



# Longitudinal Associations Between Peer Victimization and Emotional Difficulties in Schoolchildren: The Role of Sleep Quality

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## Abstract

Children who are victimized by their peers are at increased risk of developing emotional difficulties and disorders (e.g., mental health diagnoses); conversely, children experiencing emotional difficulties may also be more likely to experience peer victimization. Sleep quality could serve as a protective buffer or risk factor in these longitudinal associations. In the present study, we examined bidirectional pathways between peer victimization and emotional difficulties, testing sleep quality as a potential moderator. Children ( $N=293$  ages 8–11; 52% girls) in grades 3–5 completed measures of emotional difficulties (anxiety, depression, irritability, emotion coping, and emotion dysregulation), peer victimization, and sleep quality in the fall (T1) and spring (T2) semesters of one school year. Path models, controlling for covariates and stabilities, showed that peer victimization at T1 predicted higher levels of anxiety, depression, irritability, and poor emotion coping at T2. Sleep quality moderated one path: the link between T1 peer victimization and T2 emotion dysregulation, which was positive and significant only among those with high sleep quality; those with low sleep quality at T1 showed moderate levels of dysregulation irrespective of victimization. Longitudinal paths from T1 emotional difficulties to T2 victimization were all nonsignificant. Model results were not moderated by grade or gender. Overall, results support the unidirectional conclusion that peer victimization contributes to various forms of emotional difficulties, but not vice versa. Sleep quality is relevant as a moderator, underscoring the need for further research. Findings suggest implications for prevention and intervention efforts to promote social-emotional development in school settings.

**Keywords** Peer victimization · School · Mental health · Children · Sleep

## Introduction

Peer victimization, or the experience of being the recipient of another child's aggressive behavior, has been linked to a range of negative outcomes including academic, interpersonal, physical health, behavioral, and emotional problems (Arseneault et al., 2010; Storch & Ledley, 2005). In particular, peer victimization is associated with symptoms and

disorders of anxiety, depressed mood, irritability, and emotion dysregulation, with important clinical and developmental implications (Forbes et al., 2019). Sleep quality may be one important factor to consider in relation to victimization and emotional difficulties, especially in light of sleep's transdiagnostic relevance to mental health (Harvey et al., 2011) and the high prevalence of sleep-related conditions among children with and without mental health disorders (Trosman & Ivanenko, 2021). Although links between emotional problems and peer victimization have been established, questions remain regarding the directionality of these associations and the possible moderating role of sleep quality. Accordingly, this longitudinal study seeks to (a) understand the role of school-based victimization in predicting significant emotional problems, and vice versa; and (b) examine sleep quality as a potential moderator of these relationships. In doing so, we adopt a developmental psychopathology framework, e.g., considering the interplay between typical and atypical development, while testing a putative risk/protective factor,

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across multiple domains (e.g., school, peers, sleep, mental health; Cicchetti & Rogosch, 2002).

Of note, the present study was informed by two recent relevant meta-analytic reviews. First, a meta-analysis of longitudinal studies of peer victimization and internalizing problems in children found significant linkages between peer victimization and internalizing problems in either direction (Reijntjes et al., 2010). More recently, an updated meta-analytic review of bidirectional links between internalizing problems and peer victimization found comparable effect sizes in both directions ( $r_s = 0.18\text{--}0.19$ ); however, most individual studies had focused on *unidirectional* effects, usually with peer victimization as the predictor. Further, these studies focused only on internalizing symptoms rather than a broader emotional spectrum (e.g., irritability, emotion dysregulation, emotion coping) or possible moderators (e.g., sleep; Christina et al., 2021).

### Peer Victimization and Emotional Problems

Peer victimization is associated with myriad difficulties across development. Children who are chronically rejected and victimized by peers experience a host of poor psychological sequelae, which can undermine classroom participation, inhibit overall achievement, and may lead to other forms of social, interpersonal, and peer difficulties (Ladd et al., 2008; Storch & Ledley, 2005). Taken together, these patterns of peer difficulties may confer considerable risk for poor adjustment and mental health concerns, particularly in the domain of emotional difficulties.

Peer victimization is linked to comorbidity in mental health conditions (Ranta et al., 2009), earlier onset and higher severity (Snyder et al., 2004), and poorer long-term outcomes, compared to non-victimized youth (McDougall & Vaillancourt, 2015). Multiple forms of victimization have been linked to subsequent anxiety and depression symptoms (Tampke et al., 2018), and significant cross-sectional relationships exist among depression, anxiety, and victimization (Forbes et al., 2019). Additionally, peer victimization is linked to maladaptive long-term outcomes such as substance use, aggressive behaviors, delinquency, suicidality, anxiety, sadness, isolation, suicidal ideation, conduct problems, and even psychotic symptoms (Arseneault et al., 2010; Klomek et al., 2008; Sullivan et al., 2006).

In addition to research on the *presence or degree* of emotional difficulties (e.g., anxiety, depressive symptoms), it is also critical to consider *how children experience and deal with* their challenging emotions, as this may contribute to developmental outcomes in line with developmental psychopathology emotion regulation perspectives (e.g., Zeman et al., 2006) and may vary significantly across youth. Specifically, it is important to examine how children cope with feeling sad or angry (i.e., *emotion coping*, an adaptive construct)

as well as the extent to they become dysregulated in their behavior expression (i.e., *emotion dysregulation*, a maladaptive construct; Zeman et al., 2001, 2002). Emotion coping applies to peer victimization, as emotion coping strategies among victimized youth are associated with more severe emotional experiences (Mendez et al., 2016).

In addition to peer victimization predicting subsequent psychopathology, a converse scenario is also plausible: emotional difficulties may predict subsequent peer victimization. Research on this question is more limited. Internalizing symptoms (e.g., withdrawal, depression) have been identified as risk factors for both overt and relational forms of peer victimization (Arseneault et al., 2010; Hodges & Perry, 1999; Sentse et al., 2017), with recent findings suggesting significant longitudinal effects in either direction (Cho et al., 2022). Notably, irritability and anger have received almost no attention in this literature, but behavior problems characterized by irritability and anger (e.g., aggression, oppositionality) may co-occur with peer victimization and seem to predict peer victimization (Arseneault et al., 2010; Ter-Stepanian et al., 2019). Associations may also be bidirectional, with evidence to suggest poor social experiences in childhood predict irritability, callous-unemotional traits, and internalizing problems in adolescence (Barker & Salekin, 2012).

Although associations between emotional difficulties and peer victimization are well established, fewer studies have examined the longitudinal bidirectional paths between these variables. In youth samples, studies have found bidirectional longitudinal pathways between peer victimization and internalizing problems, anxiety, and depression (e.g., Cho et al., 2022; Forbes et al., 2019; Hodges & Perry, 1999; Sweeting et al., 2006). However, these studies have primarily focused on internalizing concerns (i.e., anxiety, depression), without considering broader emotional and transdiagnostic variables (e.g., irritability, emotion dysregulation, emotion coping), which are implicated across the development and maintenance of youth mental health disorders more broadly. As such, it is important to both replicate these findings of bidirectional longitudinal pathways between peer victimization and internalizing concerns, and to expand these findings to transdiagnostic constructs and emotional variables.

### The Role of Sleep Quality

In addition to replicating and expanding these longitudinal findings, it is important to consider potential moderating variables. Some work has investigated the potential risk or protective factors associated with the relationships between peer victimization and emotional difficulties, and varying biological and conceptual models have been proposed to help explain the established relationships between poor sleep and emotion outcomes in youth (e.g., Gruber & Cassoff,

2014; Short et al., 2013). Further, meta-analytic findings show that victimized youth are likely to experience poor sleep, and effects are stronger for youth between 7 and 12 years of age as compared adolescents ages 13–17 (van Geel et al., 2016).

Indeed, poor sleep quality has a notable impact on internalizing problems and may be an important moderating factor to consider among victimized youth (McMakin & Alfano, 2015; Uhde et al., 2009). Self-reported sleep quality and time in bed are associated with anxiety, depression, irritability, reactive aggression, and delinquent behaviors in youth, and exacerbates the link between peer victimization and internalizing symptoms (Rubens et al., 2017; Tampke et al., 2018). Additionally, associations between anxiety and poor sleep in youth may persist into adolescence and adulthood (Narmandakh et al., 2020). With significant clinical and developmental implications in the domains of both peer victimization and emotional difficulties, understanding the role of sleep quality in these associations is crucial.

### Gender and Age Considerations

Lastly, it is important to consider the roles of gender and development. For instance, while boys and girls share some similar peer experiences, boys are both more likely to be victimized than girls, and victimized boys may also face more significant consequences than girls who are victimized (Carbone-Lopez et al., 2010). In one meta-analysis, boys tended to show more externalizing emotions than girls from preschool to middle childhood, then fewer externalizing emotions than girls during adolescence (Chaplin & Aldao, 2013). Longitudinal bidirectional findings paths may be moderated by gender: in girls, anxiety and peer victimization showed significant bidirectional pathways; however, in boys, victimization predicted subsequent anxiety but not vice versa (Sentse et al., 2017). Links from peer victimization to internalizing difficulties may also differ across gender and emotion coping style (Cooley et al., 2022). Gender differences in sleep continue across development, with girls tending to acquire longer and less fragmented sleep (Franco et al., 2020). In sum, school-age boys and girls may have different experiences in physical and social-emotional development that should be considered.

Regarding development, sleep quality and timing also vary considerably from early childhood through adolescence and into adulthood (Franco et al., 2020). Similarly, psychopathology onset is usually earliest for disorders of disruptive behavior and irritability/anger, with onset of anxiety and depression typically occurring in late childhood through mid-adolescence (Ghandour et al., 2019). Peer socialization is also moderated by development, with peer affiliations tending to gain greater depth, breadth, and importance in the transition from childhood to adolescence. Thus, age and

gender are both important to consider as potential covariates and moderators. Middle childhood is an important period for social-emotional development, and elementary school could offer valuable opportunities for early intervention and prevention.

### The Present Study

The present study investigates the longitudinal, bidirectional relationships among child emotional difficulties and peer victimization, while considering sleep quality as a moderator. Self-report rating scales were administered to children in grades 3–5 over two semesters. Grade and gender were controlled for and later considered as moderators, given their relevance to peer victimization, emotional difficulties, and sleep quality. Three general hypotheses were put forth: (a) peer victimization would predict subsequent emotional difficulties; (b) emotional difficulties would predict subsequent victimization; and (c) sleep quality would emerge as a moderator, a risk or protective factor, in both temporal relationships. In addition, we anticipated that being a girl would predict subsequent emotional difficulties, but not peer victimization status, and that grade level would moderate longitudinal paths in the model.

## Method

### Participants and Procedures

The sample included 293 children (ages 8–11 years,  $M=9.24$ ,  $SD=0.94$ ; 52% girls) enrolled in grades 3–5 (107 in 3rd grade, 90 in 4th grade, and 96 in 5th grade). Of the 372 students originally deemed eligible, 300 parents provided parental consent (an 81% consent rate). Students who had moved out of district were in special education classes, declined to participate, were absent during data collection periods, or were not on the original class roster were removed from the dataset, resulting in the final sample of  $N=293$ . Data were included in this analysis from children who provided data on measures of interest on at least one occasion.

Although further demographic data are not available at the person-level, schoolwide records indicate that 35% of students were eligible for free or reduced-cost lunch and that students largely identified as White (79%), with approximately 21% identifying a racial minority or multi-racial background (9% Black or African American, 6% Hawaiian/Pacific Islander, 4% Native American, 2% Asian; 5% identified their ethnicity as Hispanic or Latino). These data are consistent with U.S. Census data for the community served by this district: 80% White, 5% Black or African American, 7% Asian, 5% two or more races, and 3% American Indian or

Alaska Native; 7% Hispanic or Latino; and a median household income estimated at \$53,639.

Assessments were carried as part of a long-term research partnership with a public school district in a small town in the Midwestern United States. Children completed a series of self-report measures toward the end of the Fall 2014 (T1) and Spring 2015 (T2) semesters of the same school year. Measures were administered within each classroom by trained research assistants (RAs), with the lead RA reading items aloud and two to three other RAs monitoring and assisting students as they completed measures by paper and pencil. Children were instructed that they could choose not to participate (an alternative activity outside the classroom was provided) and, if they did participate, that they could leave blank any items they did not want to answer. Children received a small prize (e.g., colorful pencils) for their participation. All procedures were approved by the school district and the university's institutional review board. Parental consent and child assent were obtained prior to participation.

## Measures

### Peer Victimization

Peer victimization was measured using the Victimization of Self scale from Peer Experiences Questionnaire (Vernberg et al., 1999) which was modified to accommodate children at or below a third-grade reading level (Dill et al., 2004). This is a 9-item measure addressing both relational (e.g., "A kid ignored me on purpose to hurt my feelings") and overt (e.g., "A kid hit, kicked, or pushed me in a mean way") victimization experiences. Children are asked to rate their experiences using a 5-point Likert scale (1 = *Never* to 5 = *A few times a week*). This measure has demonstrated good psychometric properties in previous work (Dill et al., 2004). Internal consistency for the current sample was good (T1  $\alpha=0.87$ ; T2  $\alpha=0.89$ ).

### Anxiety

The Pediatric Anxiety Scale of the Patient-Reported Outcomes Measurement Information System (PROMIS; Irwin et al., 2010) was used to measure anxiety. This 8-item measure asks children to rate their anxiety symptoms over the last week on a 5-point Likert scale (1 = *Never* to 5 = *Almost Always*). The mean of all responses was computed, with higher scores indicating greater anxiety. The PROMIS Pediatric Anxiety Scale has shown good validity and test-retest reliability (Irwin et al., 2010; Varni et al., 2014), with excellent internal consistency in the current sample (T1  $\alpha=0.89$ , T2  $\alpha=0.91$ ). For clinical and descriptive purposes, raw scores can be transformed into *t*-scores with ranges for interpretation; although not empirically tested for

the PROMIS Pediatric Anxiety, 8-item version, the following *t*-score ranges have been suggested to classify elevated scores: 55–64.5 (*slightly elevated*), 65.7–79.3 (*elevated*), and 79.3–83.3 (*very elevated*) (Seattle Children's Hospital, 2016). In the current sample, 20% of youths ( $n=58$ ) reported levels of anxiety that fell in the slightly elevated range, while 6% ( $n=19$ ) reported elevated anxiety, and 0.6% ( $n=2$ ) reported very elevated anxiety.

### Depressive Symptoms

Children's depressive symptoms were measured using the Short Form Mood and Feelings Questionnaire (SMFQ; Messer et al., 1995), a 13-item measure in which children rate statements about how they have felt in the past two weeks (e.g., "I felt miserable or unhappy") on a 3-point scale (0 = *Not True* to 2 = *True*). The SMFQ has shown good psychometric properties for brief and reliable measurement of depression in youth as young as 7 years old (Messer et al., 1995; Sharp et al., 2006). Internal consistency was good at T1 ( $\alpha=0.87$ ) and excellent at T2 ( $\alpha=0.91$ ). Mean scores were used in analyses. Prior work has advised against the use of clinical cutoffs for the SMFQ in child populations (Jarbin et al., 2020); however, sum scores were calculated for the sample ( $M=4.16$ ,  $SD=4.70$ ), and 15% of youths reported total scores > 1 SD above the mean ( $n=45$ ).

### Irritability

The Affective Reactivity Index (ARI; Stringaris et al., 2012) was used to measure irritability. The ARI is a 6-item measure in which children are asked to rate the severity and frequency of their symptoms over the past 6 months on a 3-point scale (0 = *Not True* to 2 = *Certainly True*). An example item is "I am easily annoyed by others." The ARI has been shown to have good psychometric properties in clinical and non-clinical samples of youths (Dougherty et al., 2021; Evans et al., 2021; Stringaris et al., 2012). Internal consistency was consistently good (T1  $\alpha=0.82$ , T2  $\alpha=0.83$ ). Mean scores were included for analyses, with greater mean scores indicative of higher levels of irritability. Child-report ARI sum scores > 2 have been used to classify youths with severe mood dysregulation (Kircanski et al., 2017). In the present sample, 37% ( $n=105$ ) reported total ARI scores > 2, indicative of clinically elevated irritability.

### Emotion Coping and Dysregulation

Beyond the valance-specific or diagnosis-oriented emotion variables listed above (anxiety, depression, irritability), we also examined emotion coping and dysregulation, which represent more dynamic and transdiagnostic indices of emotional functioning. Specifically, *emotion coping* refers to



the extent to which children can effectively apply strategies for handling their unpleasant emotions in an adaptive way; and *emotion dysregulation* refers to behavioral patterns of expressing one's emotions in ways that are exaggerated, disinhibited, or otherwise inappropriate (e.g., tantrums; Zeman et al., 2002).

Emotion coping and emotion dysregulation were assessed using the Children's Emotion Management Scale (CEMS). Children completed the 12-item Sadness and 11-item Anger versions of the scale (Zeman et al., 2001, 2002). They were asked to rate how they express and handle their emotions on a 3-point Likert scale (1 = *Hardly ever* to 3 = *Often*), including items such as "I stay calm and keep my cool when I am mad," (Anger Coping) and "I whine/fuss about what's making me sad." (Sadness Dysregulation). Mean scale scores were used for analyses. Emotion Coping scores were computed as the mean of their Sadness Coping (5 items) and Anger Coping (4 items) scores; Emotion Dysregulation was computed as the mean of their Sadness Dysregulation (3 items) and Anger Dysregulation (3 items) scores. The CEMS has shown evidence of convergent and discriminant validity in clinical and community samples (Evans et al., 2021; Folk et al., 2014; Zeman et al., 2001, 2002). Internal consistency was acceptable (T1/T2: emotion coping  $\alpha=0.81/0.87$ , emotion dysregulation  $\alpha=0.66/0.69$ ).

### Sleep Quality

Sleep quality was assessed using a 4-item self-report measure, where items are all rated on 3-point Likert scales with potential response anchors tailored to each question (Meijer et al., 2000). The four items assess sleep latency, frequency of night wakings, difficulty returning to sleep, and subjective sleep quality. Mean scores across items were totaled; higher scores indicate greater quality of sleep. This measure has shown acceptable psychometric properties in youth samples (Meijer et al., 2000). Child self-report sleep measures have been utilized in clinical research settings to measure subjective self-report sleep quality, and they are feasible alternatives to physiological measures of sleep in youth (Van Meter & Anderson, 2020). Internal consistency in the current sample was borderline at T1 ( $\alpha=0.59$ ) but acceptable at T2 ( $\alpha=0.69$ ). Scales with fewer items tend to have lower internal consistency ratings due to the brevity of the measure (e.g., Cronbach, 1951; Taber, 2018).

### Analytic Plan

First, descriptive statistics and correlations were examined for all study variables. Next, longitudinal path models were estimated in Mplus version 8 (Muthén & Muthén, 2017). All variables were mean-centered prior to analyses. Models controlled for grade, gender, and stability paths by specifying

these paths as covariates predicting all outcome variables. All models used maximum likelihood robust estimation (MLR) to account for missing data (range 0.0–1.5% across all variables) and mild departures from normality (summarized below). Models were evaluated primarily based on the significance, magnitude, and directionality of longitudinal path coefficient estimates, in line with our aims and hypotheses. Still, overall model fit was also considered through holistic evaluation based on CFI and TLI estimates (values closer to 1.00 indicating better fit, with  $> 0.95$  often being considered good and  $> 0.90$  being acceptable) and RMSEA and its 90% confidence intervals (RMSEA values closer to 0.00 indicating better fit, with values  $< 0.05$  being good and  $< 0.08$  being acceptable (Kline, 2015)). Model 1 focused on direct cross-lagged paths from peer victimization at T1 to emotional difficulties at T2, and vice versa. Model 2 added interaction terms testing sleep quality as a moderator of paths from T1 predictors to T2 outcomes. Significant interaction effects, where found, were probed by estimating them independently from the larger model. Robust interaction effects were explored by plotting outcomes at average ( $M$ ), high (+1  $SD$ ), and low (-1  $SD$ ) levels of the predictor and moderator variables. Lastly, multi-group models were estimated using the Satorra-Bentler chi-square difference test (appropriate for MLR) to ascertain whether the overall pattern of results varied based on age or gender (Muthén & Muthén, 2017).

## Results

### Descriptive Statistics and Correlations

For all study variables, univariate descriptive statistics and bivariate correlations (concurrent and longitudinal) are presented in Table 1. All variables showed moderate to high longitudinal stability from T1 to T2 ( $r_s=0.43$ – $0.60$ ), suggesting that about 18–36% of the variance in T2 outcomes could be accounted for by prior T1 measurements of the same variable. Correlations showed that T1 peer victimization was associated with emotion dysregulation, emotion coping, irritability, depression, and anxiety at both T1 ( $|r_{s}|=0.15$ – $0.47$ ) and longitudinally to T2 ( $|r_{s}|=0.13$ – $0.33$ ). Conversely, all emotion variables at T1 ( $|r_{s}|=0.13$ – $0.38$ ) and T2 ( $|r_{s}|=0.17$ – $0.37$ ) were correlated with T2 peer victimization. Thus, initial results supported the possibility of bidirectional associations to be tested via path models.

Regarding the hypothesized moderator, T1 sleep quality showed little-to-no association with emotion dysregulation/emotion coping variables at either occasion ( $|r_{s}|=0.05$ – $0.12$ ), but poor sleep quality was significantly correlated with irritability, depression, and anxiety cross-sectionally at T1 ( $|r_{s}|=0.27$ – $0.40$ ) and longitudinally to T2

**Table 1** Descriptive statistics and bivariate correlations for all study variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. T1 peer vic	–															
2. T1 sleep quality	-.22**	–														
3. T1 emo dysreg	.23**	-.11	–													
4. T1 emo coping	-.15*	.09	-.09	–												
5. T1 irritability	.39**	-.27**	.38**	-.29**	–											
6. T1 depression	.47**	-.40**	.30**	-.19**	.50**	–										
7. T1 anxiety	.34**	-.35**	.25**	-.15*	.42**	.62**	–									
8. T2 peer vic	.55**	-.17**	.16**	-.13**	.31**	.38**	.23**	–								
9. T2 sleep quality	-.16**	.47**	-.20**	.10	-.24**	-.30**	-.26**	-.16**	–							
10. T2 emo dysreg	.13*	-.05	.43**	-.15**	.35**	.19**	.16**	.17**	-.21**	–						
11. T2 emo coping	-.19**	.12*	-.26**	.45**	-.40**	-.24**	-.20**	-.19**	.19**	-.37**	–					
12. T2 irritability	.31**	-.18**	.27**	-.27**	.60**	.38**	.34**	.35**	-.30**	.52**	-.47**	–				
13. T2 depression	.33**	-.25**	.22**	-.10	.34**	.55**	.47**	.37**	-.36**	.41**	-.30**	.61**	–			
14. T2 anxiety	.26**	-.31**	.13**	-.04	.23**	.44**	.57**	.30**	-.36**	.27**	-.27**	.47**	.70**	–		
15. Grade	-.14*	.02	-.03	.01	.06	.04	.03	-.06	.06	.16*	-.03	.12*	.15*	.12*	–	
16. Gender	-.08	-.04	-.10	.04	-.13*	-.05	.13*	-.01	.02	.05	-.03	-.01	.03	.13*	.01	–
<i>M</i>	1.47	2.00	1.55	2.14	0.44	0.33	1.96	1.59	2.03	1.52	2.18	0.42	0.33	1.96	3.96	0.52
<i>SD</i>	0.62	0.43	0.44	0.48	0.47	0.37	0.87	0.70	0.45	0.42	0.52	0.44	0.39	0.86	0.83	0.50

*Vic* victimization, *emo* emotion, *dysreg* dysregulation

\**p* < .05; \*\**p* < .01

( $|r| = 18-0.31$ ). Peer victimization and sleep quality were similarly inversely correlated, both concurrently and longitudinally across T1 and T2 ( $|r| = 0.16-0.22$ ). There were a few significant, but weak and inconsistent, associations between study variables with students' current grade level ( $|r| \leq 0.16$ ) and their gender ( $|r| \leq 0.13$ ), consistent with the decision to include these terms as covariates.

### Bidirectional Path Model

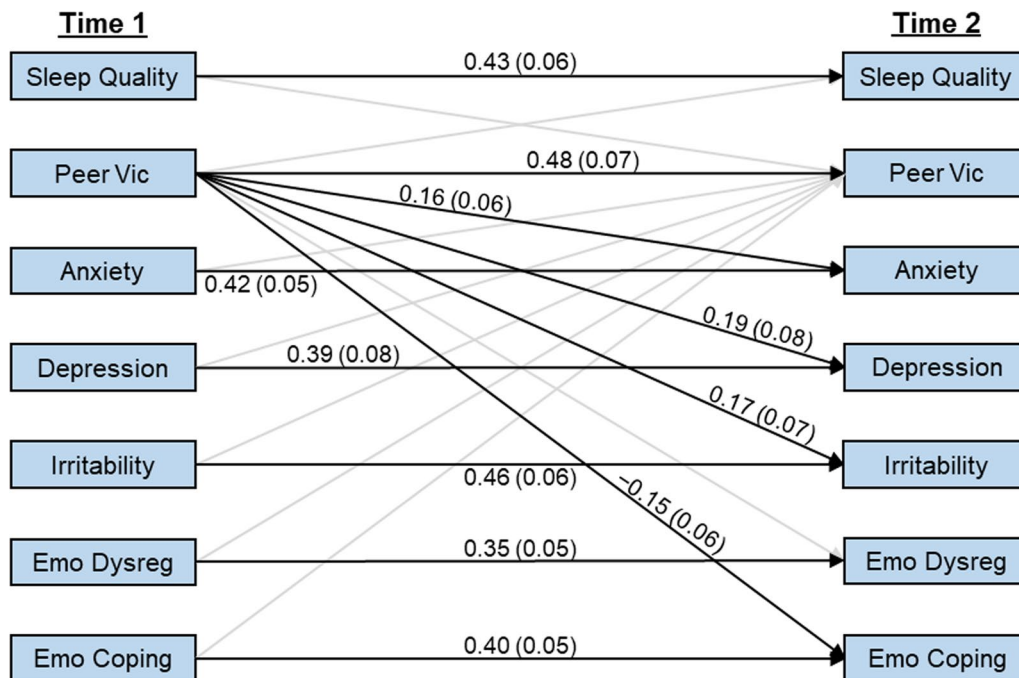
Results of the path model analysis are summarized in Fig. 1, with complete unstandardized results reported in Table 2. Model 1 converged successfully,  $\chi^2 (df = 30) = 81.148$ ,  $p < 0.001$ , MLR scaling correction factor = 1.157. The overall model showed reasonably good fit to the data, RMSEA = 0.076 (90% CI 0.057, 0.096), CFI = 0.959, TLI = 0.836, SRMR = 0.051. Controlling for covariates and stability paths, T1 peer victimization predicted higher levels of T2 emotion problems on four of the five outcomes examined: anxiety, depression, irritability, and poor emotion coping at T2; only the path to T2 emotion dysregulation was not significant. In the opposite direction, only one of the five paths trended toward significance: from T1 depression to T2 peer victimization. The other four paths from emotional difficulties at T1 to subsequent victimization at T2 were not significant. The model also revealed a high degree of

longitudinal stability (all  $ps < 0.001$ ) in peer victimization, sleep quality, and all emotional difficulties from T1 to T2. Regarding covariates, grade level was positively associated with anxiety ( $B = 0.133$ ,  $SE = 0.050$ ,  $p = 0.005$ ), depression ( $B = 0.074$ ,  $SE = 0.022$ ,  $p = 0.001$ ), irritability ( $B = 0.063$ ,  $SE = 0.023$ ,  $p = 0.007$ ), and dysregulation ( $B = 0.093$ ,  $SE = 0.027$ ,  $p = 0.001$ ), but not emotion coping ( $p = 0.34$ ). Gender did not predict any T2 outcomes ( $ps > 0.059$ ).

### Sleep Quality as a Moderator

In Model 2, sleep quality was added as a moderator of the main paths summarized above. Specifically, a product term was created for T1 sleep quality  $\times$  T1 peer victimization (both mean-centered), which was added as to the model as a predictor of all five emotional difficulties at T2; and vice versa for the paths from T1 emotional difficulties to T2 peer victimization. Also, T1 sleep quality was included as a predictor of all T2 outcomes to account for direct effects. All other aspects of the model remained identical to Model 1. For clarity, only the results of these interaction coefficients are reported here, as tests of the moderator hypothesis.

Three interaction effects were significant: First, T1 sleep quality moderated the (previously nonsignificant) path from T1 peer victimization to T2 emotional dysregulation ( $B = 0.177$ ,  $SE = 0.063$ ,  $p = 0.005$ ). In addition, T1 sleep



**Fig. 1** Path diagram showing significant longitudinal associations from Model 1. *Note.* Estimates represent standardized coefficients (standard error) displayed only for significant ( $p < .05$ ) paths, denoted by dark lines. Gray lines denote estimated paths that were nonsignificant. All variables were also regressed on grade and gender, and

covariance paths were included; for clarity, these paths and nonsignificant coefficients are not shown here. See Table 1 for all unstandardized parameter estimates corresponding to these results. *Vic* victimization, *emo* emotion, *dysreg* dysregulation

**Table 2** Parameter estimates for the longitudinal paths from Time 1 predictors to Time 2 outcomes among sleep quality, peer victimization, and emotion difficulties (Model 1)

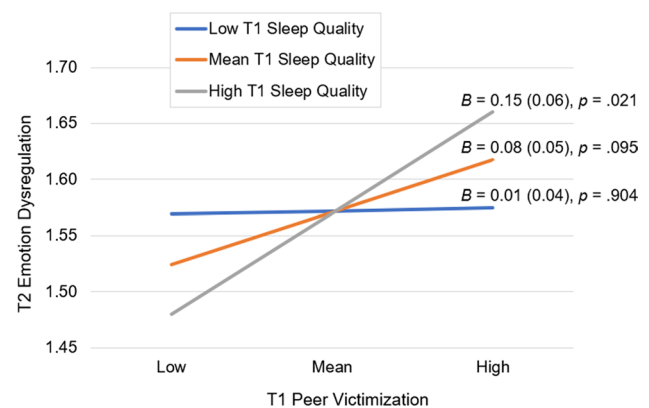
	Path Coefficient	Standard Error	Two-tailed <i>P</i> value	<i>R</i> -square	
<i>T2 sleep quality ON</i>					
T1 peer victimization	−0.045	0.047	.336	0.206	
T1 sleep quality	<b>0.448</b>	<b>0.063</b>	<b>&lt; .001</b>		
<i>T2 peer victimization ON</i>					
T1 peer victimization	<b>0.541</b>	<b>0.077</b>	<b>&lt; .001</b>	0.318	
T1 sleep quality	0.010	0.091	.915		
T1 anxiety	−0.072	0.055	.192	0.278	
T1 depression	0.277	0.147	.060		
T1 irritability	0.123	0.103	.232		
T1 emotion dysregulation	−0.027	0.089	.762		
T1 emotion coping	−0.031	0.060	.606		
<i>T2 anxiety ON</i>					
T1 peer victimization	<b>0.206</b>	<b>0.082</b>	<b>.011</b>		0.277
T1 Anxiety	<b>0.402</b>	<b>0.049</b>	<b>&lt; .001</b>		
<i>T2 depression ON</i>					
T1 peer victimization	<b>0.113</b>	<b>0.050</b>	<b>.025</b>	0.315	
T1 Depression	<b>0.399</b>	<b>0.072</b>	<b>&lt; .001</b>		
<i>T2 irritability ON</i>					
T1 peer victimization	<b>0.115</b>	<b>0.048</b>	<b>.016</b>	0.173	
T1 Irritability	<b>0.418</b>	<b>0.057</b>	<b>&lt; .001</b>		
<i>T2 emotion dysregulation ON</i>					
T1 peer victimization	0.058	0.043	.177	0.196	
T1 emotion dysregulation	<b>0.331</b>	<b>0.053</b>	<b>&lt; .001</b>		
<i>T2 emotion coping ON</i>					
T1 peer victimization	<b>−0.119</b>	<b>0.049</b>	<b>.015</b>		
T1 emotion coping	<b>0.419</b>	<b>0.062</b>	<b>&lt; .001</b>		

Bold values indicate significant at  $p < .05$

All path estimates are unstandardized. All variables were also regressed on grade and gender, and covariance paths were included; for clarity, these results are not reported here. See Fig. 1 for path diagram

quality appeared to moderate the paths from T1 depression ( $B = -1.182$ ,  $SE = 0.361$ ,  $p = 0.001$ ) and T1 emotion dysregulation ( $B = 0.609$ ,  $SE = 0.227$ ,  $p = 0.007$ ) to T2 peer victimization. However, when these latter two effects were re-estimated as standalone path/regression models apart from all other model terms, the previously significant ( $ps < 0.01$ ) interaction effects in the paths to T2 peer victimization became nonsignificant ( $ps > 0.10$ ). This suggests the results were statistical artifacts of the overall model, which were not robust on their own. In contrast, the result that T1 sleep quality significantly moderated the path from T1 peer victimization to T2 emotion dysregulation remained robust and significant when examined as a standalone model ( $B = 0.168$ ,  $SE = 0.067$ ,  $p = 0.012$ ). This result is further interpreted below. No other moderator effects for sleep quality were significant ( $ps > 0.10$ ).

Figure 2 plots the results of the interaction between sleep quality and peer victimization in predicting subsequent emotion dysregulation. As shown, the longitudinal association



**Fig. 2** Sleep quality moderates the longitudinal association between peer victimization and emotion dysregulation. *Note.* Low, mean, and high values for both variables are plotted based on the sample  $M \pm 1$  *SD*. Model is plotted to represent a hypothetical 4th-grade girl, controlling for T1 levels of emotion dysregulation



between T1 peer victimization and T2 emotion dysregulation was positive and significant only among those with *high* levels of sleep quality. In contrast, for children with *low* levels of sleep quality, peer victimization did not show any association with subsequent emotion dysregulation. Results indicate that a child with high sleep quality who experienced little-to-no peer victimization would have the lowest levels of emotional dysregulation, whereas a child with the same high level of sleep quality who was also highly victimized by their peers would have scores of  $> 1.65$  for emotion dysregulation, falling closest to 2 = “*sometimes*” having such problems, on average. Conversely, children with poor sleep quality tended to show sample-average levels of emotion dysregulation ( $M = 1.57$ ), regardless of their level of victimization.

### Gender and Grade

Lastly, to examine any gender difference, and given associations between grade level and anxiety, depression, irritability, and emotion dysregulation, Models 1 and 2 were re-estimated as multi-group models by gender (boys, girls) and grade level (third, fourth, fifth). Chi-square difference tests showed no differences by gender for Model 1,  $\Delta\chi^2 (df = 33) = 32.928, p = 0.471$ , or for Model 2,  $\Delta\chi^2 (df = 48) = 62.345, p = 0.080$ . Similarly, there were no overall differences by grade level for Model 1,  $\Delta\chi^2 (df = 66) = 76.304, p = 0.181$ , or for Model 2,  $\Delta\chi^2 (df = 96) = 117.859, p = 0.064$ . Accordingly, results reported above can be interpreted as applying similarly across boys and girls and across grades 3, 4, and 5.

### Discussion

The goal of the current study was to examine emotional difficulties as antecedents and consequents of peer victimization in children, and to consider the role of sleep quality as a possible moderator in these paths. Several interesting findings emerged. First, peer victimization at T1 predicted subsequently higher levels of anxiety, depression, irritability, and poor emotion coping at T2; however, the converse paths were not significant: none of these emotion variables at T1 uniquely predicted peer victimization at T2. Interestingly, the path from peer victimization to emotion dysregulation—originally found to be nonsignificant in Model 1—was significantly moderated by sleep quality in Model 2. That is, the association between T1 peer victimization and T2 emotion dysregulation was apparent among those with high levels of sleep quality and nonsignificant among those with poor sleep quality. Sleep quality did not robustly moderate any other paths among peer victimization and emotional difficulties. Results were not moderated by gender or grade

level. Overall, these findings suggest that schoolchildren who experience peer victimization are at increased risk to experience a range of emotional difficulties over time, including anxiety, depression, irritability, and difficulty coping with emotions such as sadness and anger. Further, this longitudinal risk pattern appears to be unidirectional rather than bidirectional in nature; peer victimization uniquely predicted subsequent emotional difficulties, but these emotional difficulties did not predict subsequent peer victimization.

The finding that peer victimization predicted subsequent emotional difficulties is largely consistent with the existing literature on this question. However, the unidirectional nature of this result in the present study seems to be inconsistent with some prior literature indicating bidirectional paths between emotional difficulties and peer victimization over time (Forbes et al., 2019; Hodges & Perry, 1999; Sentse et al., 2017). Additionally, null findings surrounding gender as a moderator contradict some prior research suggesting the presence of gender differences across emotional difficulties, experiences of peer victimization, and sleep problems (e.g., Carbone-Lopez et al., 2010; Chaplin & Aldao, 2013; Franco et al., 2020).

Inconsistencies with previous work surrounding directionality of these relationships and gender differences may be related to differences in data collection timepoints, as the present study examined trajectories across semesters, with many existing studies having examined trajectories of peer victimization and emotion difficulties over extended time periods (i.e., years). These findings may provide insight into specifics of temporal relationships between variables, suggesting children with emotional difficulties may not be at immediate risk of peer victimization in the subsequent semester, but risk may continue to increase with time and across development. For instance, prior research finding bidirectional, longitudinal pathways between peer victimization and anxiety among girls was conducted among middle schoolers, which may shed light on the developmental trajectories of these potential relationships (Sentse et al., 2017). Future work should continue investigating how these associations may continue within a longitudinal framework and may hold significant implications for peer victimization prevention efforts within the school setting.

Findings are somewhat consistent with previous literature indicating that victimized youth may be more likely to experience general psychological distress (Arseneault et al., 2010; Christina et al., 2021). More specifically, findings conceptually replicate previous work suggesting that peer victimization places youth at risk of internalizing difficulties, such as anxiety and depression. The present study also establishes a shorter, more fine-grained timeline by which these associations may occur. Less research has focused on peer victimization as a risk factor for the development of more nuanced behavioral or affective concerns, and the

present findings suggest irritability and emotion coping skills are additional subsequent outcomes of victimization. In the context of development, elementary school is a crucial time in which youth are at particular risk of developing emotional, behavioral, and affective concerns. Such risks may also be exacerbated by victimization within the school setting, highlighting the importance of the present findings and underscoring the need for more effective prevention and intervention efforts, particularly within school-age children.

Current results indicate that peer victimization at T1 was correlated with emotion dysregulation and sleep quality, both cross-sectionally and longitudinally, indicating some association between these variables and replicating prior research suggesting that general sleep problems are associated with emotion dysregulation (Palmer et al., 2018). However, when sleep quality was examined as a moderator, rather than revealing the hypothesized *buffering effect* of high sleep quality, we found a *dampening effect* of low sleep quality. Specifically, among youth who reported low quality sleep, peer victimization did not appear to play a role in subsequent emotion dysregulation; conversely, among youth reporting high quality sleep, peer victimization led to greater difficulties with emotion dysregulation. Current findings do not dispel the possibility of associations between these variables, but future work should examine these developmental trajectories taking a more fine-grained approach. For example, given that emotion dysregulation can vary with time, it is possible that peer victimization is associated with more static or trait-like patterns of emotion dysregulation, rather than being dynamic from day to day and heavily influenced by time-varying factors like sleep. This also points to the need for research on these variables over shorter timespan (e.g., days). Sleep quality appears to play a role in the pathways and associations between peer victimization to emotion dysregulation, which may have important implications for intervention and prevention in school settings.

### Limitations

First, the sample was predominantly White, and students were in grades 3–5 in a public school in the Midwest. Although participants were demographically representative of their community, more research is needed among other communities and in more racially, ethnically, and socioeconomically diverse samples. Work among clinical samples and older and younger youth will also be important. Youths' experiences of victimization, sleep problems, and emotional difficulties may vary considerably across development, settings, and groups, and key stressors (e.g., race-based discrimination, financial insecurities) may exacerbate these challenges. Future research should include deliberate efforts and community partnerships aimed at reaching specific populations, promoting diversity, and increasing access.

Such efforts could help clarify the extent to which these findings replicate and generalize, and how they may vary across groups and contexts—including relations among variables as well as clinical implications.

Measures were brief rating scales and relied on self-report, making the study susceptible to mono-informant and method biases. Future research should use multi-informant and multi-method approaches, including other raters (e.g., parents, teachers, peers) and methods (e.g., accelerometry, sleep diaries, ecological momentary assessment). However, the validity and reliability of youth self-report of emotional and behavioral problems has been well established in the literature for youth as young as 7 years old (e.g., Ebesutani et al., 2011). Regarding sleep quality, youth aged 8–12 have been found to be reliable informants on their own sleep quality, often reporting on their own sleep problems more reliably than their parent (Meltzer et al., 2013). Inquiring about a child's own subjective experience of sleep may also capture other behavioral disturbances not found in other objective measures or by other informants, and self-report measures may also be more clinically useful and accessible (Van Meter et al., 2020).

Third, the fall-spring assessment schedule provides a picture of a single school year, but it may not be the ideal interval for these questions. Developmental processes related to emotion, victimization, and sleep could unfold over shorter (e.g., days, weeks) or longer (e.g., years) intervals than we observed here. It is also possible that study variables may be influenced by seasonal factors such as fall vs. spring semester. However, it is not possible to disentangle seasonality from T1-T2 change without more waves, and our data showed little evidence of mean differences in study variables between the two time points. While changes across a single school year remains ecologically valid, future research should collect data across different intervals and longer total spans to better understand how these variables may shift across time.

Lastly, our models incorporated a large number of variables, parameter estimates, and statistical tests without corrections, which increases model complexity and the risk for Type I errors. Generally, this is a byproduct of analytic strengths in that we could consider an array of emotional outcomes (e.g., including irritability, not just internalizing problems) and produce comprehensive models that test for bidirectionality and tests moderators.

### Implications and Future Directions

Clinically, these findings have implications for safety, prevention, and intervention efforts aimed at supporting youth mental health and social-emotional development in school settings. In terms of screening and identification, victimized youth may be at risk of experiencing depression,

anxiety, irritability, and emotion regulation problems. Some research in existing school-based screening and prevention has suggested that surveying when and where students feel the most safe (e.g., school climate) could greatly inform such screening and prevention efforts and plays a role in promoting school safety (Vaillancourt et al., 2010; Williford et al., 2019). Training for caregivers and teachers to recognize victimized youths, as well as adult intervention in instances of peer victimization, should also be considered as well (Cooley et al., 2022). Given some evidence for cross-sectional correlations between sleep difficulties, emotional problems, and peer victimization in the current study, further research is needed to help clarify the exact nature of relationships between sleep, peer victimization and emotional problems, despite null findings of the current study.

In future work, use of empirically supported, well-validated instruments is crucial to identify youths who are experiencing peer victimization (e.g., Joseph & Stockton, 2018), though multi-informant (e.g., self, peer, teacher, caregiver) and multi-method (e.g., rating scales, observations) should also be utilized to clarify victimization status. Regarding intervention strategies, anti-bullying prevention programs have been shown to reduce school-based victimization by around 15–16% (Gaffney et al., 2019). It may be particularly important for such interventions to promote prosocial behaviors and engagement among youth to prevent victimization, thereby reducing risk of poor emotional outcomes. Additionally, school-based programming may focus on emotion identification and emotion coping skills, particularly as emotions may vary and shift as a function of biology, genetics, environment, or social experiences transpiring across development. By focusing on promotion these skills, it may be possible to prevent victimization and mitigate risk of general mental health conditions, suicidality, delinquency, substance use problems, and more.

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## Declarations

**Conflict of interest** The authors have no relevant financial or non-financial interests to disclose.

**Ethics Approval** All study procedures were approved by and conducted in accordance with the [IRB name masked for review]. The study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

**Consent to Participate** Informed consent was obtained from caregivers of all participants and assent was obtained from all participants in accordance with the [IRB name masked for review].

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