

## Responses to Interpersonal Stress: Normative Changes Across Childhood and the Impact of Peer Victimization

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This research examined the development of stress responses across second to sixth grades and whether exposure to peer victimization alters stress response trajectories. Youth (338 girls; 298 boys;  $M_{\text{age}} = 7.97$  years,  $SD = .37$ ) reported on stress responses; teachers and youth reported on peer victimization. Latent growth curve modeling revealed an increase in effortful engagement responses and a decrease in disengagement and involuntary engagement responses during this period. Peer victimization disrupted these normative trajectories, resulting in less effortful engagement and more effortful disengagement and involuntary stress responses in early adolescence. These findings suggest that early peer victimization sensitizes youth to stress by interfering with the development of effective coping and fostering maladaptive stress responses.

Youths' mental health is intricately tied to how they respond to, and cope with, stress (Connor-Smith, Compas, Wadsworth, Thomsen, & Saltzman, 2000; Wadsworth, Rieckmann, Benson, & Compas, 2004). As problems arising in relationships can have a particularly pernicious effect on emotional well-being (Rudolph et al., 2000), developing adaptive stress responses in the face of interpersonal problems is a critical task during childhood. Although it is assumed that increasing regulation of physiological, cognitive, and emotional systems leads to more effective coping with age (Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001; Skinner & Zimmer-Gembeck, 2007), research on the development of stress responses is often limited to a small subset of reactions rather than the confluence of physiological, cognitive, emotional, and behavioral reactions that systemically forms a stress response. Moreover, few studies utilize longitudinal data (Zimmer-Gembeck & Skinner, 2011), and most focus narrowly on volitional coping strategies with

less attention to automatic, involuntary responses. Furthermore, little is known about how early interpersonal adversity or changes in interpersonal adversity across childhood affect the development of stress responses. To address these gaps, this study examined normative changes in responses to interpersonal stress from middle childhood to early adolescence and tested whether a common and salient form of childhood interpersonal adversity, peer victimization (i.e., being the target of repeated physical, verbal, or relational aggression from peers) predicts trajectories of change in stress responses.

### *Normative Development of Responses to Stress*

Compas et al. (2001) provide a comprehensive framework for conceptualizing stress responses. This framework distinguishes two orthogonal dimensions: (a) effortful coping versus involuntary reactions and (b) engagement with versus disengagement from stressors, yielding four stress response categories: effortful engagement (efforts to modify or adapt to stressors, e.g., problem solving, cognitive restructuring), effortful disengagement (efforts directed away from stressors, e.g.,

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avoidance, denial), involuntary engagement (automatic responses involving overengagement with stressors, e.g., rumination, emotional arousal), and involuntary disengagement (automatic responses involving underengagement with stressors, e.g., emotional numbing, escape). Consistent with theoretical perspectives on the benefits of active coping responses (Compas et al., 2001), effortful engagement consistently is associated with positive social and emotional well-being (Flynn & Rudolph, 2011; Wadsworth et al., 2004), whereas involuntary responses are associated with maladjustment (Connor-Smith et al., 2000; Flynn & Rudolph, 2011; Wadsworth et al., 2004) in adolescence. Research on the correlates of effortful disengagement has been inconsistent, yielding a mix of positive (e.g., Troop-Gordon, Rudolph, Sugimura, & Little, 2015), negative (Connor-Smith et al., 2000; Sontag & Graber, 2010), or null associations (Compas et al., 2001; Flynn & Rudolph, 2007).

During childhood, stress responses vary across time and situations. With age, these responses become increasingly entrenched such that stress responses are more trait-like by adulthood (Compas, Connor, Saltzman, Thomsen, & Wadsworth, 1999). It is assumed that changes in stress responses are the result of increasing regulation of the biological, cognitive, and emotional systems necessary for effective and volitional coping, as well as the behavioral strategies necessary to support coping efforts (Compas et al., 2001). Therefore, although some developmental advances may temporarily foster maladaptive responses (e.g., stronger perspective taking skills resulting in involuntary engagement; Skinner & Zimmer-Gembeck, 2007), these advances should predominantly generate an increase in effortful engagement and a concomitant decrease in disengagement and involuntary engagement responses. Consistent with this premise, age-related increases have been documented in effortful coping responses, including problem solving, distraction, emotion regulation, and cognitive restructuring (Skinner & Zimmer-Gembeck, 2007). However, this research often uses cross-sectional designs that focus solely on volitional coping strategies, lack a strong conceptual framework, and vary as to whether responses were evaluated with regard to specific or nonspecific stressors (Skinner & Zimmer-Gembeck, 2007; Zimmer-Gembeck & Skinner, 2011). This study addresses these limitations by (a) using longitudinal data to identify normative changes in stress responses across middle childhood into early adolescence, (b) drawing on Compas et al.'s (2001) well-established

theoretical framework to classify stress responses, and (c) examining changes in stress responses specifically within the context of an interpersonal stressor.

#### *Childhood Peer Victimization as a Predictor of Stress Responses in Early Adolescence*

Beyond normative changes, it is critical to understand how early experience can shape individual differences in growth trajectories of stress responses. Drawing from theories emphasizing the role of early adversity in sensitizing youth to later stress (Boyce & Ellis, 2005), this study examined whether frequent exposure to peer victimization interferes with the development of effective stress responses. Peer victimization may disrupt children's ability to regulate physiological and emotional responses to stress, lead to cognitions that undermine effective responding (e.g., thoughts of hopelessness, self-blame, worthlessness), and hamper opportunities to develop active, problem-solving behaviors aimed at resolving stressful situations. The long-term consequence may be reduced effortful engagement and more effortful disengagement and involuntary stress responses. Although peer adversity comes in many forms, chronic peer victimization may take a particularly pernicious toll on children's ability to respond effectively to stress. Approximately 10%–20% of children experience frequent peer victimization, and the consequences for psychological well-being are well-documented, including internalizing and externalizing problems (Rudolph, Troop-Gordon, Hessel, & Schmidt, 2011; Troop-Gordon & Ladd, 2005), school maladjustment and academic failure (Nakamoto & Schwartz, 2010), and treatment for psychological disorders in adulthood (Sourander et al., 2009). Moreover, peer victimization is associated with dysregulated physiological response systems (Knack, Jensen-Campbell, & Baum, 2011; Vaillancourt et al., 2008, for a review, see Murray-Close, 2013), depressogenic and aggressogenic cognitions (e.g., Høglund & Leadbeater, 2007; Rudolph, 2009; Rosen, Milich, & Harris, 2007; Troop-Gordon & Ladd, 2005), emotion dysregulation (McLaughlin, Hatzenbuehler, & Hilt, 2009; Rudolph, 2009), and poor behavioral coping responses (Wilton, Craig, & Pepler, 2000). The accumulation of these effects is likely sustained maladaptive stress responses over time.

Only a few studies directly examine linkages between peer victimization, or related forms of peer adversity, and stress responses utilizing a theoretical framework (e.g., Compas et al., 2001) that

identifies responses based on a confluence of underlying physiological, cognitive, emotional, and behavior reactions. Among a sample of early adolescent girls, peer stress was correlated with less frequent effortful engagement coping and more frequent involuntary engagement (Sontag, Graber, Brooks-Gunn, & Warren, 2008). In a follow-up study of adolescent boys and girls, peer stress was correlated with more voluntary disengagement and involuntary responses to stress (Sontag & Graber, 2010). A recent, longitudinal study, using data from the same larger data set as the current study, examined whether peer victimization in third and fourth grades predicted stress responses a year later when children were in the fourth and then fifth grades. (Troop-Gordon et al., 2015). Peer victimization forecast lower levels of effortful engagement and higher levels of involuntary responses. Peer victimization did not predict effortful disengagement, although correlations suggested a positive concurrent association. These studies lend support to the idea that peer adversity may undermine effective stress responses. However, these findings were based either on cross-sectional data or prediction across a 1-year period. Furthermore, these studies accounted for the development of between-person differences in stress responses as a function of earlier peer adversity but provided no insights into mean-level changes within individuals. This study examined whether exposure to peer victimization early in childhood has a long-term effect on within-person stress response development across childhood and into early adolescence and whether changes in peer victimization over time are associated with co-occurring shifts in responses to interpersonal stress.

### *The Present Study*

Stress responses and peer victimization were tracked from second to sixth grades. Latent growth curve modeling was used to identify normative trajectories of stress response development as well as change in victimization over time. We anticipated that youth would show gradual increases in effortful engagement and gradual decreases in effortful disengagement and involuntary responses. Parallel process latent growth curve modeling was used to assess the relative contributions of early (second-grade) peer victimization and changes in peer victimization (second to sixth grades) to the prediction of individual differences in these stress response trajectories.

Middle childhood may be a critical period for developing effective stress responses needed to

foster healthy adjustment during early adolescence. Heightened neural and emotional sensitivity to social stress during early adolescence has been well documented (Somerville, 2013), and these physiological and psychological shifts occur at a time when youth show increased concern for peer group acceptance and popularity (Gavin & Furman, 1989; LaFontana & Cillessen, 2009) and greater reliance on age mates for social support (Furman & Buhrmester, 1992). Observed increases in mental health problems during early adolescence often are attributed to these biological and contextual changes (Nelson, Leibenluft, McClure, & Pine, 2005). It is likely that those early adolescents who have already cultivated effortful engagement responses to interpersonal stress and who show low levels of involuntary stress responses can best handle the psychobiological shifts and increased social demands of adolescence. Therefore, it is important to know whether early exposure to peer victimization hampers the development of effective stress responses during this sensitive period. Furthermore, early adolescence is a time of increasing sensitivity to social stress in girls relative to boys (Nelson et al., 2005; Rudolph, 2002; Somerville, 2013). Consequently, as children approach adolescence, ongoing peer victimization may more strongly disrupt healthy stress response development among girls than among boys. Thus, we explored the possibility that trajectories of stable or increasing peer victimization would more strongly predict stress response development in girls than in boys.

## **Method**

### *Participants and Procedures*

Participants were 636 children (298 boys, 338 girls;  $M_{\text{age}} = 7.97$  years,  $SD = .37$ ; 66.7% White, 21.7% African American, 11.6% other; 34.7% received a subsidized school lunch) from several Midwestern towns. The data were collected from two cohorts of children between the spring of 2006 and spring of 2011. This sample was the same as that used in Troop-Gordon et al.'s (2015) study. The previous study used three waves of data collected when the children were in the third, fourth, and fifth grades. In order to assess within-person trajectories over an extensive developmental period, the current study uses five waves of data collected when the children were in the second to sixth grades. In the second grade, parents provided written consent, and children provided oral assent. Of

the 725 eligible children, 576 (80%) received parental consent. Participants and nonparticipants at  $W_1$  did not significantly differ in gender,  $\chi^2(1) = 0.15$ , *ns*, age,  $t(723) = 0.63$ , *ns*; ethnicity (White vs. minority),  $\chi^2(1) = 0.59$ , *ns*; or school lunch status (full pay vs. subsidized),  $\chi^2(1) = 0.35$ , *ns*. In the third grade, an additional 60 classmates of the participating children were recruited, yielding a total of 636 participants. These 60 children provided data beginning in the winter of third grade. Participants completed annual follow-up assessments through the sixth grade.

Of the original 636 participants, 554 (87%) had relevant self-report or teacher report data in the sixth grade. Youth with sixth-grade data did not differ from those without data in gender,  $\chi^2(1) = 0.02$ , *ns*; ethnicity (White vs. minority),  $\chi^2(1) = 1.37$ , *ns*; school lunch status (full pay vs. subsidized),  $\chi^2(1) = 0.35$ , *ns*; or age,  $t(634) = 1.68$ , *ns*. Youth recruited in the second grade who remained in the study did not differ on any of the second-grade variables than youth who did not remain in the study, all  $t(574) \leq 0.78$ , *ns*. Youth recruited in the third grade who remained in the study did not differ on any of the third-grade variables than youth who did not remain in the study, all  $t(58) \leq 1.37$ , *ns*. All 636 participating children were included in the analyses (see Results).

The procedures for this study were approved by the university's Institutional Review Board. In the winter of each year, questionnaires were administered during two classroom sessions to small groups (3–4 students) in elementary school (second to fifth grades) and larger groups (15–20 students) in middle school (sixth grade). Teachers returned their surveys to a locked box at their school, in person, or by mail. Children received a small gift; teachers received a monetary reimbursement. Each participating elementary school classroom received a monetary honorarium, and middle schools received a school-wide honorarium.

### Measures

Table 1 presents descriptive data and reliability (i.e., Cronbach's alphas) of the measures for girls and boys. Peer victimization scores were low to moderate. Effortful engagement scores were somewhat higher than those for effortful disengagement or involuntary responses. All of the measures showed strong internal consistency across waves with the exception of moderate reliability for second-grade effortful disengagement.

Table 1  
Descriptive Data and Internal Reliability of Measures

|  | Girls    |           |          | Boys     |           |          |
|--|----------|-----------|----------|----------|-----------|----------|
|  | <i>M</i> | <i>SD</i> | $\alpha$ | <i>M</i> | <i>SD</i> | $\alpha$ |
| Second-grade victimization             | 1.91     | .54       | .93      | 1.90     | .52       | .92      |
| Third-grade victimization              | 1.84     | .53       | .95      | 1.85     | .55       | .95      |
| Fourth-grade victimization             | 1.75     | .49       | .94      | 1.83     | .55       | .95      |
| Fifth-grade victimization              | 1.72     | .52       | .95      | 1.71     | .49       | .95      |
| Sixth-grade victimization <sup>a</sup> | 1.58     | .47       | .95      | 1.67     | .46       | .94      |
| Second-grade effortful engagement      | 3.98     | .54       | .80      | 3.89     | .57       | .80      |
| Third-grade effortful engagement       | 3.84     | .51       | .83      | 3.79     | .54       | .83      |
| Fourth-grade effortful engagement      | 3.97     | .58       | .85      | 3.88     | .60       | .85      |
| Fifth-grade effortful engagement       | 4.01     | .66       | .86      | 3.94     | .58       | .86      |
| Sixth-grade effortful engagement       | 4.08     | .70       | .85      | 4.01     | .64       | .88      |
| Second-grade effortful disengagement   | 1.89     | .45       | .65      | 1.92     | .47       | .68      |
| Third-grade effortful disengagement    | 2.32     | .36       | .75      | 2.29     | .38       | .79      |
| Fourth-grade effortful disengagement   | 2.21     | .35       | .79      | 2.22     | .39       | .79      |
| Fifth-grade effortful disengagement    | 2.21     | .36       | .80      | 2.17     | .36       | .74      |
| Sixth-grade effortful disengagement    | 2.17     | .33       | .80      | 2.15     | .36       | .80      |
| Second-grade involuntary engagement    | 2.32     | .40       | .76      | 2.36     | .42       | .70      |
| Third-grade involuntary engagement     | 2.22     | .38       | .82      | 2.24     | .39       | .79      |
| Fourth-grade involuntary engagement    | 2.20     | .39       | .84      | 2.24     | .40       | .80      |
| Fifth-grade involuntary engagement     | 2.20     | .41       | .85      | 2.23     | .38       | .82      |
| Sixth-grade involuntary engagement     | 2.19     | .42       | .89      | 2.22     | .41       | .83      |
| Second-grade involuntary disengagement | 1.83     | .34       | .72      | 1.84     | .38       | .71      |
| Third-grade involuntary disengagement  | 1.67     | .31       | .74      | 1.71     | .34       | .75      |
| Fourth-grade involuntary disengagement | 1.62     | .32       | .81      | 1.67     | .35       | .81      |
| Fifth-grade involuntary disengagement  | 1.59     | .38       | .83      | 1.65     | .35       | .80      |
| Sixth-grade involuntary disengagement  | 1.55     | .35       | .87      | 1.60     | .34       | .83      |

<sup>a</sup>Differs across sex at  $p < .05$ .



*Peer Victimization*

Each year from second to sixth grades, children and teachers completed a revised version (Rudolph, Abaied, Flynn, Sugimura, & Agoston, 2011) of the Social Experiences Questionnaire (Crick & Grotpeter, 1996) to assess victimization (e.g., "How often do you get teased by another kid?," "How often does a friend spread rumors about you because they are mad at you?"). Children and teachers indicated how often children experienced each type of victimization from 1 (*never*) to 5 (*all the time*). Eleven new items were created to provide a more comprehensive assessment of victimization, resulting in a 21-item measure. Of the new items, six assessed overt victimization (e.g., "How often do you get teased by another kid?") and five assessed relational victimization (e.g., "How often does a friend spread rumors about you because they are mad at you?"). Within-informant scores were computed as the mean of the items. Self- and teacher reports had excellent internal reliability across all waves (all  $\alpha$ s > .91). This revised version of the Social Experiences Questionnaire has strong predictive validity (Rudolph, Abaied, et al., 2011). In general, self-reports of victimization correspond to reports by peers (Graham & Juvonen, 1998) and parents (Bollmer, Harris, & Milich, 2006). Teacher reports of victimization also have established reliability and validity, and self- and teacher reports of victimization are significantly correlated (Ladd & Kochenderfer-Ladd, 2002).

Within-wave correlations between self-reports and teacher reports of victimization ranged from .19 to .31,  $ps < .001$ ; thus, composite scores were calculated by averaging across child and teacher reports. Composite scores increase reliability and reduce the impact of measurement error (Ladd & Kochenderfer-Ladd, 2002). The composite peer victimization score had strong internal reliability (see Table 1) and provided a more comprehensive picture of victimization by incorporating both child and teacher perspectives, which may provide both overlapping and distinct information about victimization experiences. Indeed, research shows that self- and teacher reports of victimization are uniquely associated with children's adjustment, and a multi-informant composite of victimization is a better predictor of adjustment than monoinformant assessments (Ladd & Kochenderfer-Ladd, 2002). Stability coefficients ranged from .50 to .56,  $ps < .001$ , across the five waves of data.

*Responses to Stress*

Each year from second to sixth grades, children completed a revision (Rudolph, Abaied, et al., 2011) of the Responses to Stress Questionnaire (RSQ; Connor-Smith et al., 2000), modified to assess responses to peer aggression. The RSQ measures self-reported physiological, cognitive, emotional, and behavioral responses to stress. Children checked a box indicating how often they engaged in each response *when other kids are mean*. These responses were converted to a 4-point scale. Items from the original measure were reworded for younger children, and the measure was shortened (see Rudolph, Abaied, et al., 2011; Troop-Gordon et al., 2015 for details regarding item selection). The revised measure included 38 items and retained the same four dimensions as the original measure: (a) effortful engagement (14 items; e.g., "I do something to try to fix the problem or take action to change things."), (b) effortful disengagement (6 items; e.g., "I try to believe it never happened."), (c) involuntary engagement (10 items; e.g., "I keep remembering what happened or can't stop thinking about what might happen."), and involuntary disengagement (8 items; e.g., "I just have to get away, I can't stop myself."). Because the effortful disengagement subscale had only moderate internal consistency at  $W_1$ , three previously omitted items were included at the later waves, yielding a nine-item scale. Consistent with other studies of coping (Connor-Smith et al., 2000; Osowiecki & Compas, 1999), proportion scores were computed as the score for each subscale divided by the total score. These scores were multiplied by 10 to aid in model convergence. Convergent and discriminant validity has been established through correlations with another well-validated coping measure (Connor-Smith et al., 2000). Stability coefficients across the five waves of data ranged from .32 to .62 for effortful engagement, .17 to .33 for effortful disengagement, .32 to .54 for involuntary engagement, and .26 to .52 for involuntary disengagement,  $ps < .001$ .

*Plan for Analyses*

Data analysis was conducted in three stages. First, descriptive and correlational statistics were computed, and  $t$  tests were performed to identify gender differences in all study variables. Second, to address the first objective of this study (documenting normative trajectories in stress responses from

second through sixth grades), latent growth curve analyses were conducted using Mplus statistical software (Muthén & Muthén, 1998–2012). These analyses were conducted using full information maximum likelihood estimation (Enders & Bandalos, 2001); thus, parameters were estimated using all available data from the 636 participating youth. Separate models were estimated for each type of stress response. For each stress response, a latent intercept variable representing the initial level of the stress response was estimated by setting indicator paths from the observed second- to sixth-grade stress response variables to be equal to 1. A latent variable representing linear change in the stress response was estimated by setting indicator paths from the observed second- to sixth-grade stress response variables to be equal to 0, 1, 2, 3, and 4, respectively. A latent variable representing an acceleration or deceleration in change (i.e., a quadratic slope) was estimated by setting indicator paths from the observed second- to sixth-grade stress response variables to be equal to 0, 1, 4, 9, and 16. By setting the path from second-grade stress response variables to the latent linear and quadratic slopes at 0, the intercept could be interpreted as the level of the stress response at the onset of the study (i.e., second grade; Duncan, Duncan, Strycker, Li, & Alpert, 1999). These unconditional latent growth curve models provided estimates of the means and variances of the latent intercept, linear slope, and quadratic slope that were not conditional on other study variables. For parsimony, the latent quadratic term was retained in the model only if the mean of the latent quadratic term was significantly different from 0 or if the variance in the latent quadratic slope was significantly  $> 0$ . If the mean of the latent quadratic slope was significantly different from 0 but there was not significant variance in the latent quadratic slope, the latent quadratic slope was retained in the model, and the variance of the term set to 0 to facilitate estimation of the final growth model.

Potential gender differences were examined using multigroup structural equation modeling. All paths and variances were estimated separately for girls and boys. The model was then reestimated constraining all means and variances of the latent intercept and slope factors to be equal across gender, and a chi-square difference test was used to determine whether there was a significant decrease in model fit. A significant decrement in model fit was followed by sequentially constraining parameters to identify those that differed between boys

and girls. Final models were estimated constraining all parameters to be equal for boys and girls except for those parameters for which a significant gender difference was found.

Third, a final series of latent growth curve models was conducted to address the second objective of this study, examining whether stress response latent trajectories varied as a function of early (second-grade) peer victimization and changes in (second- to sixth-grade) victimization. Initially, a multigroup latent growth curve model was estimated for peer victimization. The peer victimization trajectory was then added as a predictor of each stress response trajectory. These conditional models (i.e., the trajectory for the stress response was conditional on the peer victimization trajectory) were estimated separately for each stress response. In each model, the stress response latent intercept was predicted by the peer victimization latent intercept, and the stress response latent linear and, when there was significant variance, quadratic slope were predicted by the peer victimization latent intercept and latent slope. Chi-square difference tests were used to determine whether there was a significant decrease in model fit when the predictive paths were constrained to be equal for girls and boys; if a significant gender difference emerged, paths were constrained sequentially to identify those that differed by gender. Final models were estimated constraining all paths to be equal for boys and girls except in those cases in which a significant gender difference was found.

To better understand how stress response trajectories differ as a function of peer victimization trajectories, two sets of plots were generated. First, stress response latent trajectories were plotted at high (+1 *SD*) and low (−1 *SD*) values of the peer victimization latent intercept and at the average latent peer victimization slope. Thus, the estimated stress response trajectories reflect the enduring impact of early peer victimization on changes in stress responses taking into account the subsequent normative changes in peer victimization. Second, for those models in which the peer victimization latent linear slope predicted the stress response latent linear or quadratic slope, stress response trajectories were plotted at high (+1 *SD*) and low (−1 *SD*) levels of the peer victimization latent linear slope and at the average peer victimization latent intercept. Thus, the estimated stress response trajectories reflect changes in the stress response as a function of concurrent changes in peer victimization.

Table 2  
*Intercorrelations of Study Variables by Sex*

|  | Peer victimization |             |              |             |             |
|--|--------------------|-------------|--------------|-------------|-------------|
|  | Second grade       | Third grade | Fourth grade | Fifth grade | Sixth grade |
| 1. Second-grade effortful engagement       | -.15/-.13          | -.05/-.19   | -.13/-.14    | -.13/-.11   | -.07/-.13   |
| 2. Third-grade effortful engagement        | -.12/-.20          | -.31/-.42   | -.34/-.40    | -.29/-.28   | -.26/-.34   |
| 3. Fourth-grade effortful engagement       | -.20/-.20          | -.27/-.36   | -.39/-.39    | -.32/-.29   | -.32/-.35   |
| 4. Fifth-grade effortful engagement        | -.17/-.27          | -.25/-.37   | -.28/-.38    | -.36/-.37   | -.31/-.42   |
| 5. Sixth-grade effortful engagement        | -.22/-.27          | -.24/-.34   | -.28/-.31    | -.38/-.36   | -.48/-.42   |
| 6. Second-grade effortful disengagement    | -.09/-.21          | -.27/-.22   | -.08/-.08    | -.12/-.02   | -.12/-.01   |
| 7. Third-grade effortful disengagement     | .08/.04            | -.10/-.01   | -.04/.01     | -.15/.08    | -.16/.03    |
| 8. Fourth-grade effortful disengagement    | .02/.11            | .02/.04     | -.04/-.02    | -.02/.06    | .02/.00     |
| 9. Fifth-grade effortful disengagement     | .02/.05            | .06/-.04    | -.05/.05     | -.01/.08    | -.02/-.01   |
| 10. Sixth-grade effortful disengagement    | .06/.29            | .05/.19     | .00/.18      | .08/.31     | .01/.22     |
| 11. Second-grade involuntary engagement    | .13/.23            | .17/.25     | .11/.17      | .13/.15     | .13/.09     |
| 12. Third-grade involuntary engagement     | .09/.14            | .32/.32     | .28/.29      | .28/.20     | .25/.23     |
| 13. Fourth-grade involuntary engagement    | .14/.05            | .23/.26     | .34/.29      | .23/.17     | .22/.24     |
| 14. Fifth-grade involuntary engagement     | .08/.13            | .18/.30     | .23/.25      | .28/.25     | .20/.35     |
| 15. Sixth-grade involuntary engagement     | .18/.14            | .21/.25     | .25/.23      | .33/.20     | .45/.34     |
| 16. Second-grade involuntary disengagement | .20/.19            | .22/.24     | .19/.10      | .18/.03     | .11/.10     |
| 17. Third-grade involuntary disengagement  | .02/.14            | .19/.31     | .24/.29      | .24/.14     | .22/.25     |
| 18. Fourth-grade involuntary disengagement | .18/.20            | .19/.31     | .33/.36      | .30/.25     | .26/.33     |
| 19. Fifth-grade involuntary disengagement  | .18/.29            | .21/.31     | .28/.32      | .32/.30     | .32/.33     |
| 20. Sixth-grade involuntary disengagement  | .17/.14            | .20/.21     | .27/.19      | .31/.21     | .40/.24     |

Note. Intercorrelations presented before the slash are for girls; intercorrelations presented after the slash are for boys. Correlations  $\geq |.08|$  are significant at  $p < .05$ . Correlations  $\geq |.11|$  are significant at  $p < .01$ .

## Results

### *Gender Differences and Correlational Data*

A series of  $t$  tests revealed no significant gender differences with the exception of sixth-grade victimization,  $t(552) = 2.33$ ,  $p < .05$ , with boys scoring higher than girls. Table 2 presents correlations between peer victimization and each stress response across waves. Correlations ranged from small to moderate and were in expected directions. Correlations among stress responses (not shown in Table 2) varied with relatively weak to moderate relations between effortful engagement and effortful disengagement ( $r_s = -.06$  to  $-.26$ ), effortful disengagement and involuntary engagement ( $r_s = -.42$  to  $-.11$ ), effortful disengagement and involuntary disengagement ( $r_s = -.02$  to  $-.33$ ), and involuntary engagement and involuntary disengagement ( $r_s = .20$  to  $.60$ ). Stronger, negative relations were found between effortful engagement and involuntary engagement ( $r_s = -.58$  to  $-.87$ ) and between effortful engagement and involuntary disengagement ( $r_s = -.57$  to  $-.81$ ).

### *Unconditional Latent Growth Curve Analyses for Stress Responses*

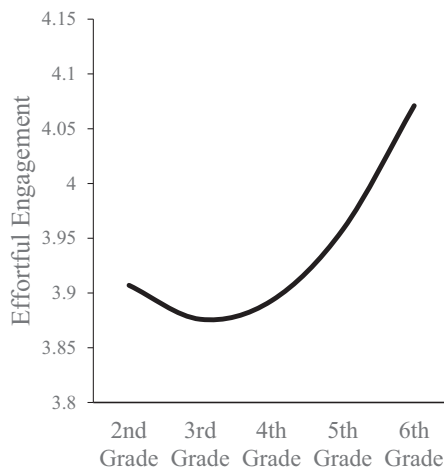
#### *Effortful Engagement*

Based on the modification indices, two adjustments were made to the unconditional model for effortful engagement: The covariances between the third- and fourth-grade and the fourth- and fifth-grade effortful engagement indicators were freed. The variance of the quadratic slope was nonsignificant for boys and for girls and, therefore, was set to 0. The model fit was significantly reduced when the means and variances of the latent intercept and linear slope and the mean of the latent quadratic slope were set to be equal for boys and girls,  $\Delta\chi^2(5) = 14.21$ ,  $p = .014$ . This was due to greater variance in the linear slope for boys than for girls,  $\Delta\chi^2(1) = 8.41$ ,  $p = .004$ . A final model constraining all parameter estimates to be equal for boys and girls except the variance in the linear slope fit the data well,  $\chi^2(18, N = 636) = 39.359$ ,  $p = .003$ , comparative fit index (CFI) = 0.97, root mean square error of approximation (RMSEA) = .061, standardized root mean square residual (SRMR) = .066. The

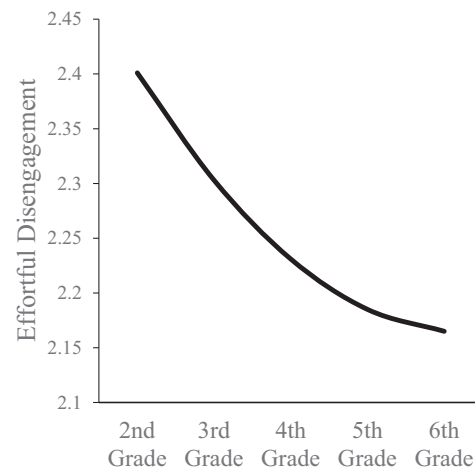
mean linear slope was negative and significantly different from 0 ( $M = -0.055$ ,  $p = .01$ ), and the mean quadratic slope was positive and significantly different from 0 ( $M = 0.024$ ,  $p < .001$ , for boys and girls, respectively). There was significant variance in the latent intercept (.112,  $p < .001$ ) and the latent linear slope (.009 and .023,  $ps \leq .002$ , for boys and girls, respectively). Figure 1a presents a plot of the effortful engagement trajectory. Consistent with the negative latent linear slope and positive latent quadratic slope, scores on effortful engagement declined very slightly between second and third grades and increased between fourth and sixth grades.

### Effortful Disengagement

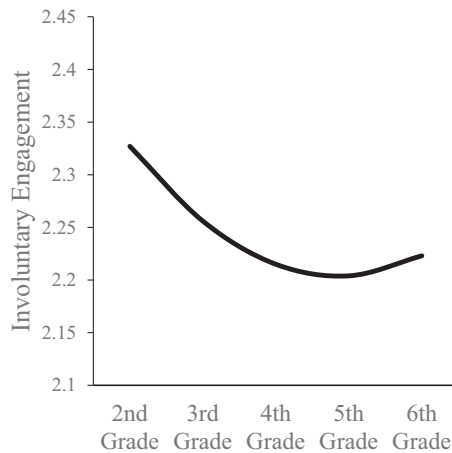
Based on the modification indices, two adjustments were made to the unconditional model for effortful disengagement: The covariances between the second- and fourth-grade and third- and fourth-grade effortful disengagement indicators were freed. The variance of the quadratic slope was nonsignificant for boys and girls, and therefore it was set to 0. The model fit was not significantly reduced when the means and variances of the latent intercept and linear slope and the mean of the latent quadratic slope were set to be equal for boys and girls,  $\Delta\chi^2(5) = 4.65$ ,  $p = .46$ . A final model constraining



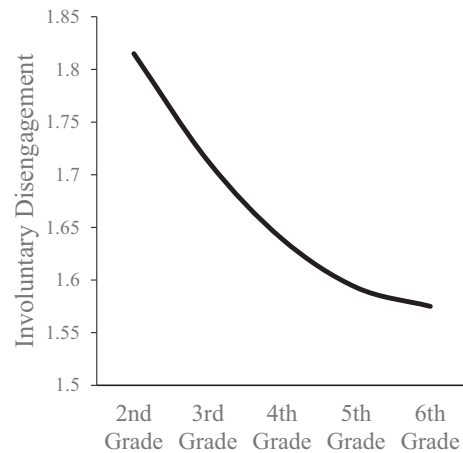
(a) Effortful Engagement



(b) Effortful Disengagement



(c) Involuntary Engagement



(d) Involuntary Disengagement

Figure 1. Plots of unconditional latent growth curves for (a) effortful engagement, (b) effortful disengagement, (c) involuntary engagement, and (d) involuntary disengagement.



all parameter estimates to be equal for boys and girls fit the data well,  $\chi^2(17, N = 636) = 25.683$ ,  $p = .08$ , CFI = 0.96, RMSEA = .040, SRMR = .067. The mean linear slope was negative and significantly different from 0 ( $M = -0.111$ ,  $p < .001$ ), and the mean quadratic slope was positive and significantly different from 0 ( $M = 0.013$ ,  $p = .04$ ). There was significant variance in the latent intercept (.039,  $p < .001$ ) and slope (.003,  $p = .01$ ). Figure 1b presents a plot of the effortful disengagement trajectory. Consistent with the negative latent linear slope and positive quadratic slope, effortful disengagement declined steadily between the second and fourth grades with this decrease decelerating between the fourth and sixth grades.

#### *Involuntary Engagement*

No modifications were needed to achieve adequate fit for the unconditional model for involuntary engagement, and the model fit was not significantly reduced when the means and variances of the latent intercept, latent linear slope, and latent quadratic slope were set to be equal for boys and girls,  $\Delta\chi^2(6) = 5.69$ ,  $p = .46$ . A final model constraining all parameter estimates to be equal for boys and girls fit the data well,  $\chi^2(18, N = 636) = 17.431$ ,  $p = .49$ , CFI = 1.00, RMSEA = .000, SRMR = .034. The mean linear slope was negative and significantly different from 0 ( $M = -0.086$ ,  $p < .001$ ), and the mean quadratic slope was positive and significantly different from 0 ( $M = 0.015$ ,  $p < .001$ ). There was significant variance in the latent intercept (.058,  $p < .001$ ), linear slope (.036,  $p = .005$ ), and quadratic slope (.002,  $p = .001$ ). Figure 1c presents a plot of the involuntary engagement trajectory. Consistent with the negative latent linear slope and positive latent quadratic slope, involuntary engagement declined between the second and fourth grades and increased slightly between the fourth and sixth grades.

#### *Involuntary Disengagement*

Based on the modification indices, one adjustment was made to the unconditional model for involuntary disengagement: The covariance between the fourth- and sixth-grade involuntary disengagement indicators was freed. The model fit was significantly reduced when the means and variances of the latent intercept, latent linear slope, and latent quadratic slope were set to be equal for boys and girls,  $\Delta\chi^2(6) = 14.94$ ,  $p = .02$ . However, when parameters were tested sequentially, only a

marginal difference emerged for the variance of the latent quadratic slope,  $\Delta\chi^2(1) = 3.66$ ,  $p = .056$ . Because the variance in the latent quadratic slope was significant for boys (.002,  $p = .015$ ) but not girls (.00,  $p = .89$ ), the variance was set to 0 for girls only. In addition, although the variance in the latent linear slope was not significantly different for boys and girls, setting the variance to be equal led to problems with model convergence. Therefore, the variance in the latent linear slope was freely estimated for boys and girls. A final model constraining the means of the latent intercept, linear slope, and quadratic slope, and the variance in the latent intercept, to be equal for boys and girls fit the data well,  $\chi^2(17, N = 636) = 39.054$ ,  $p = .002$ , CFI = 0.96, RMSEA = .064, SRMR = .076. The mean linear slope was negative and significantly different from 0 ( $M = -0.116$ ,  $p < .001$ ), and the mean quadratic slope was positive and significantly different from 0 ( $M = 0.014$ ,  $p < .001$ ). There was significant variance in the latent intercept (.034,  $p < .001$ ) and slope (.028 and .006,  $ps \leq .04$ , for boys and girls, respectively). Figure 1d presents a plot of the involuntary disengagement trajectory. Consistent with the negative latent linear slope and positive latent quadratic slope, involuntary disengagement declined between the second and fourth grades with this decrease decelerating between fifth and sixth grades.

#### *Stress Response Latent Growth Curve Trajectories as a Function of Peer Victimization Latent Growth Trajectories*

Next, conditional models were estimated to examine whether stress response latent trajectories varied as function of early (second-grade) peer victimization and changes in (second- to sixth-grade) victimization. Based on the modification indices, when testing the unconditional model for peer victimization, two adjustments were made: The covariances between the third- and fourth-grade and the fourth- and fifth-grade victimization indicators were freed. The latent quadratic slope was not significantly different from 0 and had negligible variance and, therefore, was dropped from the model. The model fit was marginally reduced when the means and variances of the latent intercept and latent linear slope were set to be equal for boys and girls,  $\Delta\chi^2(4) = 8.74$ ,  $p = .07$ . This was due to a greater average decline in peer victimization among girls than boys,  $\Delta\chi^2(1) = 5.28$ ,  $p = .02$ . A final model constraining the means of the latent intercept and the variance in the latent intercept and latent slope to

be equal for boys and girls fit the data well,  $\chi^2(19, N = 636) = 38.379, p = .005, CFI = 0.98, RMSEA = .057, SRMR = .052$ . The mean linear slope was negative and significantly different from 0 ( $M_s = -0.058$  and  $-0.081, p_s < .001$ , for boys and girls, respectively), and the mean quadratic slope was positive and significantly different from 0 ( $M = 0.014, p < .001$ ), and there was significant variance in the latent intercept (.147,  $p < .001$ ) and the latent linear slope (.005,  $p < .001$ ).

This final model was used to test conditional models in which peer victimization trajectories predicted trajectories of stress responses. Unstandardized path coefficients for the predictive paths are presented in Table 3. Plots of trajectories are presented in Figures 2 and 3. In order to provide accurate predicted trajectories for boys and girls, trajectories were estimated separately for boys and girls to take into account the significant gender difference in the peer victimization latent slope.

*Effortful Engagement*

A conditional model for effortful engagement was estimated and tested for gender differences in the predictive paths (i.e., the paths from the peer victimization latent intercept to the effortful engagement latent intercept and linear slope, and the path from the peer victimization latent linear slope to the effortful engagement latent linear slope). The model fit was significantly reduced when these paths were constrained to be equal for boys and girls,  $\Delta\chi^2(3) = 9.89, p = .02$ . This was due to gender differences in the path from the peer victimization latent intercept to the effortful engagement latent

intercept,  $\Delta\chi^2(1) = 4.35, p = .04$ , from the peer victimization latent intercept to the effortful engagement latent slope,  $\Delta\chi^2(3) = 7.55, p = .006$ , and from the peer victimization latent linear slope to the effortful engagement latent linear slope,  $\Delta\chi^2(1) = 5.53, p = .02$ . A final model freeing these predictive paths fit the data well,  $\chi^2(81, N = 636) = 153.367, p < .001, CFI = 0.96, RMSEA = .053, SRMR = .056$ . For boys and girls, the peer victimization latent intercept was negatively associated with the effortful engagement latent intercept, and this association was stronger for boys than girls. In addition, for boys and girls, the peer victimization latent intercept was negatively associated with the effortful engagement linear slope, and this association was stronger for girls than boys. As shown in Figure 2a, second-grade effortful engagement scores were higher at low levels of initial peer victimization than at high levels of initial peer victimization, and this difference was slightly greater for boys. In addition, at low levels of initial peer victimization, effortful engagement increased steadily between second and sixth grades. In comparison, at high levels of initial peer victimization, effortful engagement declined between second and fourth grades, and increased slightly between fourth and sixth grades. This difference in the slopes was significantly greater for girls than for boys.

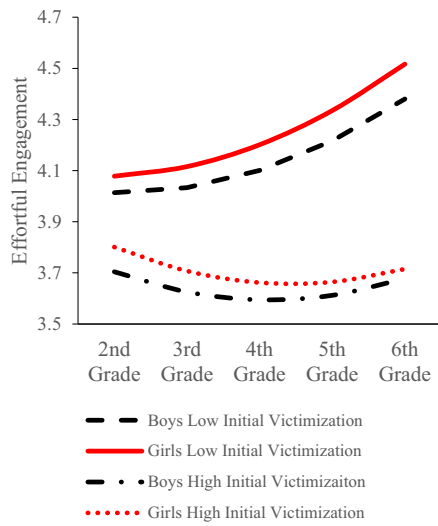
In addition, the peer victimization latent linear slope was negatively associated with the effortful engagement latent linear slope, and this association was stronger for girls than for boys.

As shown in Figure 3a, at a relatively high victimization slope (i.e., 1 SD above the mean), for

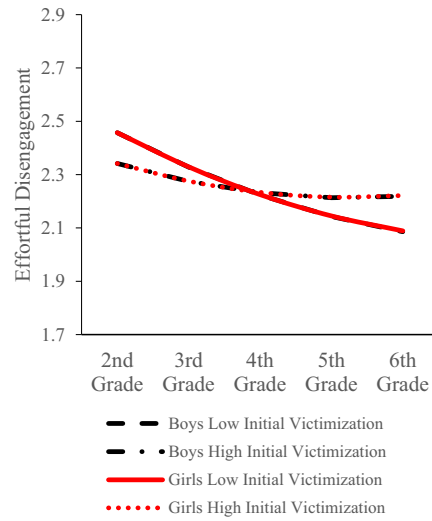
Table 3  
Unstandardized Path Coefficients Conditional Models Testing Relations Between Latent Peer Victimization and Stress Response Trajectories

| Stress response           | Peer victimization intercept → Stress response intercept |         | Peer victimization intercept → Stress response linear slope |         | Peer victimization intercept → Stress response quadratic slope |       | Peer victimization slope → Stress response linear slope |          | Peer victimization slope → Stress response quadratic slope |       |
|---------------------------|--|---------|---|---------|--|-------|---|----------|--|-------|
|                           | Boys   | Girls   | Boys  | Girls   | Boys   | Girls | Boys  | Girls    | Boys   | Girls |
| Effortful engagement      | -.41***  | -.36*** | -.13**  | -.17*** | —  | —     | -.70**  | -1.53*** | —  | —     |
| Effortful disengagement   | -.15***  | -.15*** | .08***  | .08***  | —  | —     | -.03  | -.03     | —  | —     |
| Involuntary engagement    | .29***   | .29***  | .04*  | .04*    | —  | —     | .64***  | .64***   | —  | —     |
| Involuntary disengagement | .25***   | .25***  | .05**   | .05**   | -.01*  | —     | .72***  | .72***   | -.14*  | —     |

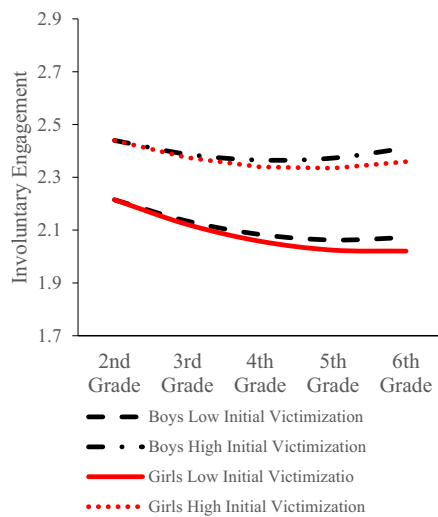
Note. Unstandardized paths were constrained to be equal for boys and girls unless a significant gender difference was detected or, as was in the case of involuntary engagement, only for boys was there significant variance in the latent quadratic slope. \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .



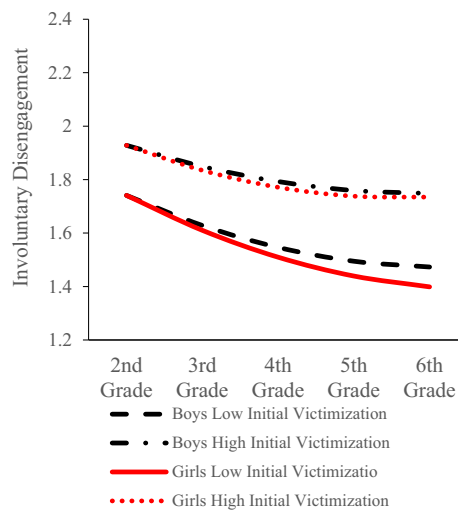
(a) Effortful Engagement



(b) Effortful Disengagement



(c) Involuntary Engagement



(d) Involuntary Disengagement

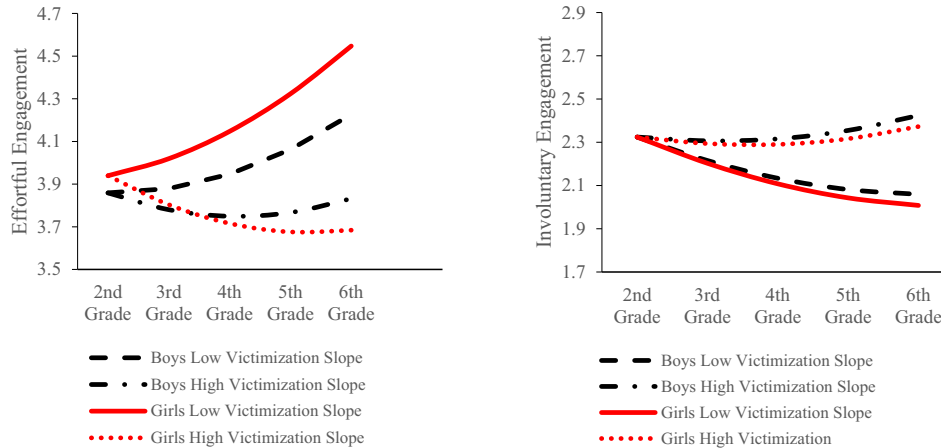
Figure 2. Plots of conditional latent growth curves at low and high levels of initial peer victimization for (a) effortful engagement, (b) effortful disengagement, (c) involuntary engagement, and (d) involuntary disengagement.

girls, effortful engagement slightly decreased between second and fifth grades and then remained relatively stable between fifth and sixth grades. For boys, at a relatively high victimization slope, effortful engagement trajectories remained relatively stable between second and sixth grades. For boys and girls, greater declines in the peer victimization slope (i.e., a slope 1 SD below the mean) were associated with an increase in effortful engagement between second and sixth grades. The association between peer victimization slope and effortful engagement trajectories was particularly strong for

girls, who showed notable increases in effortful engagement when peer victimized declined.

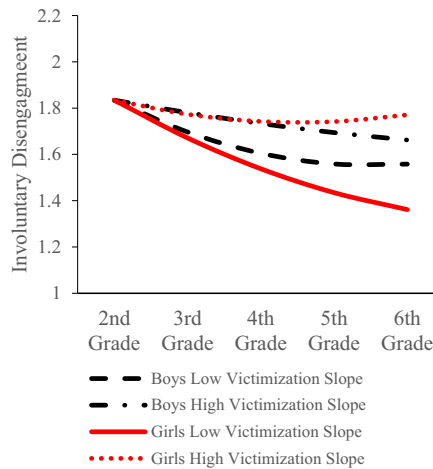
#### Effortful Disengagement

A conditional model for effortful disengagement was estimated and tested for gender differences in the predictive paths (i.e., the paths from the peer victimization latent intercept to the effortful disengagement latent intercept and linear slope, and the path from the peer victimization latent linear slope to the latent effortful disengagement linear slope).



(a) Effortful Engagement

(b) Involuntary Engagement



(c) Involuntary Disengagement

Figure 3. Plots of conditional latent growth curves at low and high levels of peer victimization slopes for (a) effortful engagement, (b) effortful disengagement, and (c) involuntary disengagement.

The model fit was not significantly reduced when the predictive paths were constrained to be equal for boys and girls,  $\Delta\chi^2(3) = 1.32, p = .73$ . The final model constraining the predictive paths to be equal for boys and girls fit the data well,  $\chi^2(83, N = 636) = 166.706, p < .001, CFI = 0.93, RMSEA = .056, SRMR = .073$ . For boys and girls, the peer victimization latent linear intercept was negatively associated with the effortful disengagement latent intercept and positively associated with the effortful disengagement linear slope. As shown in Figure 2b, second-grade effortful disengagement scores were higher at low levels of initial peer victimization than at high levels of initial peer victimization. In addition, at low levels of peer victimization, effortful disengagement declined

between second and sixth grades. In contrast, at high levels of initial victimization, effortful disengagement declined slightly between second and third grades and remained stable between third and sixth grades. The association between the peer victimization and effortful disengagement latent linear slopes was not significant for boys or girls. Therefore, the effortful disengagement trajectories were not plotted as a function of the victimization slope.

*Involuntary Engagement*

A conditional model for involuntary engagement was estimated and tested for gender differences in the predictive paths (i.e., the paths from the peer



victimization latent intercept to the involuntary engagement latent intercept, linear slope, and quadratic slope and the paths from the peer victimization latent linear slope to the latent involuntary engagement linear slope and quadratic slope). The model fit was not significantly reduced when the predictive paths were constrained to be equal for boys and girls,  $\Delta\chi^2(5) = 7.69$ ,  $p = .17$ . The paths from the peer victimization latent intercept and latent linear slope to the involuntary engagement latent quadratic slope were nonsignificant. Therefore, these paths were set to 0. The final model constraining these predictive paths to be equal for boys and girls fit the data well,  $\chi^2(84, N = 636) = 143.35$ ,  $p < .001$ , CFI = 0.96, RMSEA = .047, SRMR = .058. For boys and girls, the peer victimization latent linear intercept was positively associated with the involuntary engagement latent intercept and linear slope. As shown in Figure 2c, for boys and girls, involuntary engagement scores were higher at high levels of initial peer victimization than at low levels of initial peer victimization. In addition, at high levels of peer victimization, involuntary engagement remained relatively stable between second and sixth grades. In contrast, at low levels of initial peer victimization, involuntary engagement declined between second and fourth grades and remained stable between fourth and sixth grades.

In addition, for boys and girls, the peer victimization latent linear slope was positively associated with the involuntary engagement latent linear slope. As shown in Figure 3b, at a relatively high peer victimization slope, involuntary engagement remained relatively stable between second and fourth grades and increased slightly between fourth and sixth grades. In contrast, greater declines in peer victimization were associated with a decrease in involuntary engagement between second and sixth grades, although this decline decelerated between fourth and sixth grades.

### *Involuntary Disengagement*

A conditional model for involuntary disengagement was estimated that included three predictive paths for boys and girls (i.e., the paths from the peer victimization latent intercept to the involuntary disengagement latent intercept and linear slope, and the path from the peer victimization latent linear slope to the latent involuntary disengagement linear slope). In addition, because the variance of the involuntary disengagement latent quadratic slope was significant for boys but constrained to 0 for girls, the paths from the peer

victimization latent intercept and linear slope to the involuntary disengagement latent quadratic slope were estimated for boys. The model fit was not significantly reduced when the three shared predictive paths were constrained to be equal for boys and girls,  $\Delta\chi^2(3) = 2.19$ ,  $p = .53$ . The final model constraining the predictive paths to be equal for boys and girls fit the data well,  $\chi^2(80, N = 636) = 130.03$ ,  $p < .001$ , CFI = 0.97, RMSEA = .044, SRMR = .060. For boys and girls, the peer victimization latent intercept was positively associated with the involuntary disengagement latent intercept and linear slope. For boys, the peer victimization latent intercept was negatively associated with the involuntary disengagement quadratic slope. As shown in Figure 2d, second-grade involuntary disengagement scores were higher at high levels of initial peer victimization than at low levels of initial-grade peer victimization. Involuntary disengagement declined between second and fourth grades, and this decline was sharper at low compared to high levels of initial peer victimization. Declines in involuntary disengagement decelerated between fourth and sixth grades, and for boys, this deceleration was greater at low levels of initial peer victimization.

In addition, for boys and girls, the peer victimization latent linear slope was positively associated with the involuntary disengagement latent linear slope, and for boys, the peer victimization latent linear slope was negatively associated with the involuntary disengagement quadratic slope. As can be seen in Figure 3c, at a high peer victimization slope, involuntary disengagement remained fairly stable between second and sixth grades for girls and declined slightly between second and sixth grades for boys. In contrast, declines in peer victimization predicted a decrease in involuntary disengagement between second and fourth grades for boys and girls, followed by relative stability in involuntary disengagement between fourth and sixth grades for boys and a continued decline in involuntary disengagement between fourth and sixth grades for girls.

### **Discussion**

Although accumulating evidence links stress responses to physical and mental health (Connor-Smith et al., 2000; Flynn & Rudolph, 2011; Wadsworth et al., 2004), far less is known about how stress responses change with age and how individual differences in stress responses develop (Skinner & Zimmer-Gembeck, 2007). This study addressed

these limitations by providing evidence that normative shifts reflect increases in adaptive stress responses and reductions in responses that compromise well-being. The findings further show that peer victimization deflects these trajectories. Specifically, peer victimization predicted changes that resulted in lower levels of effortful engagement coping and higher levels of effortful disengagement and involuntary responses in early adolescence. By tracking stress responses and peer victimization over time, these findings highlight the long-term legacy of early peer victimization on stress responses throughout childhood and early adolescence.

#### *Normative Changes in Stress Responses*

These findings are the first to document patterns of change in stress responses across middle childhood and into early adolescence. Effortful engagement was the only stress response that increased during this period. More specifically, effortful engagement remained stable between the second and fourth grades and increased between the fourth and sixth grades. These findings are consistent with Zimmer-Gembeck and Skinner's (2011) conclusion that many advances in coping occur between late childhood and early adolescence (approximately ages 10–12). During this period, children show better regulation of biological, cognitive, and emotional systems (Compas et al., 2001), allowing for more effective engagement with stressors, including advances in problem solving, cognitive restructuring, and acceptance. Furthermore, parents grant children more autonomy (Collins, Madsen, & Susman-Stillman, 2002), and peer relationships become more complex (Parker, Rubin, Erath, Wojslawowicz, & Busskirk, 2006), yielding new opportunities and social pressure to develop effective responses to interpersonal problems. These coping abilities developed across middle childhood may be critical for youth as they transition to adolescence and face new social challenges.

In contrast, effortful disengagement declined between second and sixth grades. Prior research documents age-related declines in effortful disengagement strategies, such as avoidance and wishful thinking, during late childhood (Zimmer-Gembeck & Skinner, 2011). Although disengaging with an interpersonal stressor (e.g., denial, avoidance) may reduce negative emotional responses to stress temporarily, it likely undermines social goals. Effortful disengagement may, therefore, become gradually supplanted by more effective effortful engagement

responses that have a higher likelihood of fostering social relationships.

Involuntary stress responses also declined during this period, consistent with the proposition that automatic, uncontrollable stress responses should decrease as children gain better regulation of stress response systems (Compas et al., 2001). However, involuntary engagement rose slightly between fourth and sixth grades. Starting in early adolescence, maturational changes may alter the course of involuntary engagement with interpersonal stressors (e.g., rumination). Although boys and girls did not show different involuntary engagement trajectories in this study, the involuntary engagement scale used in this study may have masked potential gender differences. Girls, for example, have a documented increase in rumination during this period (Nolen-Hoeksema, 2001). Boys, in contrast, show greater impulsivity at this age (Coté, Tremblay, Nagin, Zoccolillo, & Vitaro, 2002) and, therefore, may be more likely than girls to evidence increases in other involuntary engagement responses such as impulsive action. Thus, examining gender differences in the development of specific involuntary engagement responses should be an objective of future research.

#### *Peer Victimization Trajectories as Predictors of Stress Response Trajectories*

These findings are the first to show that exposure to peer victimization relatively early in middle childhood contributes to the development of stress responses across childhood and early adolescence. A strong pattern emerged showing that early peer victimization stifles the normative development of effortful engagement responses. For boys and girls, second-grade peer victimization predicted less effortful engagement in second grade. Moreover, high levels of peer victimization in second grade were followed by relatively stagnant growth in effortful engagement that stood in contrast to the trajectories of increasing effortful engagement found at low levels of early peer victimization. The cumulative impact of early peer victimization, therefore, was notably low levels of effortful engagement in sixth grade. Children exposed to peer victimization early in the school years may come to believe that effortful engagement strategies will be ineffective, and their ability and motivation to enact such strategies competently may be impaired (Troop-Gordon et al., 2015). However, even after accounting for early peer victimization, trajectories of stable or increasing peer victimization predicted

suppressed growth in effortful engagement, suggesting that these responses continue to be impacted by peer victimization through late childhood and early adolescence.

Interestingly, although the impact of early peer victimization on second-grade effortful engagement was stronger for boys than girls, the long-term impact of both initial victimization and trajectories of victimization was stronger for girls than boys. Girls develop greater self-regulation during childhood (Raffaelli, Crockett, & Shen, 2005), which at low levels of peer victimization may allow them to learn how to respond effectively to interpersonal stress. High levels of peer victimization, however, may negate any advantages girls have in developing effortful engagement strategies by reducing their opportunities to learn how to skillfully resolve interpersonal conflicts and degrading their confidence in their ability to actively resolve problems arising in their relationships.

Trajectories of effortful disengagement also varied significantly as a function of early peer victimization. Low levels of second-grade peer victimization were concurrently associated with high levels of effortful disengagement followed by decreases in effortful disengagement coping through sixth grade. Early in elementary school, effortful disengagement may be an adaptive coping mechanism. However, as children get older, disengagement coping may be seen as an immature and ineffective means of dealing with interpersonal stress. Those who experienced little exposure to peer victimization may, therefore, gradually engage in more effective coping over the course of childhood and early adolescence. In contrast, high levels of second-grade peer victimization were associated with lower levels of effortful disengagement coping in second grade for boys but were followed by little change in effortful disengagement for boys and girls. Consequently, by sixth grade, effortful disengagement was highest among children who had been peer victimized in second grade. Whether this reflects the development of an adaptive or deleterious response pattern is unclear given mixed findings regarding the association between effortful disengagement and internalizing problems (for a review, see Compas et al., 2001). Thus, future research is needed to clarify the long-term consequences of engaging in effortful disengagement following victimization.

Not only was second-grade victimization concurrently associated with higher levels of involuntary responses to stress, early and continuing peer victimization disrupted normative declines in

involuntary stress responses. Blunted or heightened activation of physiological systems taxed by peer victimization (Knack et al., 2011; Vaillancourt et al., 2008), and associated cognitive and affective responses (Hoglund & Leadbeater, 2007; McLaughlin et al., 2009; Rosen et al., 2007; Rudolph, 2009; Troop-Gordon & Ladd, 2005), may heighten risk for involuntary stress responses such as rumination or emotional numbing (Compas et al., 2001). Due to the latent quadratic slope for boys, differences in involuntary disengagement trajectories were more pronounced for girls, who showed sharp declines at low levels of victimization. Girls' stronger orientation toward relationships (Rose & Rudolph, 2006) and heightened sensitivity to interpersonal stress (Nelson et al., 2005; Rudolph, 2009) may result in more awareness of, and reactivity to, changes in their peer relationships over time. This sensitivity may benefit girls who witness a decrease in their exposure to victimization but may have costs for girls victimized early in childhood or who are exposed to stable or increasing peer victimization over time as they become less likely to actively cope with social stressors and inhibit involuntary responses.

#### *Strengths, Limitations, and Future Directions*

By conducting assessments over a 5-year span, we were able to document within-person changes in stress responses throughout childhood and into early adolescence, a period during which sensitivity to interpersonal stress is heightened (Nelson et al., 2005) and having a well-established repertoire of coping strategies may be critical for healthy adjustment. By examining links to early (second grade) and concurrent changes in peer victimization, this study provides novel insights into the impact childhood peer victimization has on adolescents' ability to respond effectively to stress. Furthermore, peer victimization was measured using self-reports and teacher reports. This not only allowed for a robust measure of peer victimization but also reduced the likelihood that links with stress responses were due to shared method variance. However, future research should address limitations of this study. Most notably, stress responses were examined only during childhood and early adolescence. It is possible that early victimization continues to impact stress responses throughout adolescence, either directly or by sensitizing youth to problems that arise in their relationships. Thus, it will be important to test associations between early peer victimization and

stress responses later in adolescence. Furthermore, maladaptive stress responses also may contribute to interpersonal difficulties (Flynn & Rudolph, 2011; Visconti & Troop-Gordon, 2010). Future studies may find that peer victimization in childhood represents just the beginning of an escalating cycle of problematic stress responses, social difficulties, and psychological maladjustment.

Building on this research also will require examining other types of peer adversity that may be just as detrimental to stress response development, such as friendlessness, conflict, and rejection. Associations among these different forms of peer adversity are often modest (Gorman, Schwartz, Nakamoto, & Mayeux, 2011; Ladd & Troop-Gordon, 2003), and, therefore, future studies should consider the cumulative effects of experiencing multiple forms of peer adversity on stress responses. In addition, person-centered analyses would provide a more fine-grained understanding of the specific combinations of changes in stress responses that are predicted from peer victimization. For example, it is possible that some victimized children show reductions in effortful engagement coping but no increases in involuntary responses; others may show increases in involuntary disengagement but not in involuntary engagement.

#### *Implications for Practice*

These findings have a number of implications for interventions aimed at reducing peer adversity and supporting adolescents' socioemotional development. First, documenting the long-term effects of early peer victimization on stress responses highlights the need to intervene as soon as possible with children who are experiencing peer adversity. Even accounting for changes in peer victimization across childhood, victimization in second grade significantly predicted later stress responses. Thus, programs designed to prevent peer victimization and foster socioemotional learning skills (Espelage, Low, Polanin, & Brown, 2013; Kärnä et al., 2011) need to be implemented before long-term trajectories of peer victimization have been established. For those adolescents who experience early and prolonged peer adversity, programs that teach emotion regulation and problem-solving skills may aid them in learning how to effectively cope with stress. Indeed, by fostering adaptive coping during a period of heightened sensitivity to social stress, interventions may prevent escalations in interpersonal and emotional problems.

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