subjective stress, negative affect, and effort withdrawal, they may actually have supported persistence. Specifically, being motivated to do better than their same-grade peers (i.e., normative goals) but also being given no formal indication of how well they were performing (i.e., uncertainty) may have eased reticence to engage with the TSST associated with the being informed about a relatively poor performance (Dykman, 1998). It is possible that providing children with a benchmark for success (e.g., "Most children can speak for all 5 min and can answer 30 math items correctly. That should be your goal") or negative feedback (e.g., "Your performance is not as good as others, but you can still catch up") may encourage children with performance goals to withdraw effort (e.g., self-handicap) if and when their performance falls short of the mark. Further research is needed to test this claim. Second, younger children (e.g., under 12 years of age) have been known to have an immature understanding of ability, rating their competence as higher than it objectively is relative to peers (e.g., Nicholls, 1984; 1989). It is possible that perceptions of high ability may have buffered against debilitating normative goal and uncertainty effects on behavioral persistence. Future research that uses a wider age range (e.g., preadolescent, adolescent) and assesses children's perceptions of their ability prior to and following the TSST would be well poised to examine the potential contributions of perceived ability (and age-related individual differences therein) on children's response to the TSST.

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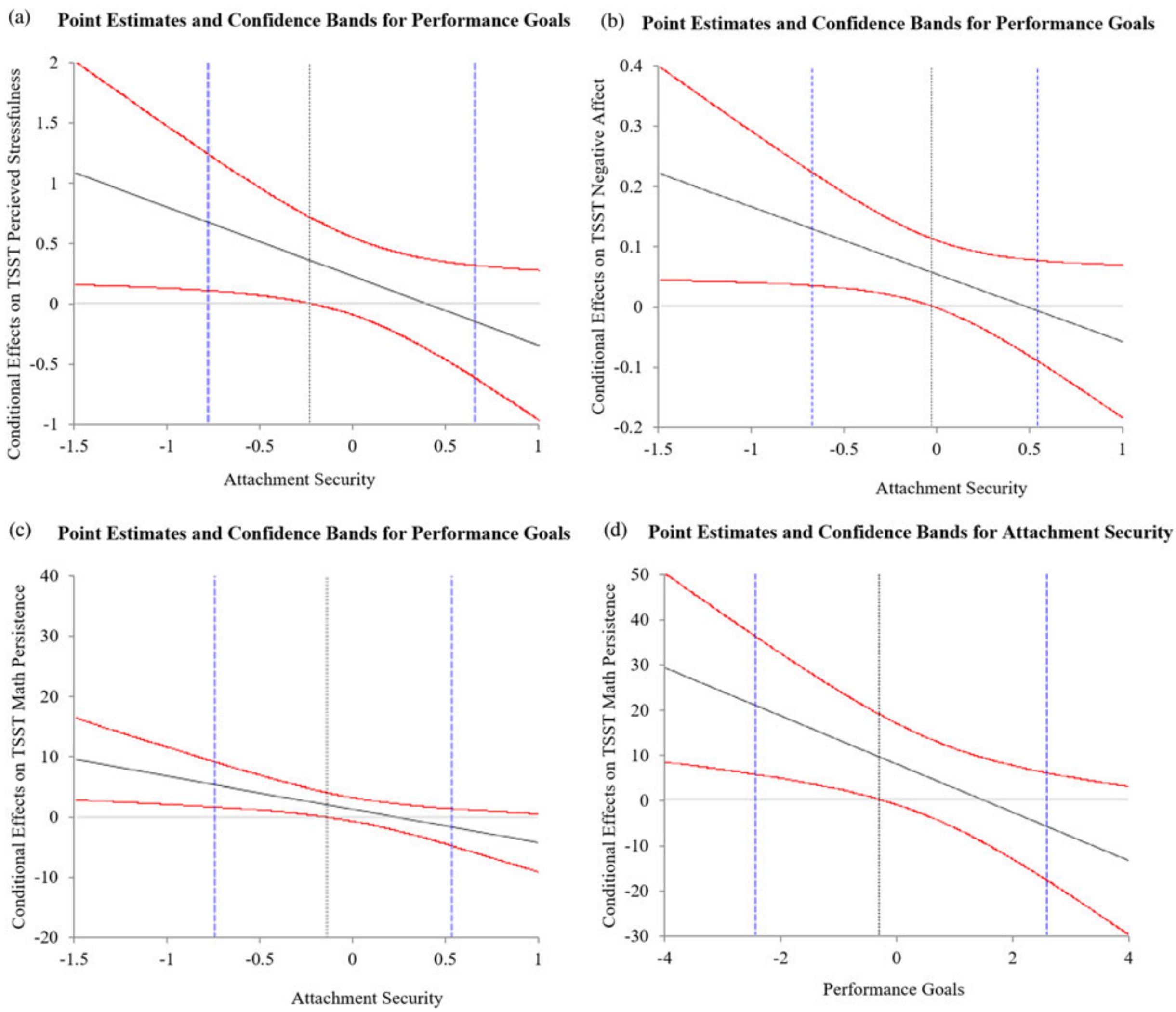

Figure 3. Point estimates (thick black lines) and 95% confidence bands (red lines) of the conditional effects of performance goals on Trier Social Stress Test (TSST) (a) perceived stressfulness, (b) negative affect, and (c) math persistence across the range of attachment security scores. In (d), conditional effects of attachment security on TSST math persistence across the range of performance goal scores were plotted for visual clarity of the effect in question. Purple vertical dashed lines represent 10th and 90th percentile moderator scores.

Performance goals and physiologic arousal

As expected, performance goals interacted with attachment security to predict physiologic reactivity to the TSST. Specifically, children with performance goals and insecure views displayed HPA hyperreactivity, one hypothesized contributor to performance-goal-based vulnerability (Dykman, 1998). Only two studies have linked performance goals to physiologic reactivity (e.g., electroencephalographic, electromyographic, blood volume pulse, and heart rate), and each focused on adults and omitted links to depression (Sideridis, 2008; Sideridis et al., 2013). Thus, this study is the first to demonstrate this hypothesized relationship and attachment-security-based individual differences therein in a sample of preadolescent boys and girls.

Findings extend prior adult evidence to the youth risk for depression literature and expand that knowledge base in notable ways. First, performance goals may potentially play an important role in HPA-mediated stress to depression pathways (Doom & Gunnar, 2013; Lopez-Duran et al., 2009). If so, the frequency at which children face novel stressors in day-to-day schooling is a relevant concern, as repeated hyperactivation places undue biological "wear and tear" on children's developing brains and bodies, and, thus, contributes to risk for mental health problems (e.g., depression; McEwen, 2000; Sher, 2004). Second, performance goal to HPA hyperreactivity patterns emerged only when attachment security was considered. Seeking support from adult caregivers in the face of academic and interpersonal stressors is characteristic of the phenomenology of being a child. For children with performance goals, feeling cared for and trusting in a parent's responsive support, even when not physically present (cf., Gunnar, 2017), may help to lessen concerns about self-worth and promote autonomous coping (Allen & Miga, 2010; Mikulincer & Shaver, 2007). Alternatively, lacking this internalized assuredness of care in times of need may increase performance-goal-based vulnerability at the physiologic level.

Integrating findings across the multiple levels of analysis provides insight into the complex manner by which performance goals may increase vulnerability to depression. If children with performance goals demonstrate overt, approach-related behavior (i.e., persistence) when competence is called into question, how, then, are these children most vulnerable to depression? Perhaps

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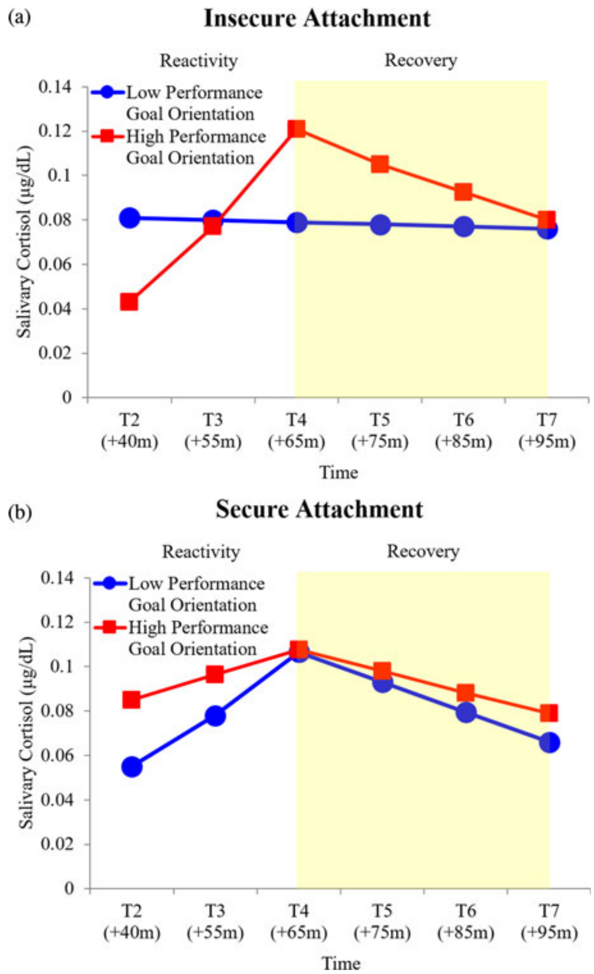

Figure 4. Predicted salivary cortisol levels for high (red line, square markers) and low (blue line, circle markers) performance goal orientation by (a) insecure and (b) secure attachment during reactivity and recovery (shaded region) phases. Predicted trajectories plotted at 10th and 90th percentile performance goal orientation and attachment security values and reverse transformed for illustrative purposes.

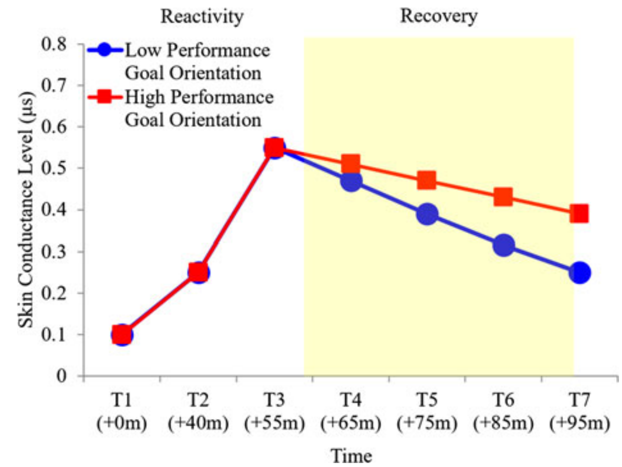

Figure 5. Predicted skin conductance levels for high (red line, square markers) and low (blue line, circle markers) performance goal orientation during the recovery (shaded region) phase. Nonsignificant reactivity trajectories plotted for visual clarity. Predicted recovery trajectories plotted at 10th and 90th percentile performance goal values and reverse transformed for illustrative purposes.

overt persistence comes at the expense (e.g., Lucas, Gratch, Cheng, & Marsella, 2015) of covert physiologic hyperarousal, with reactivity in excess of that warranted by the demands of a stressor (Burke, Davis, Otte, & Mohr, 2005). Neuroendocrine activation helps children meet the demands of a stressful encounter (Shirtcliff, Peres, Dismukes, Lee, & Phan, 2014) and use cognitively demanding regulation strategies (Johnson, Perry, Hostinar, & Gunnar, 2019). Yet, neuroendocrine hyperactivation may oppose efforts to meet these demands. Indeed, performance-goal-related vulnerability to depression may manifest during the reactivity phase as excessive HPA activation that interferes with the regulation of academic performance (e.g. fewer math responses for children with performance goals and insecure views), whereas healthy functioning manifests as moderate HPA activation that supports performance (e.g., greater math responses for children with low-performance goal orientation and secure views).

Performance goals and regulatory fit

Our anticipated recovery phase findings lend further insight into additional putative psychobiological factors that may link performance goals to depression vulnerability. Relative to their low-performance goal counterparts, children with high-performance goal orientation displayed more protracted SNS recovery and those with additional insecure views displayed more protracted HPA recovery following the TSST. Findings suggest that performance-goal-based vulnerability manifests not only as excessive physiologic reactivity to stressors in novel academic and interpersonal contexts but also more limited physiologic recovery capacity. Indeed, protracted recovery is a pattern implicated in psychobiological risk for depression (Ji et al., 2016; Lopez-Duran et al., 2015; Shull et al., 2016; Zoccola & Dickerson, 2012).

Performance goals also contributed to *regulatory fit* processes, lending insight about ways that specific coping skills work or backfire in supporting these children's HPA recovery. That children with performance goals displayed less protracted HPA recovery during avoidance relative to those in distraction helps shed light on why these children might willfully engage in avoidance, a strategy thought to ironically prolong the experience of stress rather than alleviate it. When ability comes under scrutiny, children with performance goals prefer to engage in avoidance because it sustains their goal to protect self-worth (Rothbaum et al., 2009), but also because "feeling right" (Higgins, 2005) about doing so may support less protracted recovery (i.e., optimal regulatory fit). Indeed, avoidance-related rumination as a protective form of self-handicapping may support "feeling right," insofar as it allows these children to defend their goal (i.e., rumination as egosyntonic) by building a "mountain of evidence" that justifies the cessation of approach-related effort (Nolen-Hoeksema et al., 2008). That "feeling right" increases strength of engagement in an activity (Higgins, 2005) may also shed light on the apparent *driven quality* of avoidance for children seeking to protect self-worth (Rothbaum et al., 2009).

Conversely, if "feeling wrong" stems from engaging in an activity in a manner that disrupts goal pursuits, then this might also explain why distraction for children with performance goals backfires and is associated with protracted physiologic recovery (i.e., poorer regulatory fit). That is, distraction for children with performance goals is perhaps at odds with goals to protect self-worth. As such, distraction as a means of coping may be egodystonic, invalidating of children's concerns about appearing incompetent

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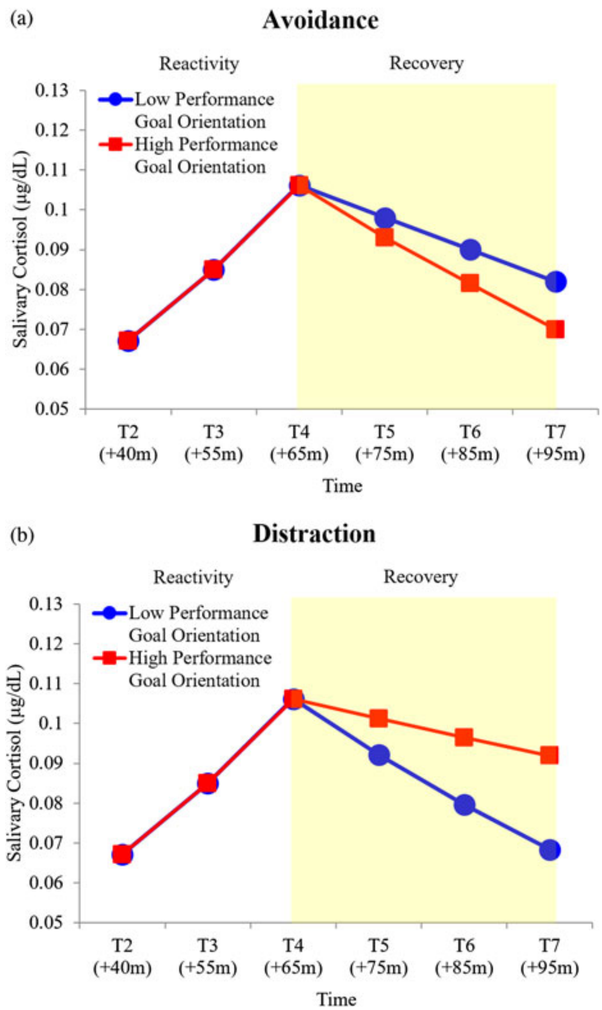

Figure 6. Predicted salivary cortisol levels for high (red line, square markers) and low (blue line, circle markers) performance goal orientation by (a) avoidance and (b) distraction conditions during the recovery (shaded region) phase. Nonsignificant reactivity trajectories plotted for visual clarity. Predicted recovery trajectories plotted at 10th and 90th percentile performance goal orientation values and reverse transformed for illustrative purposes.

and feeling worthless, and have greater perceived costs than benefits. Indeed, recent electroencephalography (EEG) evidence shows that, following competence frustration (e.g., doubting ability to perform well after a difficult task), those with performance goals display less pronounced reward positivity (RewP) to being provided a chance to restore competence and prove ability (Fang, Fu, Li, & Meng, 2019). Still further, evidence that effortful avoidance involves neural projections from amygdala to reward-processing brain regions (e.g., nucleus accumbens) suggests that effortful avoidance may have a certain appeal (LeDoux, Moscarello, Sears, & Campese, 2017) for some individuals (i.e., performance goal oriented).

Prevention and intervention implications

If performance goals increase vulnerability to depression in children, then why have they been overlooked in the psychopathology literature? Research on children's performance goals has relied almost exclusively on self-report and behavioral observation methods, despite theoretical premise that physiologic arousal stemming from stressor-induced threats to self-worth plays a key role in this vulnerability (Dykman, 1998). Thus, lack of clinical attention to performance goals may stem from limited knowledge about benefits afforded (e.g., behavioral persistence) as well as costs assessed (i.e., physiologic dysregulation) by performance goals and developmentally sensitive individual differences therein at different levels of analysis.

Though effects were small and require replication, these findings point to the potential utility of incorporating performance goal orientation and perceived attachment security into school-based mental health screening and intervention efforts. Most school-age children experience academic and social stressors during their tenure as students, which, for some, leads to depressive problems (Bandura, Pastorelli, Barbaranelli, & Caprara, 1999; Orth, Robins, & Roberts, 2008). Additionally, many school-based prevention programs targeting risk for depression focus on the development and utilization of active coping skills and reduction of reliance on avoidance (Compas et al., 2001). However, as our findings suggest, active motivational factors may place limits on how effective active coping skills are in helping youth manage stress and may intrinsically reward the use of avoidance for distress alleviation. Thus, targeting motivational vulnerability factors (e.g., performance goals) may be a requisite component of maximally effective coping skill-based, in-school prevention and intervention efforts for youth at risk of depression. Performance goal vulnerability may be difficult to detect at the outset of the school year (i.e., prior to academic or interpersonal setbacks) via traditional teacher reports or child-level screeners that focus on symptoms, as negative self-beliefs (e.g., "I am dumb. No one likes me") and related problems lie dormant until activated by acute stressors. Proper early identification may require assessing motivational factors as well as perceptions of the availability of care in the event that academic or interpersonal difficulties arise.

Furthermore, incorporating therapeutic elements known to lessen the cognitive tie between demonstrating competence and self-worth may also be promising (Rothbaum et al., 2009). Interventions that promote *learning goals* (e.g., motivation to develop competence) may potentially offset performance-goal-based vulnerability by helping children come to know that taking risks and learning from mistakes helps develop ability. Teachers can promote learning goals by recognizing children's efforts during difficult, novel tasks (e.g., working on a new subject, making a new friend) versus acknowledging stale successes in well-versed domains. Similarly, interventions that foster *malleable self-beliefs* (e.g., ability can be developed) may mitigate against performance goal vulnerability by helping children to know that their abilities are ever changing and growing. Teachers can promote malleable beliefs by noticing and reflecting back to children the specific ways in which they are developing (e.g., *language of becoming*; Wachtel, 2001). Still further, interventions that foster *noncontingent self-worth* (Cassidy & Shaver, 2008; Crocker & Park, 2004) in school-based preventative programs hold promise to this end. Psychoeducation about performance goal susceptibility to depression and training in coping skills that loosen the tie between performance and self-worth may help buffer against potential depression emergence. Mindfulness-based skills such as self-acceptance (i.e., nonjudgment about immediate experience), self-compassion (i.e., kindness and caring towards the self in the face of stress), and self-affirmation (i.e., affirming core values) are known to help lessen concern about validating self-worth (Hayes, Strosahl, & Wilson, 1999), mitigate the effects of failure on rumination (Koole, Smeets, van Knippenberg, &

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Table 7. Summary of study aims, hypotheses, and support from study results

Hypotheses	Performance goal main effect	Attachment security interaction effect
Aim 1: Subjective Experience		
Performance goals		
positively predict self-reported internalizing problems	Yes	Yes
positively predict parent-reported internalizing problems	No	Yes
positively predict self-reported involuntary responses to stress	Yes	No
positively predict parent-reported involuntary responses to stress	No	No
positively predict TSST perceived stressfulness	Yes	Yes
positively predict TSST negative affect	Yes	Yes
Aim 2: Objective Behavior		
Performance goals		
negatively predict TSST speech persistence	Yes	No
negatively predict TSST math persistence	No	Yes
Aim 3: Physiologic Arousal		
Reactivity: Performance goals		
predict HPA hyperreactivity	No	Yes
predict SNS hyperreactivity	No	No
Recovery: Performance goals		
predict protracted HPA recovery	No	Yes
predict protracted SNS recovery	Yes	No
Regulatory Fit: Performance goals		
predict less and more protracted HPA recovery in avoidance & distraction, respectively	Yes	No
predict less and more protracted SNS recovery in avoidance & distraction, respectively	No	No

Note. BASC = Behavior Assessment System for Children; RSQ = Responses to Stress Questionnaire; TSST = Trier Social Stress Test; HPA = hypothalamic–pituitary–adrenal axis; SNS = sympathetic nervous system.

Dijksterhuis, 1999), as well as buffer neuroendocrine and physiologic stress responses associated with threats to self-worth (Creswell et al., 2005). Furthermore, prevention efforts may seek to foster children's noncontingent self-worth by increasing caregivers' and teachers' acceptance of susceptible children's efforts in the face of failed attempts to manage novel academic and interpersonal stressors (Cassidy & Shaver, 2008; Crocker & Park, 2004).

Limitations and future directions

There are limitations to the current study that point to directions for future research. First, our sample size was small for such a complex design. As such, our findings require replication in larger, more diverse samples. To this end, the results are limited to a community sample of predominantly White, nonurban children. While there was variability with respect to household annual income, research focusing on samples with greater variation in risk for depression are needed (e.g., poverty, Englund, Egeland, & Collins, 2008; family history of major depression; Abela et al., 2005). Second, the assessment of attachment security was limited to maternal caregivers. Future research examining attachment with peers and teachers as buffers of performance-goal-based vulnerability is warranted. Indeed, children increasingly turn towards peers and teachers to fulfill attachment-related needs as they transition into adolescence (Nickerson & Nagle, 2005; Ryan, Stiller, & Lynch, 1994). Third, sample size limitations precluded an examination of patterns by gender. More research is needed to determine how performance-goal-based vulnerability may converge or differ across gender at multiple levels of analysis, given gender differences emerge in rates of psychopathology and in physiologic functioning as children age into adolescence (Doom & Gunnar, 2013; Hankin, Mermelstein, & Roesch, 2007). Fourth, the current study did not assess children's cognitions in response to the TSST, limiting inference about whether behavioral persistence or physiologic arousal effects were due to decrements in perceived ability or negative thought emergence. Future studies incorporating self-report both prior to and immediately following TSST exposure would be well poised to test whether shifts in perceived ability in addition to shifts from vulnerable (e.g., "If I fail, then I am worthless") to negative (e.g., "I am now worthless") self-beliefs account for additional variance in behavioral persistence and physiologic responses. Fifth, we can only speculate that learning goals, malleable beliefs, or noncontingent self-worth mitigate against performance goal vulnerability and attachment-based individual differences therein.

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It is also possible that behavioral persistence and physiologic reactivity were buffered by such factors (e.g., learning orientation, focus on improvement). Research is needed to deduce whether each buffer against performance goal vulnerability and the levels of analysis at which this occurs. Sixth, data were collected at a single time point, precluding inference about directionality. Future research incorporating longitudinal designs are needed to elucidate whether performance goals are in fact a *risk factor* (Kraemer et al., 1997) for depressive problems and whether HPA and SNS dysregulation function as a biological mechanism of this risk. Seventh, although our food and beverage restrictions covered items containing caffeine that a group of children this age might consume (e.g., chocolate, candy, soda with or without sugar, energy drinks), we did not ask participants to avoid caffeine specifically. Thus, it is possible that nonadherence or other caffeine consumption (e.g., unsweetened tea, black coffee) may have contributed to our findings. Eighth, individual level (e.g., intelligence, mental or physical health impairment) and day of experiment (e.g., exercise exertion, wake time) factors that were not assessed may have also impacted our findings. These limitations notwithstanding, the current study provides novel empirical evidence and nuanced detail on how performance goal orientation contributes to vulnerability to depression in preadolescents at multiple levels of analysis, with implications for early identification and prevention of the development of internalizing psychopathology.

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References

Abela, J. R., Hankin, B. L., Haigh, E. A., Adams, P., Vinokuroff, T., & Trayhern, L. (2005). Interpersonal vulnerability to depression in high-risk children: The role of insecure attachment and reassurance seeking. *Journal of Clinical Child and Adolescent Psychology*, *34*, 182–192. https://doi.org/10.1207/s15374424jccp3401_17

Allen, J. P., & Miga, E. M. (2010). Attachment in adolescence: A move to the level of emotion regulation. *Journal of Social and Personal Relationships*, *27*, 181–190. https://doi.org/10.1177%2F0265407509360898

Anderman, E. M., Griesinger, T., & Westerfield, G. (1998). Motivation and cheating during early adolescence. *Journal of Educational Psychology*, *90*, 84–93. https://psycnet.apa.org/doi/10.1037/0022-0663.90.1.84

Baer, A. R., Grant, H., & Dweck, C. (2008). *Personal goals predict the impact of distress*. Unpublished manuscript. Stanford University, Stanford, CA.

Bandura, A., Pastorelli, C., Barbaranelli, C., & Caprara, G. V. (1999). Self-efficacy pathways to childhood depression. *Journal of Personality and Social Psychology*, *76*, 258–269. https://psycnet.apa.org/doi/10.1037/0022-3514.76.2.258

Bendezú, J. J., Perzow, S. E. P., & Wadsworth, M. E. (2016). What constitutes effective coping and efficient physiologic regulation following psychosocial stress depends on involuntary stress responses. *Psychoneuroendocrinology*, *73*, 42–50. https://doi.org/10.1016/j.psyneuen.2016.07.005

Bowlby, J. (1973). *Attachment and loss: Separation (Vol. 2)*. London: Hogarth.

Bowlby, J. (1979). *The making and breaking of affective bonds*. London: Tavistock.

Burke, H. M., Davis, M. C., Otte, C., & Mohr, D. C. (2005). Depression and cortisol responses to psychological stress: A meta-analysis. *Psychoneuroendocrinology*, *30*, 846–856. https://doi.org/10.1016/j.psyneuen.2005.02.010

Cacioppo, J. T., Berntson, G. G., Sheridan, J. F., & McClintock, M. K. (2000). Multilevel integrative analyses of human behavior: Social neuroscience and the complementing nature of social and biological approaches. *Psychological Bulletin*, *126*, 829–843. doi:10.1037/0033-2909.126.6.829

Capaldi, D. M., & Rothbart, M. K. (1992). Development and validation of an early adolescent temperament measure. *The Journal of Early Adolescence*, *12* (2), 153–173.

Cassidy, J., & Shaver, P. R. (2008). *Handbook of attachment: Theory, research, and clinical applications* (2nd ed). New York: Guilford Press.

Church, M. A., Elliot, A. J., & Gable, S. L. (2001). Perceptions of classroom environment, achievement goals, and achievement outcomes. *Journal of Educational Psychology*, *93*, 43–54. https://psycnet.apa.org/doi/10.1037/0022-0663.93.1.43

Cicchetti, D. (2010). A multiple-levels-of-analysis perspective on research in development and psychopathology. In T. P. Beauchaine & S. P. Hinshaw (Eds.), *Child and adolescent psychopathology* (pp. 27–57). Hoboken, NJ: Wiley.

Cicchetti, D. (2016). A multilevel developmental psychopathology systems perspective on depression. In T. Frodl (Ed.), *Systems neuroscience in depression* (pp. 3–28). Cambridge, MA: Elsevier, Academic Press.

Compas, B. E., Connor-Smith, J. K., Saltzman, H., Thomsen, A. H., & Wadsworth, M. E. (2001). Coping with stress during childhood and adolescence: problems, progress, and potential in theory and research. *Psychological Bulletin*, *127*, 87–127. https://psycnet.apa.org/doi/10.1037/0033-2909.127.1.87

Compas, B. E., Connor, J. K., Saltzman, H., Thomsen, A. H., & Wadsworth, M.. (1999). Getting specific about coping: Effortful and involuntary responses to stress in development. In M. Lewis, & D. Ramsey (Eds.), *Soothing and Stress* (pp. 229–256). Mahwah, NJ: Erlbaum.

Connor-Smith, J. K., Compas, B. E., Wadsworth, M. E., Thomsen, A. H., & Saltzman, H. (2000). Responses to stress in adolescence: Measurement of coping and involuntary stress responses. *Journal of Consulting and Clinical Psychology*, *68*, 976–992. doi:10.1037/0022-006X.68.6.976

Creswell, J. D., Welch, W. T., Taylor, S. E., Sherman, D. K., Gruenewald, T. L., & Mann, T. (2005). Affirmation of personal values buffers neuroendocrine and psychological stress responses. *Psychological Science*, *16*, 846–851. https://doi.org/10.1111%2Fj.1467-9280.2005.01624.x

Crocker, J., & Park, L. E. (2004). The costly pursuit of self-esteem. *Psychological Bulletin*, *130*, 392–414. doi:10.1037/0033-2909.130.3.392

Cummings, E. M., El-Sheikh, M., Kouros, C. D., & Keller, P. S. (2007). Children's skin conductance reactivity as a mechanism of risk in the context of parental depressive symptoms. *Journal of Child Psychology and Psychiatry*, *48*, 436–445. https://doi.org/10.1111/j.1469-7610.2006.01713.x

Cury, F., Elliot, A. J., Da Fonseca, D., & Moller, A. C. (2006). The social-cognitive model of achievement motivation and the 2 × 2 achievement goal framework. *Journal of Personality and Social Psychology*, *90*, 666–679. https://psycnet.apa.org/doi/10.1037/0022-3514.90.4.666

Darnon, C., Harackiewicz, J. M., Butera, F., Mugny, G., & Quiamzade, A. (2007). Performance-approach and performance-avoidancegoals: When uncertainty makes a difference. *Personality and Social Psychology Bulletin*, *33*(6), 813–827.

Davis, E. P., Bruce, J., & Gunnar, M. R. (2002). The anterior attention network: Associations with temperament and neuroendocrine activity in 6-year-old children. *Developmental Psychobiology*, *40*, 43–56. https://psycnet.apa.org/doi/10.1002/dev.10012

De Kloet, E. R., Joëls, M., & Holsboer, F. (2005). Stress and the brain: From adaptation to disease. *Nature Reviews. Neuroscience*, *6*, 463–475. https://psycnet.apa.org/doi/10.1038/nrn1683

Doom, J. R., & Gunnar, M. R. (2013). Stress physiology and developmental psychopathology: past, present, and future. *Development and Psychopathology*, *25*, 1359–1373. https://psycnet.apa.org/doi/10.1017/S0954579413000667

Dweck, C. S. (1986). Motivational processes affecting learning. *American Psychologist*, *41*(10), 1040.

Dweck, C. S. (1999). *Self-theories: Their role in motivation, personality, and development*. Philadelphia, PA: Psychology Press.

Dweck, C. S., & Leggett, E. L. (1988). A social–cognitive approach to motivation and personality. *Psychological Review*, *95*, 256–273. https://psycnet.apa.org/doi/10.1037/0033-295X.95.2.256

Dykman, B. M. (1998). Integrating cognitive and motivational factors in depression: initial tests of a goal-orientation approach. *Journal of Personality and Social Psychology*, *74*, 139–158. https://psycnet.apa.org/doi/10.1037/0022-3514.74.1.139

https://doi.org/10.1017/S0954579420000851 Published online by Cambridge University Press

Elliot, A. J., & Church, M. A. (1997). A hierarchical model of approach and avoidance achievement motivation. *Journal of Personality and Social Psychology*, *72*(1), 218.

Elliot, A. J., & Church, M. A. (2003). A motivational analysis of defensive pessimism and self-handicapping. *Journal of Personality*, *71*, 369–396. https://psycnet.apa.org/doi/10.1111/1467-6494.7103005

Elliot, E. S., & Dweck, C. S. (1988). Goals: An approach to motivation and achievement. *Journal of Personality and Social Psychology*, *54*, 5–12. doi:10.1037/0022-3514.54.1.5

Elliot, A. J., & McGregor, H. A. (1999). Test anxiety and the hierarchical model of approach and avoidance achievement motivation. *Journal of Personality and Social Psychology*, *76*, 628. doi:10.1037/0022-3514.76.4.628

Elliot, A. J., McGregor, H. A., & Gable, S. (1999). Achievement goals, study strategies, and exam performance: A mediational analysis. *Journal of Educational Psychology*, *91*, 549–563. https://psycnet.apa.org/doi/10.1037/0022-0663.91.3.549

Elliot, A. J., & Moller, A. C. (2003). Performance-approach goals: Good or bad forms of regulation? *International Journal of Educational Research*, *39*, 339–356. https://doi.org/10.1016/j.ijer.2004.06.003

Elliot, A. J., & Thrash, T. M. (2002). Approach-avoidance motivation in personality: Approach and avoidance temperaments and goals. *Journal of Personality and Social Psychology*, *82*, 804–818. https://psycnet.apa.org/doi/10.1037/0022-3514.82.5.804

Englund, M. M., Egeland, B., & Collins, W. A. (2008). Exceptions to high school dropout predictions in a low-income sample: Do adults make a difference? *Journal of Social Issues*, *64*, 77–94. https://doi.org/10.1111/j.1540-4560.2008.00549.x

Evans, G. W., & Marcynyszyn, L. A. (2004). Environmental justice, cumulative environmental risk, and health among low-and middle-income children in upstate New York. *American Journal of Public Health*, *94*, 1942–1944. DOI: 10.2105/ajph.94.11.1942

Fang, H., Fu, H., Li, X., & Meng, L. (2019). Trapped in the woods: High performance goal orientation impedes competence restoration. *Personality and Individual Differences*, *150*, 109479. https://doi.org/10.1016/j.paid.2019.06.022

Granger, D. A., Hibel, L. C., Fortunato, C. K., & Kapelewski, C. H. (2009). Medication effects on salivary cortisol: Tactics and strategy to minimize impact in behavioral and developmental science. *Psychoneuroendocrinology*, *34*, 1437–1448. https://psycnet.apa.org/doi/10.1016/j.psyneuen.2009.06.017

Grant, K. E., Compas, B. E., Stuhlmacher, A. F., Thurm, A. E., McMahon, S. D., & Halpert, J. A. (2003). Stressors and child and adolescent psychopathology: Moving from markers to mechanisms of risk. *Psychological Bulletin*, *129*, 447–466. doi:10.1037/0033-2909.129.3.447

Grant, H., & Dweck, C. S. (2003). Clarifying achievement goals and their impact. *Journal of Personality and Social Psychology*, *85*, 541–553. https://psycnet.apa.org/doi/10.1037/0022-3514.85.3.541

Greaven, S. H., Santor, D. A., Thompson, R., & Zuroff, D. C. (2000). Adolescent self-handicapping, depressive affect, and maternal parenting styles. *Journal of Youth and Adolescence*, *29*, 631–646. https://psycnet.apa.org/doi/10.1023/A:1026499721533

Gunnar, M. R. (2017). Early social deprivation and dysregulation of the hypothalamic-pituitary-adrenocortical axis. *Journal of the American Academy of Child & Adolescent Psychiatry*, *56*, S317.

Gunnar, M. R., Talge, N. M., & Herrera, A. (2009). Stressor paradigms in developmental studies: What does and does not work to produce mean increases in salivary cortisol. *Psychoneuroendocrinology*, *34*, 953–967. https://psycnet.apa.org/doi/10.1016/j.psyneuen.2009.02.010

Hankin, B. L. (2012). Future directions in vulnerability to depression among youth: Integrating risk factors and processes across multiple levels of analysis. *Journal of Clinical Child and Adolescent Psychology*, *41*, 695–718. DOI: 10.1080/15374416.2012.711708

Hankin, B. L., & Abramson, L. Y. (2001). Development of gender differences in depression: An elaborated cognitive vulnerability–transactional stress theory. *Psychological Bulletin*, *127*, 773–796. doi:10.1037/0033-2909.127.6.773

Hankin, B. L., Mermelstein, R., & Roesch, L. (2007). Sex differences in adolescent depression: Stress exposure and reactivity models. *Child Development*, *78*, 279–295. https://psycnet.apa.org/doi/10.1111/j.1467-8624.2007.00997.x

Harackiewicz, J. M., Barron, K. E., Carter, S. M., Lehto, A. T., & Elliot, A. J. (1997). Predictors and consequences of achievement goals in the college classroom: Maintaining interest and making the grade. *Journal of Personality and Social Psychology*, *73*, 1284–1295. https://psycnet.apa.org/doi/10.1037/0022-3514.73.6.1284

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach.* New York, NY: Guilford Press.

Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (1999). *Acceptance and commitment therapy (p. 6)*. New York: Guilford Press.

Higgins, E. T. (2005). Value from regulatory fit. *Current Directions in Psychological Science*, *14*, 209–213.

Higgins, R. L., Snyder, C. R., & Berglas, S. (1990). *Self-handicapping: The paradox that isn't*. New York: Plenum Press.

Hill-Soderlund, A. L., Mills-Koonce, W. R., Propper, C., Calkins, S. D., Granger, D. A., Moore, G. A., … Cox, M. J. (2008). Parasympathetic and sympathetic responses to the strange situation in infants and mothers from avoidant and securely attached dyads. *Developmental Psychobiology*, *50*, 361–376. https://psycnet.apa.org/doi/10.1002/dev.20302

Hong, Y. Y., Chiu, C. Y., Dweck, C. S., Lin, D. M. S., & Wan, W. (1999). Implicit theories, attributions, and coping: A meaning system approach. *Journal of Personality and Social Psychology*, *77*, 588–599. https://psycnet.apa.org/doi/10.1037/0022-3514.77.3.588

Ji, J., Negriff, S., Kim, H., & Susman, E. J. (2016). A study of cortisol reactivity and recovery among young adolescents: Heterogeneity and longitudinal stability and change. *Developmental Psychobiology*, *58*, 283–302. DOI: 10.1002/dev.21369

Johnson, A. E., Perry, N. B., Hostinar, C. E., & Gunnar, M. R. (2019). Cognitive–affective strategies and cortisol stress reactivity in children and adolescents: Normative development and effects of early life stress. *Developmental Psychobiology*, *61*(7), 999–1013.

Kaplan, A., & Maehr, M. L. (2007). The contributions and prospects of goal orientation theory. *Educational Psychology Review*, *19*, 141–184. https://psycnet.apa.org/doi/10.1007/s10648-006-9012-5

Kelly, A. E., & Kahn, J. H. (1994). Effects of suppression of personal intrusive thoughts. *Journal of Personality and Social Psychology*, *66*, 998–1006. doi:10.1037/0022-3514.66.6.998

Kerns, K. A., Klepac, L., & Cole, A. (1996). Peer relationships and preadolescents' perceptions of security in the child-mother relationship. *Developmental Psychology*, *32*, 457–466. doi:10.1037/0012-1649.32.3.457

Koole, S. L., Smeets, K., Van Knippenberg, A., & Dijksterhuis, A. (1999). The cessation of rumination through self-affirmation. *Journal of Personality and Social Psychology*, *77*, 111–125. doi:10.1037/0022-3514.77.1.111

Kraemer, H. C., Kazdin, A. E., Offord, D. R., Kessler, R. C., Jensen, P. S., & Kupfer, D. J. (1997). Coming to terms with the terms of risk. *Archives of General Psychiatry*, *54*, 337–343. https://psycnet.apa.org/doi/10.1001/archpsyc.1997.01830160065009

Kudielka, B. M., Hellhammer, D. H., & Kirschbaum, C. (2007). Ten years of research with the Trier Social Stress Test – revisited. In E. Harmon-Jones, & P. Winkielman (Eds.), *Social Neuroscience* (pp. 56–83). New York, NY: Guilford.

Kuroda, Y., & Sakurai, S. (2011). Social goal orientations, interpersonal stress, and depressive symptoms among early adolescents in Japan: A test of the diathesis-stress model using the trichotomous framework of social goal orientations. *The Journal of Early Adolescence*, *31*, 300–322. https://psycnet.apa.org/doi/10.1177/0272431610363158

Lambird, K. H., & Mann, T. (2006). When do ego threats lead to self-regulation failure? Negative consequences of defensive high self-esteem. *Personality and Social Psychology Bulletin*, *32*(9), 1177–1187.

LeDoux, J. E., Moscarello, J., Sears, R., & Campese, V. (2017). The birth, death and resurrection of avoidance: A reconceptualization of a troubled paradigm. *Molecular Psychiatry*, *22*, 24–36. https://psycnet.apa.org/doi/10.1038/mp.2016.166

Lee, A., & Hankin, B. L. (2009). Insecure attachment, dysfunctional attitudes, and low self-esteem predicting prospective symptoms of depression and anxiety during adolescence. *Journal of Clinical Child and Adolescent Psychology*, *38*, 219–231. https://doi.org/10.1080/15374410802698396

Lindsay, J. E., & Scott, W. (2005). Dysphoria and self-esteem following an achievement event: Predictive validity of goal orientation and personality style theories of vulnerability. *Cognitive Therapy and Research*, *29*, 769–785.

https://doi.org/10.1017/S0954579420000851 Published online by Cambridge University Press

Little, R. J. (1988). A test of missing completely at random for multivariate data with missing values. *Journal of the American Statistical Association*, *83*(404), 1198–1202.

Lopez-Duran, N. L., Kovacs, M., & George, C. J. (2009). Hypothalamic–pituitary–adrenal axis dysregulation in depressed children and adolescents: A meta-analysis. *Psychoneuroendocrinology*, *34*, 1272–1283. https://psycnet.apa.org/doi/10.1016/j.psyneuen.2009.03.016

Lopez-Duran, N. L., McGinnis, E., Kuhlman, K., Geiss, E., Vargas, I., & Mayer, S. (2015). HPA-axis stress reactivity in youth depression: Evidence of impaired regulatory processes in depressed boys. *Stress*, *18*, 545–553. https://doi.org/10.3109/10253890.2015.1053455

Lucas, G. M., Gratch, J., Cheng, L., & Marsella, S. (2015). When the going gets tough: Grit predicts costly perseverance. *Journal of Research in Personality*, *59*, 15–22. https://psycnet.apa.org/doi/10.1016/j.jrp.2015.08.004

Maehr, M. L., & Zusho, A. (2009). Achievement goal theory: The past, present, and future. In K. R. Wentzel & A. Wigfield (Eds.), *Handbook of motivation at school* (pp. 77–104). New York: Routledge.

Mcewen, B. S. (2000). The neurobiology of stress: From serendipity to clinical relevance. *Brain Research*, *886*(1–2), 172–189.

Mesa, V. (2012). Achievement goal orientations of community college mathematics students and the misalignment of instructor perceptions. *Community College Review*, *40*, 46–74. https://doi.org/10.1177/0091552111435663

Midgley, C., Kaplan, A., & Middleton, M. (2001). Performance-approach goals: Good for what, for whom, under what circumstances, and at what cost? *Journal of Educational Psychology*, *93*, 77–86. doi:10.1037/0022-0663.93.1.77

Midgley, C., Maehr, M. L., Hruda, L. Z., Anderman, E., Anderman, L., Freeman, K. E., … Urdan, T. (2000). *Patterns of adaptive learning survey (PALS)*. Ann Arbor, MI: The University of Michigan.

Mikulincer, M., & Shaver, P. R. (2007). *Attachment in adulthood: Structure, dynamics, and change*. New York: Guilford Press.

Miller, R., & Plessow, F. (2013). Transformation techniques for cross-sectional and longitudinal endocrine data: Application to salivary cortisol concentrations. *Psychoneuroendocrinology*, *38*, 941–946. DOI: 10.1016/j.psyneuen.2012.09.013

Mosteller, F., & Tukey, J. W.. (1977). *Data analysis and regression: A second course in statistics*. Reading, MA: Addison Wesley.

Murdock, T. B., Miller, A. D., & Goetzinger, A. (2007). Effects of classroom context on university students' judgments about cheating: Mediating and moderating processes. *Social Psychology of Education*, *10*, 141–169. https://doi.org/10.1007/s11218-007-9015-1

Nicholls, J. (1984). Achievement motivation: Conceptions of ability, subjective experience, task choice, and performance. *Psychological Review*, *91*, 328–346. https://doi.org/10.1037/0033-295X.91.3.328

Nicholls, J. (1989). *The competitive ethos and democratic education*. Cambridge, MA: Harvard University Press.

Nickerson, A. B., & Nagle, R. J. (2005). Parent and peer attachment in late childhood and early adolescence. *The Journal of Early Adolescence*, *25*, 223–249. https://psycnet.apa.org/doi/10.1177/0272431604274174

Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking rumination. *Perspectives on Psychological Science*, *3*, 400–424. https://doi.org/10.1111%2Fj.1745-6924.2008.00088.x

O'Haire, M. E., McKenzie, S. J., Beck, A. M., & Slaughter, V. (2015). Animals may act as social buffers: Skin conductance arousal in children with autism spectrum disorder in a social context. *Developmental Psychobiology*, *57*, 584–595. DOI: 10.1002/dev.21310

Orth, U., Robins, R. W., & Roberts, B. W. (2008). Low self-esteem prospectively predicts depression in adolescence and young adulthood. *Journal of Personality and Social Psychology*, *95*, 695–708. https://doi.org/10.1037/0022-3514.95.3.695

Owens, S. A., Helms, S. W., Rudolph, K. D., Hastings, P. D., Nock, M. K., & Prinstein, M. J. (2019). Interpersonal stress severity longitudinally predicts adolescent girls' depressive symptoms: The moderating role of subjective and HPA axis stress responses. *Journal of Abnormal Child Psychology*, *47* (5), 895–905.

Park, L. E., Crocker, J., & Mickelson, K. D. (2004). Attachment styles and contingencies of self-worth. *Personality and Social Psychology Bulletin*, *30*, 1243–1254. https://doi.org/10.1177%2F0146167204264000

Perry, N. B., Donzella, B., Parenteau, A. M., Desjardins, C., & Gunnar, M. R. (2019). Emotion regulation and cortisol reactivity during a social evaluative stressor: A study of post-institutionalized youth. *Developmental Psychobiology*, *61*(4), 557–572.

Petersen, A. C., Crockett, L., Richards, M., & Boxer, A. (1988). A self-report measure of pubertal status: Reliability, validity, and initial norms. *Journal of Youth and Adolescence*, *17*(2), 117–133.

Ramsook, K. A., Benson, L., Ram, N., & Cole, P. M. (2019). Age-related changes in the relation between preschoolers' anger and persistence. *International Journal of Behavioral Development*, 1–10. https://doi.org/10.1177%2F0165025419866914

Reynolds, C., & Kamphaus, R.. (2004). *Behavior assessment for children, (BASC-2)*. Circle Pines, MN: American Guidance Service.

Rhodewalt, F., & Vohs, K. D. (2005). Defensive strategies, motivation, and the self: A self-regulatory process view. In A. Elliot & C. Dweck (Eds.), *Handbook of competence and motivation* (pp. 548–565). New York: Guilford Press.

Robins, R. W., & Pals, J. L. (2002). Implicit self-theories in the academic domain: Implications for goal orientation, attributions, affect, and selfesteem change. *Self and Identity*, *1*, 313–336.

Rohleder, N., & Nater, U. M. (2009). Determinants of salivary α-amylase in humans and methodological considerations. *Psychoneuroendocrinology*, *34*, 469–485. DOI: 10.1016/j.psyneuen.2008.12.004

Rothbaum, F., Morling, B., & Rusk, N. (2009). How goals and beliefs lead people into and out of depression. *Review of General Psychology*, *13*, 302–314. https://doi.org/10.1037%2Fa0017140

Ryan, R. M., Stiller, J. D., & Lynch, J. H. (1994). Representations of relationships to teachers, parents, and friends as predictors of academic motivation and self-esteem. *The Journal of Early Adolescence*, *14*, 226–249. https://psycnet.apa.org/doi/10.1177/027243169401400207

Sher, L. (2004). Daily hassles, cortisol, and the pathogenesis of depression. *Medical Hypotheses*, *62*(2), 198–202.

Shirtcliff, E. A., Peres, J. C., Dismukes, A. R., Lee, Y., & Phan, J. M. (2014). Hormones: Commentary: Riding the physiological roller coaster: Adaptive significance of cortisol stress reactivity to social contexts. *Journal of Personality Disorders*, *28*, 40–51. https://doi.org/10.1521/pedi.2014.28.1.40

Shull, A., Mayer, S. E., McGinnis, E., Geiss, E., Vargas, I., & Lopez-Duran, N. L. (2016). Trait and state rumination interact to prolong cortisol activation to psychosocial stress in females. *Psychoneuroendocrinology*, *74*, 324–332. DOI: 10.1016/j.psyneuen.2016.09.004

Sideridis, G. D. (2005). Goal orientation, academic achievement, and depression: Evidence in favor of a revised goal theory framework. *Journal of Educational Psychology*, *97*, 366–375. doi:10.1037/0022-0663.97.3.366

Sideridis, G. D. (2007). Why are students with LD depressed? A goal orientation model of depression vulnerability. *Journal of Learning Disabilities*, *40*, 526–539. https://doi.org/10.1177/00222194070400060401

Sideridis, G. D. (2008). The regulation of affect, anxiety, and stressful arousal from adopting mastery-avoidance goal orientations. *Stress and Health: Journal of the International Society for the Investigation of Stress*, *24*, 55–69. https://doi.org/10.1002/smi.1160

Sideridis, G. D., Antoniou, F., & Simos, P. (2013). The physiological effects of goal orientations on the reading performance of students with dyslexia: A pilot study. *Procedia-Social and Behavioral Sciences*, *93*, 1546–1551. https://doi.org/10.1016/j.sbspro.2013.10.080

Spear, L. P. (2000). The adolescent brain and age-related behavioral manifestations. *Neuroscience & Biobehavioral Reviews*, *24*, 417–463. https://doi.org/10.1016/S0149-7634(00)00014-2

Susman, E. J., Dockray, S., Granger, D. A., Blades, K. T., Randazzo, W., Heaton, J. A., & Dorn, L. D. (2010). Cortisol and alpha amylase reactivity and timing of puberty: Vulnerabilities for antisocial behavior in young adolescents. *Psychoneuroendocrinology*, *35*, 557–569. doi:10.1016/j.psyneuen.2009.09.004

Turner, J. C., Thorpe, P. K., & Meyer, D. K. (1998). Students' reports of motivation and negative affect. *Journal of Educational Psychology*, *90*, 758–771. doi:10.1037/0022-0663.90.4.758

Urdan, T. (2004). Predictors of academic self-handicapping and achievement: Examining achievement goals, classroom goal structures, and culture.

https://doi.org/10.1017/S0954579420000851 Published online by Cambridge University Press

Journal of Educational Psychology, 96, 251–264. https://doi.org/10.1037/0022-0663.96.2.251

Urdan, T., Midgley, C., & Anderman, E. M. (1998). The role of classroom goal structure in students' use of self-handicapping strategies. *American Educational Research Journal*, *35*, 101–122. https://doi.org/10.3102%2F00028312035001101

van den Bos, E., de Rooij, M., Miers, A. C., Bokhorst, C. L., & Westenberg, P. M. (2014). Adolescents' increasing stress response to social evaluation: Pubertal effects on cortisol and alpha-amylase during public speaking. *Child Development*, *85*, 220–236. https://psycnet.apa.org/doi/10.1111/cdev.12118

Vaughn, B. E., Coppola, G., Verissimo, M., Monteiro, L., Santos, A. J., Posada, G., … McBride, B. (2007). The quality of maternal secure-base scripts predicts children's secure-base behavior at home in three sociocultural groups. *International Journal of Behavioral Development*, *31*, 65–76. https://doi.org/10.1177%2F0165025407073574

Wachtel, E. F. (2001). The language of becoming: Helping children change how they think about themselves. *Family Process*, *40*, 369–384. https://doi.org/10.1111/j.1545-5300.2001.4040100369.x

Wadsworth, M. E. (2013). *Responses to stress coding manual for in vivo coping*. The Pennsylvania State University: University Park.

Wadsworth, M. E., Bendezú, J. J., Loughlin-Presnal, J., Ahlkvist, J. A., Tilghman-Osborne, E., Bianco, H., … Hurwich-Reiss, E. (2018). Unlocking the black box: A multilevel analysis of preadolescent children's coping. *Journal of Clinical Child and Adolescent Psychology*, *47*, 527–541. doi:10.1080/15374416.2016.1141356

Wenzlaff, R. M., & Wegner, D. M. (2000). Thought suppression. *Annual Review of Psychology*, *51*, 59–91. https://doi.org/10.1146/annurev.psych.51.1.59

Zimmer-Gembeck, M. J., & Skinner, E. A. (2016). The development of coping and regulation: Implications for psychopathology and resilience. In D. Cicchetti (Ed.), *Developmental psychopathology* (3rd ed., Vol. 4, pp. 485–544). Oxford, UK: Wiley.

Zoccola, P. M., & Dickerson, S. S. (2012). Assessing the relationship between rumination and cortisol: A review. *Journal of Psychosomatic Research*, *73*, 1–9. https://psycnet.apa.org/doi/10.1016/j.jpsychores.2012.03.007

Zoccola, P. M., Figueroa, W. S., Rabideau, E. M., Woody, A., & Benencia, F. (2014). Differential effects of poststressor rumination and distraction on cortisol and C-reactive protein. *Health Psychology*, *33*(12), 1606.

https://doi.org/10.1017/S0954579420000851 Published online by Cambridge University Press