



Rumination about social stress mediates the association between peer victimization and depressive symptoms during middle childhood



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ARTICLE INFO

Article history:

Received 29 April 2016

Received in revised form 8 November 2016

Accepted 24 November 2016

Available online 8 December 2016

Keywords:

Peer victimization
Depressive symptoms
Problem solving
Rumination

ABSTRACT

Although prior research has established a link between exposure to peer victimization and depressive symptoms, relatively little is known about the processes underlying this association. This study examined whether maladaptive responses to a novel social stressor – specifically, lower levels of problem solving or higher levels of rumination – mediate this association. Data were gathered from 130 children (64 boys, 66 girls; M age = 9.46, SD = 0.33) who participated in a laboratory social stressor task with an unfamiliar peer. Results indicated that prior exposure to peer victimization in the school context was associated with ruminative responses to the novel stressor, which mediated the association between victimization and depressive symptoms. These results indicate that ruminative responses to social stress outside of the victimization context may serve as one process explaining the association between victimization and heightened depressive symptoms.

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Peer victimization is a common stressor, with approximately 10–20% of youth experiencing consistent victimization during the school years (Ladd & Kochenderfer-Ladd, 2002; Graham & Juvonen, 1998). Both overt¹ (e.g., hitting, verbally insulting, threatening) and relational (e.g., social exclusion, manipulation) victimization are associated with depressive symptoms (Hodges & Perry, 1999; Rudolph, Troop-Gordon, Hessel, & Schmidt, 2011). Indeed, a meta-analysis of concurrent studies (Hawker & Boulton, 2000) revealed a significant association between victimization and depressive symptoms, and a meta-analysis of longitudinal studies implicated victimization as an antecedent of depressive symptoms (Reijntjes, Kamphuis, Prinzie, & Telch, 2010). Unfortunately, relatively little research has examined the processes through which victimization leads to depressive symptoms, making it hard to determine specific targets for intervention. This study examined whether responses to social stress (i.e., problem solving and rumination) help to explain this association. Specifically, we assessed stress responses during an in vivo social stressor task with an unfamiliar peer (i.e., another

study participant), providing the opportunity to investigate whether prior victimization in the school context predicts stress responses in novel social situations.

1. Peer victimization and responses to stress

We focused on two responses to social stress: (a) problem solving, conceptualized as direct efforts to ameliorate stressors (Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001); and (b) rumination, conceptualized as a repetitive focus on negative thoughts and emotions about a stressor (Broderick, 1998). We anticipated that exposure to peer victimization would interfere with adaptive responses to stress (i.e., problem solving) and heighten maladaptive responses to stress (i.e., rumination). Revisions of the Social Information Processing model (Crick & Dodge, 1996) suggest that both past experience and emotionality play a role in assessing threatening situations, such as encountering conflict with an unfamiliar peer. Frequent exposure to peer victimization may undermine children's social self-efficacy, leading them to withdraw from subsequent stressful social situations rather than engaging in active problem-solving efforts. Victimization also may serve as a catalyst for maladaptive emotional and cognitive responses to future social interactions. Indeed, victimization is associated with negative emotions (e.g., fear, anger) and self-blame (Graham & Juvonen, 1998; Kochenderfer-Ladd, 2004; Prinstein, Cheah, & Guyer, 2005; Rudolph, Troop-Gordon, & Flynn, 2009), as well as hostile attributions (Hoglund & Leadbeater, 2007; Taylor, Sullivan, & Kliewer, 2013). Emotional arousal, self-blame, and attention to threat may foster dysregulated stress processing, such as rumination.

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¹ There has been a call for research to use the term “physical victimization” rather than “overt victimization.” This call stems from awareness that relational victimization can also be overt in nature and that physical and verbal victimization, which are both components of overt victimization, may be distinct (e.g., Ostrov & Kamper, 2015). We use the terms “relational victimization” and “overt victimization” in this study because our measure of victimization includes items assessing relational victimization, physical victimization, and verbal insults and threats.

Supporting a link between victimization and compromised problem solving, self-reports of dysregulated mood in response to a hypothetical victimization scenario are associated with less self-reported conflict resolution (Kochenderfer-Ladd, 2004). Supporting a link between victimization and rumination, cyber-victimization prospectively predicts depressive rumination (rumination about the causes and consequences of sad mood; Feinstein, Bhatia, & Davila, 2014). Research also links victimization exposure with a tendency to ruminate specifically about victimization experiences (Mathieson, Klimes-Dougan, & Crick, 2014). More broadly, victimization predicts diminished effortful engagement (including problem solving) and heightened involuntary engagement (including rumination) over time (Troop-Gordon, Rudolph, Sugimura, & Little, 2015). This study extends prior research by examining whether prior exposure to victimization at school predicts stress responses within an unfamiliar social context, thereby providing insight into the generalized and potentially enduring negative consequences of victimization.

2. Responses to stress and depressive symptoms

In turn, children's maladaptive responses to social challenges may confer risk for depressive symptoms. Indeed, research supports the idea that compromised problem solving and heightened rumination are associated with depressive symptoms. Compared to nondepressed children, depressed children are more likely to engage in ineffective problem-solving strategies (e.g., aggression) and less likely to engage in prosocial strategies (e.g., means-end problem solving) in response to stress (Garber, Quiggle, Panak, & Dodge, 1991). Concurrent and prospective studies of rumination reveal that depressive rumination predicts higher levels of depressive symptoms in youth (Abela, Brozina, & Haigh, 2002; Jose & Brown, 2008; for a meta-analysis, see Rood, Roelofs, Bögels, Nolen-Hoeksema, & Schouten, 2009). Research in adults also links depressive rumination following stress to depressive symptoms (Michl, McLaughlin, Shepherd, & Nolen-Hoeksema, 2013; Nolen-Hoeksema & Morrow, 1991). More broadly, lower levels of effortful engagement (e.g., problem solving) and higher levels of involuntary engagement (e.g., rumination) responses to peer stress predict youth depressive symptoms over time (Agoston & Rudolph, 2011; Flynn & Rudolph, 2011; Osowiecki & Compas, 1999; Troop-Gordon et al., 2015).

3. Responses to stress as a mediator of the association between victimization and depressive symptoms

The primary goal of this study was to examine whether maladaptive stress responses account for the link between victimization and depressive symptoms. We hypothesized that prior exposure to victimization at school would be associated with less problem solving and more rumination in the context of a novel social stressor, which would account for the association between victimization and depressive symptoms. Although minimal research has directly investigated these ideas, there is some evidence that responses to stress mediate the victimization-depressive symptoms link. Two studies found that depressive rumination (or a composite including depressive rumination) accounts for the association between victimization and depressive symptoms (Feinstein et al., 2014; McLaughlin, Hatzenbuehler, & Hilt, 2009). In another study, rumination about past relational victimization partially accounted for the association between victimization and depressive symptoms (Mathieson et al., 2014). Finally, a recent study revealed that general maladaptive responses to stress (lower effortful engagement and higher involuntary responses) help to explain why victimization prospectively predicts depressive symptoms (Troop-Gordon et al., 2015).

Despite this preliminary evidence, research has not examined whether responses to peer stress in novel social contexts contribute to the link between victimization and depressive symptoms. We anticipated that exposure to victimization at school would have a generalized effect on children's ability to negotiate social stressors with peers. Because

generalization of maladaptive stress responses across social settings may create a particularly high level of risk, it is important to better understand how past victimization experiences predict stress responses within novel social contexts.

4. Study overview

To address this goal, this study examined children's responses to an in vivo laboratory social stressor. This approach provides several advantages over prior research. First, it allows the examination of how prior exposure to victimization is associated with responses to a standardized naturalistic social stressor, ensuring that responses to stress are assessed in a similar context across children. Second, assessing on-line responses to stress overcomes limitations of retrospective reports used in previous studies, which may suffer from reporting biases and may not adequately reflect responses during heightened emotional arousal (Silk, Steinberg, & Morris, 2003). Third, children were paired with unfamiliar peers (i.e., other study participants), allowing us to circumvent established social biases. In sum, this study used an ecologically valid social challenge to examine (1) how exposure to victimization in the school context predicts in vivo responses to a novel social stressor, and (2) whether these responses account for the association between prior exposure to victimization in the school context and general levels of depressive symptoms. In particular, we examined whether lower levels of problem solving and higher levels of ruminative responses to stress accounted for the victimization-depressive symptoms link.

We also examined potential gender differences in these pathways. With regard to the first pathway, victimization may be more strongly associated with maladaptive responses to stress in girls than in boys. Girls endorse more social connection goals than boys (Rose & Rudolph, 2006), which may heighten emotional arousal in response to victimization, fostering less problem solving and more rumination. Indeed, girls are more likely than boys to ruminate in response to stress (Broderick, 1998). With regard to the second pathway, maladaptive responses to peer stress may be more strongly associated with depressive symptoms in girls than in boys. Because girls value close relationships more than boys (Rose & Rudolph, 2006), the disruptive effects of maladaptive stress responses on peer relationships may be amplified. Supporting this idea, ineffective responses to peer stress predict depressive symptoms more strongly in girls than in boys (Agoston & Rudolph, 2011).

To provide a conservative test of our hypotheses, we also considered covariates that could account for the link between victimization, responses to stress, and depressive symptoms. Because gender, socioeconomic class, and ethnicity often are associated with victimization and/or depressive symptoms (Due et al., 2009; Paquette & Underwood, 1999; Piccinelli & Wilkinson, 2000; Seals & Young, 2003), our primary analyses adjusted for these demographic variables. We also conducted a supplemental set of analyses that considered the quality of the dyadic interaction during the in vivo social stressor, which could contribute to children's stress responses.²

5. Method

5.1. Participants

Participants were 130 children³ (66 girls, 64 boys; *M* age = 9.46, *SD* = 0.33; 71% White, 13.6% African American, 8.3% Asian, 6.1% other; annual income 17.7% \$0–\$29,999, 27.7% \$30,000–\$59,999, 23.0%

² Due to equipment failure, dyad quality data were available for only a subset of participants (*n* = 122). Thus, these analyses were conducted to supplement the primary analyses with the full sample.

³ One participant was missing data on victimization and depressive symptoms and therefore was not included in analyses using individual level variables. However, because this participant's behavior was coded and incorporated into the dyadic negativity score used in the supplemental analyses, the full sample included 130 participants.

\$60,000–\$89,999, and 21.5% \$90,000 or over, and 10.0% unknown), who were recruited from a larger study of peer victimization. For the larger study, participants were recruited from several small urban and rural schools in the Midwest. Parents completed written consent forms and children provided verbal assent when children were in 2nd grade. Of the 725 eligible families, 576 (80%) provided consent at the initial wave; 60 additional families provided consent at the second wave. In 2nd grade, participants and non-participants did not significantly differ in gender, $\chi^2(1) = 0.15$, *ns*, age, $t(723) = 0.63$, *ns*, or ethnicity (white vs. minority), $\chi^2(1) = 0.59$, *ns*.

During the summer after the 3rd grade or fall of the 4th grade, families were invited to participate in a supplemental study. They were contacted in random order until 318 (50%) were invited to participate. Participants and invited non-participants did not significantly differ in gender, $\chi^2(1) = 0.00$, *ns*, age, $t(316) = 0.62$, *ns*, or ethnicity (white vs. minority), $\chi^2(1) = 0.07$, *ns*. Participants were partnered with an unfamiliar peer to form same-gender dyads. Both members of the dyad were participants (i.e., not confederates), allowing for a naturalistic interaction. Dyad members were not matched on any specific characteristics other than gender. In 52.3% of dyads, members were the same race. Dyad members' levels of victimization were not associated ($r_p = -0.18$, 95% CI [-0.42, 0.06], $p = 0.14$). Because recruitment took place between 3rd and 4th grade, dyad members were in the same grade.

5.2. Procedures

All procedures were approved by the university omitted for masked review Institutional Review Board. Children participated in a 3–4 h laboratory visit. Upon arrival, parents and children provided written consent/assent for the supplemental study. Children completed measures of peer victimization and depressive symptoms and engaged in a social challenge task. Dyad partners were kept in separate rooms prior to the interaction.

Children were told they would each build a replica of a block model and whoever completed the model first would receive a prize. They were given a set of blocks that was sufficient to complete only one model and left to work on the task for 9 min. One participant (0.8%) completed the model within this time frame. Eight participants (6.6%) had given up or stopped working on the model by the end of the 9 min, with the majority of these participants ($n = 5$) stopping within the last minute. After 9 min, a research assistant returned to room. Children were informed that they would each receive a prize, and were instructed to decide on the distribution of two prizes of unequal value (e.g., an art set and a pad of paper). The large majority (85%) of dyads distributed the prizes within 3 min (12% took 3–6 min; 3% took over 6 min). This ecologically valid task was designed to examine children's responses to two social challenges (insufficient materials, distribution of unequal prizes). Immediately after the completion of the stress task, children were taken into separate rooms to view a videotape of the task and were asked to report on how much they had engaged in rumination or problem solving during the interaction. Viewing the videotape allowed children to rate their responses according to the state they felt during the interaction. After a debriefing describing the nature and purpose of the task, participants who had received the less valuable prize were allowed to exchange it for the more valuable prize.

5.3. Measures

Table 1 presents descriptive statistics and reliability of the measures. All measures had adequate reliability.

5.3.1. Peer victimization

A revised version (Rudolph, Abaied, Flynn, Sugimura & Agoston, 2011) of the Social Experiences Questionnaire (Crick & Grotpeter, 1996) was used to assess children's everyday experiences of overt victimization (11 items, e.g., "How often do you get pushed or shoved by

Table 1
Descriptive statistics and intercorrelations of study variables.

	M(SD)	α	1	2	3	4
1. Victimization	1.79(0.67)	0.94	–			
2. Rumination	1.49(0.67)	0.77	0.28**	–		
3. Problem solving	3.98(0.80)	0.81	0.11	0.15	–	
4. Depressive symptoms	1.42(0.39)	0.80	0.63***	0.46***	0.03	–

** $p < 0.01$.

*** $p < 0.001$.

another kid?" "How often does another kid yell at you or call you mean names?") and relational victimization (10 items, e.g., "How often do other kids leave you out on purpose when it's time to play or do an activity?"). Children checked a box indicating how often they experienced each type of victimization on a 5-point scale (*Never to All the Time*). Research supports the validity of self-reported victimization, which corresponds with peer (Graham & Juvonen, 1998) and parent (Bollmer, Harris, & Milich, 2006) reports and behavioral observations (Ladd & Kochenderfer-Ladd, 2002). Although research shows that overt and relational aggression and victimization are distinct (Crick & Grotpeter, 1995; Ostrov & Crick, 2007), the two forms of victimization were strongly correlated, $r(129) = 0.77$, $p < 0.001$, and yielded highly similar results. Thus, analyses were conducted on a composite victimization score computed as a mean of the overt and relational victimization subscales. Furthermore, 20.9% of children had mean scores greater than or equal to 3 (i.e., at least "sometimes" experiencing victimization) for one or more subtypes of victimization (e.g., verbal victimization, relational victimization from friends).

5.3.2. Depressive symptoms

Children completed the Short Mood and Feelings Questionnaire (Angold, Costello, Messer, & Pickles, 1995) to assess depressive symptoms within the past two weeks (13 items; e.g., "I felt unhappy or miserable."). Children rated each item on a 5-point scale (*Not at All to Very Much*). Scores were computed as the mean of the items ($\alpha = 0.80$). Validity has been established through correlations with the Children's Depression Inventory and the Diagnostic Interview Schedule for Children (Angold et al., 1995). This measure differentiates depressive symptoms from other psychiatric disorders (Thapar & McGuffin, 1998).

5.3.3. Responses to stress

Following the social challenge task, each child separately observed a videotape of their interaction and indicated how much they engaged in rumination (4 items; e.g., "I couldn't stop thinking about how frustrating this was.") and problem solving (4 items; e.g., "I tried to focus on making a fair decision.") at four points during the interaction (see Appendix A for a complete list of items). Children rated each item on a 5-point scale (*Not at All to Very Much*). For each of the four assessments, the mean of the items for rumination and problem solving was computed. Scores were computed as the average of the four rumination scores and the four problem solving scores. Items were developed for the purposes of this study but some question stems (e.g., "I couldn't stop thinking about...") were adapted from the rumination subscale on the Responses to Stress Questionnaire (Compas et al., 2001). Research supports the validity of self-reported responses to laboratory stressors (Stroud et al., 2009). In a previous study using the same paradigm in a different sample (authors omitted for masked review), self-reported rumination was significantly associated with observer reports of emotion dysregulation ($r = 0.48$, $p < 0.001$), supporting the validity of such self-reports.

5.3.4. Negative affect

For the purpose of validating the task and descriptive analysis, children rated the extent to which they felt "sad or upset" and "angry or

mad” at the beginning and end of the task. Children rated each emotion on a 5-point scale (*Not at All* to *Very Much*).

5.3.5. Covariates

All analyses included gender (0 = boys, 1 = girls), school lunch status as an index of socioeconomic status (0 = full price, 1 = free or reduced price), and ethnicity (0 = non-minority, 1 = minority). To assess dyad negativity, trained coders provided a rating on a scale of 1 (*Not at All Present*) to 5 (*To a Large Degree Present*). This rating reflected several aspects of the dyadic interaction (e.g., engaging in negative interchanges or arguments; appearing uncomfortable, upset, or annoyed at each other). Two independent coders rated 25% of the interactions. The intraclass correlation coefficient (ICC) for dyad negativity showed strong agreement (ICC = 0.92).

6. Results

6.1. Overview of analyses

First, we conducted preliminary analyses examining dyad members' experiences in the interaction task and similarity between dyad members using descriptive statistics, pairwise correlations (Alfres & Kenny, 2009; Griffin & Gonzalez, 1995), and intraclass correlation coefficients (ICC; Alfres & Kenny, 2009). Second, we conducted *t*-tests to examine the main effects of gender, and we examined the bivariate correlations among victimization, responses to stress, and depressive symptoms (Table 1). Third, hierarchical linear modeling analyses were conducted in HLM 7 (Bryk & Raudenbush, 1992) to test our hypotheses. These analyses account for the dyadic nature of the data (i.e., interdependence between children nested within dyads; Kenny, Kashy, & Cook, 2006). To examine the direct effect, we examined whether victimization predicted depression (Table 2; Model 1). To test mediation, two sets of models were run examining whether: (a) victimization predicted responses to stress (rumination and problem solving; Table 3; Models 2a and 2b, respectively); (b) responses to stress predicted depressive symptoms with victimization also entered into the model (Table 4; Model 3). The indirect path from victimization to depressive symptoms through responses to stress was examined using the distribution of the product approach in RMediation (Tofighi & MacKinnon, 2011). Mean-centered victimization and responses to stress were entered at Level 1, along with covariates (lunch status and ethnicity). At Level 2, gender was added as a covariate because partners were matched on gender within dyad. Following Campbell and Kashy's (2002) recommendations, intercepts were treated as random factors, and slopes were treated as fixed factors. Interactions between victimization and gender and between responses to stress and gender also were examined. For the supplemental analyses, dyad negativity was entered at Level 2 as a covariate predicting the intercept.

6.2. Preliminary analyses: dyadic interaction and similarity between dyad members

Validating the stressful nature of the task, children reported being more “sad and upset,” $t(129) = 2.05, p = 0.04$, and more “angry or

Table 2
Hierarchical linear modeling analyses predicting depressive symptoms from victimization.

	Model 1	
	Coef(SE)	<i>t</i>
Intercept	1.40(0.05)	30.97***
Gender (0 = boys, 1 = girls)	0.01(0.06)	0.25
Lunch Status (0 = full, 1 = reduced/free)	0.00(0.06)	0.06
Ethnicity (0 = non-minority, 1 = minority)	0.05(0.06)	0.87
Victimization	0.24(0.03)	7.31***

*** $p < 0.001$.

Table 3
Hierarchical linear modeling analyses predicting responses to stress from victimization.

	Model 2a Rumination		Model 2b Problem-solving	
	Coef(SE)	<i>t</i>	Coef(SE)	<i>t</i>
Intercept	-0.08(0.14)	-0.58	-0.09(0.15)	-0.64
Gender (0 = boys, 1 = girls)	0.04(0.17)	0.26	-0.01(0.18)	-0.08
Lunch (0 = full, 1 = reduced/free)	-0.20(0.22)	-0.91	-0.01(0.20)	-0.05
Ethnicity (0 = non-minority, 1 = minority)	0.45(0.23)	1.96	0.41(0.22)	1.91
Victimization	0.30(0.10)	2.90**	0.11(0.07)	1.52

** $p < 0.01$.

mad,” $t(129) = 2.92, p = 0.004$, at the end relative to the beginning of the task. Examination of pairwise correlations indicated that dyad members' reports of feeling “sad or upset” at the end of the interaction task were significantly associated ($r_p = 0.28, 95\% [0.04, 0.52], p = 0.02$), but dyad members' reports of feeling “angry or mad” were not associated ($r_p = 0.02, 95\% [-0.23, 0.26], p = 0.90$).

Behavioral codes indicated that dyad negativity throughout the task was generally low ($M = 1.43, SD = 0.51, \text{range} = 1.00\text{--}3.50$). Children's individual ratings of feeling “sad and upset” ($M = 1.36, SD = 0.92, \text{range} = 1.00\text{--}5.00$) and “angry or mad” ($M = 1.20, SD = 0.63, \text{range} = 1.00\text{--}5.00$) at the end of the task were significantly correlated with dyadic negativity (for “sad and upset,” $r = 0.28, p = 0.002$; for “angry and mad,” $r = 0.21, p = 0.02$), suggesting that dyad negativity to some extent captured children's individual affective experiences.

Examination of the ICCs for children's responses to stress indicated that the large majority of variance in rumination and problem solving during the task was at the individual level (for rumination, ICC = 0.002; for problem solving, ICC = 0.15). Similarly, examination of pairwise correlations indicated that dyad members' responses to the stress task were not significantly associated (for rumination, $r_p = -0.05, 95\% \text{CI} [-0.29, 0.20], p = 0.71$; for problem solving, $r_p = 0.14, 95\% \text{CI} [-0.10, 0.39], p = 0.25$).

6.3. Main effects of gender and bivariate correlations

There were no significant effects of gender on victimization, $t(127) = 0.75, ns$, rumination, $t(128) = 0.07, ns$, problem solving, $t(128) = 0.13, ns$, or depressive symptoms, $t(127) = 0.30, ns$. Fisher's *r*-to-*z* transformations indicated that correlations between the variables did not significantly differ between girls and boys ($Z_s < 0.96, ns$). Thus, descriptive statistics and correlations are presented collapsing across gender (Table 1). Victimization was significantly associated with heightened rumination but was not associated with problem solving. Victimization and rumination were each associated with higher levels of depressive symptoms.

Table 4
Hierarchical linear modeling analyses predicting depressive symptoms from victimization and responses to stress.

	Model 3	
	Coef(SE)	<i>t</i>
Intercept	1.41(0.04)	34.62***
Gender (0 = boys, 1 = girls)	0.01(0.05)	0.17
Lunch (0 = full, 1 = reduced/free)	0.02(0.06)	0.32
Ethnicity (0 = non-minority, 1 = minority)	0.01(0.05)	0.11
Victimization	0.21(0.04)	5.89***
Rumination	0.12(0.04)	3.22**
Problem solving	-0.03(0.03)	-1.06

** $p < 0.01$.

*** $p < 0.001$.

6.4. Responses to stress as mediators of the link between victimization and depressive symptoms

6.4.1. Primary analyses

HLM analyses revealed that victimization significantly predicted depressive symptoms after adjusting for covariates (Table 2; Model 1). Victimization significantly predicted rumination (Table 3; Model 2a), but did not significantly predict problem solving (Table 3; Model 2b). When victimization and responses to stress were entered together in a model predicting depressive symptoms, both victimization and rumination were significant predictors (Table 4; Model 3). As expected, there was a significant indirect effect of victimization on depressive symptoms through rumination (indirect effect = 0.04, SE = 0.02, 95% CI [0.01, 0.08]). However, there was not a significant indirect effect for problem solving (indirect effect = -0.00, SE = 0.00, 95% CI [-0.01, 0.003]).

6.4.2. Moderation by gender

HLM analyses indicated that the direct association between victimization and depression was not moderated by gender ($b = 0.02$, SE = 0.07, $p = 0.71$). Similarly, associations between victimization and responses to stress (for rumination, $b = 0.08$, SE = 0.22, $p = 0.71$; for problem solving, $b = -0.14$, SE = 0.13, $p = 0.30$) and between responses to stress and depression (for rumination, $b = -0.01$, SE = 0.08, $p = 0.90$; for problem solving, $b = 0.01$, SE = 0.05, $p = 0.80$) were not moderated by gender.

6.4.3. Supplemental analyses adjusting for dyad negativity

Bivariate correlation analyses revealed that dyad negativity was significantly associated with rumination ($r = 0.29$, $p = 0.001$) but was not significantly associated with victimization, problem solving, or depressive symptoms ($r_s < 0.10$, $p_s \geq 0.29$). In the HLM models, there was a significant effect of dyad negativity predicting rumination ($b = 0.63$, SE = 0.17, $p = 0.001$; Model 2a). After adjusting for dyad negativity, we found a similar pattern of results: Victimization predicted depressive symptoms ($b = 0.23$, SE = 0.03, $p < 0.001$; Model 1); victimization predicted rumination ($b = 0.37$, SE = 0.11, $p = 0.001$; Model 2a) but not problem solving ($b = 0.13$, SE = 0.07, $p = 0.08$; Model 2b); and when victimization and responses to stress were entered together in a model predicting depressive symptoms (Model 3), victimization ($b = 0.18$, SE = 0.03, $p < 0.001$), rumination ($b = 0.14$, SE = 0.04, $p = 0.001$), and problem solving ($b = -0.06$, SE = 0.03, $p = 0.04$) were significant predictors. Supporting one of the hypothesized pathways, there was a significant indirect effect of victimization on depressive symptoms through rumination (indirect effect = 0.05, SE = 0.02, 95% CI [0.02, 0.10]), but not through problem solving (indirect effect = -0.01, SE = 0.01, 95% CI [-0.02, 0.001]).

7. Discussion

This study explored whether children's maladaptive responses to a novel social stressor help to explain the link between peer victimization and depressive symptoms. Specifically, we hypothesized that engaging in less problem solving or more rumination in response to peer stress would account for this association. Consistent with the hypotheses, exposure to victimization in the school context predicted heightened rumination about a novel social stressor with an unfamiliar peer, and rumination partially mediated the association between victimization and depressive symptoms. Diminished problem solving did not play a role in the victimization-depressive symptoms link. These results contribute a novel perspective on the sequelae of victimization by suggesting that a history of adverse peer experiences predicts maladaptive responses to stressful social situations, even when victimized children are out of the context in which victimization occurs. Moreover, by identifying a potential mechanism through which peer victimization may contribute to depressive symptoms, these results inform applied efforts

to reduce risk for depression in among children who have been victimized by their peers.

7.1. Peer victimization and rumination

As anticipated, heightened exposure to victimization at school predicted more ruminative responses to a novel laboratory social stressor. Negotiating a stressful encounter with an unfamiliar peer may be especially challenging during middle childhood, when increasing emphasis is placed on peer relationships and evaluations (Gummerum & Keller, 2008). Children exposed to higher levels of victimization at school may have found it particularly stressful to negotiate this challenge for several reasons. First, victimization may have led children to view social challenges (e.g., negotiating insufficient resources and distributing unequal prizes) as threatening and prime youth to view ambiguous situations as hostile. Indeed, victimization is associated with hostile attribution biases (Hoglund & Leadbeater, 2007; Taylor et al., 2013). Second, victimization may cause children to engage in self-blaming attributions (Graham & Juvonen, 1998; Prinstein et al., 2005; Taylor et al., 2013; Visconti, Kochenderfer-Ladd, & Clifford, 2013). Third, victimization may have led children to experience more emotion dysregulation in response to the laboratory social challenge (Rudolph et al., 2009). These maladaptive cognitive and emotional responses may have fueled the negative, repetitive thoughts characteristic of rumination. Although this study was unable to determine the precise mechanisms explaining why victimization predicted heightened rumination, results suggest that it would be beneficial for future research to investigate these processes.

7.2. Rumination and depressive symptoms

Also as anticipated, ruminative responses to a novel social stressor were associated with depressive symptoms. The link between rumination and depressive symptoms in youth is well-established (Broderick, 1998; Mathieson et al., 2014) although prior investigations typically focus on depressive rumination, with minimal research examining in vivo ruminative responses to social stressors (for an exception, see Hilt & Pollak, 2013). This study builds on prior research by showing that a tendency to ruminate in response to a novel social stressor is associated with heightened depressive symptoms.

It is not yet clear why ruminative responses to social stressors are associated with depressive symptoms but we can speculate based on theory and prior research. Rumination may trigger dysregulated cognitive styles, such as low perceived control or hopelessness about social situations. These cognitive styles, in turn, predict depressive symptoms (Abramson, Metalsky, & Alloy, 1989; Rudolph, Kurlakowsky, & Conley, 2001). Rumination about social stressors also may lead to depressive symptoms via dysregulation of biological stress response systems. Social-evaluative stressors are associated with heightened cortisol reactivity compared to non-social stressors (Dickerson & Kemeny, 2004). Rumination also is associated with attentional biases away from happy faces (Hilt & Pollak, 2013), and ruminating about social stress may increase vigilance to potentially threatening social cues, perhaps fostering perceptions of social evaluation that enhance biological stress responses associated with depressive symptoms, such as heightened cortisol reactivity (Guerry & Hastings, 2011) or blood pressure (Hilt & Pollak, 2012). Indeed, when individuals ruminate, they show higher levels of cortisol than when they are not ruminating (McCullough, Orsulak, Brandon, & Akers, 2007). Again, future research directly addressing this link would be fruitful.

7.3. Rumination accounts for the association between victimization and depressive symptoms

This study is the first to indicate that ruminative responses to a novel social stressor help explain the association between victimization and

depressive symptoms. These findings are consistent with prior research documenting that depressive rumination (Feinstein et al., 2014; McLaughlin et al., 2009) and rumination about victimization (Mathieson et al., 2014) account for the victimization–depressive symptoms link, as well as with research showing that more general responses to stress mediate the association between victimization and depressive symptoms over time (Troop-Gordon et al., 2015). However, this study extends prior research by examining rumination within the context of a naturalistic interaction with a novel peer, mirroring the context of meeting new peers outside the laboratory and showing that victimized children ruminate about social situations that are unrelated to their victimization experiences. Examining rumination in this context is revealing because the findings suggest that daily interactions with familiar peers can predict responses to social stressors with unfamiliar peers. Unfortunately, this means that children who are victimized at school transfer maladaptive stress responses to novel social situations, which may disrupt the formation of new relationships and undermine victimized children's opportunity for developing healthy peer relationships in other social contexts. However, understanding that children who have been victimized experience ruminative responses across peer contexts provides insight into a vulnerability factor that may be an effective target for interventions.

Rumination can be difficult to study naturalistically because of individual differences in the amount of stress children experience. The present research benefits from a laboratory stressor that was standardized across children, allowing us to examine how individual differences in victimization predict children's ability to respond effectively to a similar social challenge. Despite these advantages, this design also allows variability in the nature of the dyadic interactions that emerge over the course of the encounter, which could influence children's stress responses. To address this issue, supplemental analyses adjusted for differences in the observed dyad negativity, thus balancing the ecological validity of an unfamiliar, naturally emerging peer context with the control of a laboratory task. Victimization predicted rumination beyond the significant effect of dyad negativity, suggesting that victimized children's tendency to ruminate is not merely due to the adverse nature of their social experiences.

7.4. Limitations and future directions

Although victimization and rumination were assessed within different contexts (school vs. laboratory) and time frames (prior exposure to victimization vs. current responses to stress), this research was limited by the concurrent nature of the design. Some research has established a temporal sequence from victimization to subsequent stress responses (Feinstein et al., 2014; Troop-Gordon et al., 2015) but it is feasible that how children respond to stress also shapes their future exposure to victimization. Indeed, maladaptive stress responses predict the generation of social stress over time (Flynn & Rudolph, 2011). Moreover, depressive symptoms may exert a reciprocal effect on rumination (Moberly & Watkins, 2008). Thus, future research using longitudinal designs is needed to examine reciprocal effects between victimization and stress responses as well as between stress responses and depressive symptoms. This research is also limited by reliance on children's self-reports. It is possible that children's depressive symptoms contribute to over-estimations of their victimization experiences (De Los Reyes & Prinstein, 2004), inflating the estimated association between victimization and depressive symptoms. Future research would benefit from incorporating information from multiple informants to reduce shared method bias. This research provided only a snapshot of children's stress responses during middle childhood. Although gender differences in the pathway from victimization to depressive symptoms were not observed in the present study, it is possible that such differences would emerge along with girls' heightened sensitivity to interpersonal stress, rumination, and depressive symptoms during adolescence (Rose & Rudolph, 2006; Rudolph, 2009). Indeed, one study found that rumination

accounts for the association between stress and depressive symptoms earlier for adolescent girls than for boys (Jose & Brown, 2008).

More attention also is warranted to investigating the influence of victimization on problem solving efforts in the face of social stressors. In this study, victimization was not associated with less problem solving. However, problem solving was assessed specifically in the context of negotiating the insufficient resources and the prize distribution (e.g., continuing to build the model despite missing pieces, equitably distributing the prizes) whereas the assessment of rumination involved more general items that assessed responses to the situation more globally (i.e., persistent negative thoughts and emotions about the situation). Thus, the nonsignificant findings for problem solving may be due to the fact that those items had less of a social focus. It is also possible that victimization predicted rumination but not problem solving in the novel social context because rumination is a stable, involuntary response to stress whereas problem solving is a complex, effortful process that is subject to influence from multiple factors in a given context. For example, children's engagement in problem solving during a social interaction may be impacted by whether peers respond favorably to their efforts. Supporting this idea, the ICC for problem solving was higher than for rumination, suggesting that problem solving may have been more of a function of the dyadic interaction, whereas rumination may have been more driven by individual differences. However, dyad negativity predicted rumination but not problem solving, suggesting that children's problem solving was not a function of the negative quality of the interaction. Research paradigms that involve a more direct focus on problem solving in the context of negotiating peer relationships may be useful for clarifying the role of victimization in children's ability to engage in effective problem solving.

Zero-order correlations and the primary analyses indicated that problem solving was not associated with depressive symptoms. These results mirror some prior research (e.g., Abela et al., 2002) in which problem solving was operationalized in terms of quantity (e.g., how much children engage in adaptive problem solving) rather than quality (e.g., whether children engage in assertive, passive, or hostile problem solving strategies). In supplemental analyses that adjusted for dyad negativity, lower levels of problem solving emerged as a significant predictor of depressive symptoms. Thus, it may be that once the variance in depressive symptoms that is associated with negative peer interactions is accounted for, problem solving significantly explains additional variance. Future research is needed to better elucidate the association between problem solving during in vivo peer conflicts and depressive symptoms.

Finally, despite the significant indirect association between victimization and depressive symptoms via rumination, the direct effect remained significant. This pattern suggests other factors also account for the victimization–depressive symptoms link. For example, victimization heightens negative self-appraisals (Cole, Maxwell, Dukewich, & Yosick, 2010; Troop-Gordon & Ladd, 2005), negative feedback seeking (Borelli & Prinstein, 2006), and dysregulated physiological activation (Vaillancourt et al., 2008), which then may foster depressive symptoms. A comprehensive understanding of pathways from victimization to depressive symptoms will therefore need to investigate multiple explanatory mechanisms.

8. Conclusion

Overall, this research supports the hypothesis that rumination in response to a novel social stressor mediates the victimization–depressive symptoms link. These results suggest that children who have been exposed to victimization may maintain their vulnerability to depressive symptoms even when they are in new peer contexts. In order to effectively ameliorate the consequences of victimization, it may be important for interventions to focus on reducing children's rumination when faced with social stress. Fortunately, there is evidence that rumination-focused (Watkins et al., 2007) and mindfulness-based (Ramel,

Goldin, Carmona, & McQuaid, 2004) cognitive-behavioral therapies can reduce rumination in clinical populations. Interventions for victimized children may benefit from integrating these therapeutic approaches to specifically target children's cognitive responses to social stress, including those that occur in social contexts that are distinct from their peer victimization experiences. This type of intervention may reduce risk for depressive symptoms resulting from peer victimization. Additionally, these interventions have the potential to impact children's peer relationships more broadly given that the social consequences of victimization are not limited to interactions with aggressors, but also emerge within new peer relationships.

Acknowledgements

We would like to thank the families and schools who participated in this study. We are grateful for Jamie Abaied, Monica Agoston, Hannah Banagale, Molly Bartlett, Sarah Kang, Megan Flynn, Nicole Llewelyn, and Niwako Sugimura for their aid in data collection and management. This research was supported by a University of Illinois Arnold O. Beckman Award and National Institute of Mental Health Grant MH68444 awarded to Karen D. Rudolph.

Appendix A. Responses to stress measure items

Items in brackets reflect alternate wording used to assess responses to stress during the prize distribution portion of the interaction.

1. I tried to focus on finishing the puzzle. [I tried to focus on making a fair decision].
2. I tried to see if I could make something close with the pieces I had. [I tried to figure out different ways to decide who got each prize.]
3. I couldn't stop thinking about how unfair this was.
4. I kept thinking, "I hate this."
5. I tried to concentrate on putting the puzzle together. [I tried to concentrate on making a decision about the prizes.]
6. I kept thinking about how this was way too hard.
7. I couldn't stop thinking about how frustrating this was.
8. I tried to figure out what pieces I needed. [I tried to figure out who should get which prize.]

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