



The role of sleep problems in the relationship between peer victimization and antisocial behavior: A five-year longitudinal study



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ABSTRACT

Rationale: Peer victimization in children and adolescents is a serious public health concern. Growing evidence exists for negative consequences of peer victimization, but research has mostly been short term and little is known about the mechanisms that moderate and mediate the impacts of peer victimization on subsequent antisocial behavior.

Objective: The current study intended to examine the longitudinal relationship between peer victimization in adolescence and antisocial behavior in young adulthood and to determine whether sleep problems influence this relationship.

Methods: In total, 2066 adolescents participated in a prospective study from 2009 to 2013. The moderating role of sleep problems was examined by testing the significance of the interaction between peer victimization and sleep problems. The mediating role of sleep problems was tested by using bootstrapping mediational analyses. All analyses were conducted using SAS 9.3 software.

Results: We found that peer victimization during adolescence was positively and significantly associated with antisocial behavior in young adulthood ($\beta = 0.10, p < 0.0001$). This association was mediated, but not moderated by sleep problems. Specifically, peer victimization first increased levels of sleep problems, which in turn elevated the risk of antisocial behavior (indirect effect: 0.01, 95% bootstrap confidence interval: 0.004, 0.021).

Conclusion: These findings imply that sleep problems may operate as a potential mechanism through which peer victimization during adolescence leads to increases in antisocial behavior in young adulthood. Prevention and intervention programs that target sleep problems may yield benefits for decreasing antisocial behavior in adolescents who have been victimized by peers.

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1. Introduction

Peer victimization in children and adolescents is a serious public health concern (Molcho et al., 2009). In the United States, approximately 75% of youth have reported being victimized by their peers (Nansel et al., 2001), and for about 20%–30% of these youth, peer victimization has been chronic (Storch and Ledley, 2005). Victimization experiences have consistently been linked to

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health and internalizing problems in adolescents. For example, youths who are victimized have been found to have a greater risk of developing depression (Snyder et al., 2003; Yen et al., 2014), anxiety (Reijntjes et al., 2010), and suicidal ideation (van Geel et al., 2014).

Because of different responses observed in victimized adolescents (Hanish and Guerra, 2004), experiences of peer victimization could also lead to increases in externalizing problems such as aggression, antisocial behavior, and delinquency. Specifically, while some victimized children are passive and do not respond overtly, others react to victimization with aggression and are more likely to exhibit impulsive behavior, hyperactivity, and emotion dysregulation (Kochenderfer-Ladd and Ladd, 2010; Schwartz, 2000). A

substantial body of research has demonstrated that peer victimization is an important predictor of externalizing problems (Reijntjes et al., 2011). For example, Yang and McLoyd (2015) followed up youths aged 8–14 years for five years and showed that higher levels of peer victimization were significantly associated with increased risks of antisocial behavior. Similarly, Rudolph et al. (2011) found that aggressive behavior at fifth grade was predicted by early (second grade) and increasing (second through fifth grade) exposure to peer victimization. The results of Snyder et al. (2003) further revealed that growth in peer victimization was associated with growth in antisocial behavior in a sample of young children.

Despite growing evidence for the link between peer victimization and antisocial behavior in children and adolescents, little is known about the underlying mediating and moderating mechanisms of the association. Research in recent years, however, has revealed the importance of biological processes in relation to social stressors such as peer victimization (Steinberg and Avenevoli, 2000). Adopting a biopsychosocial approach that simultaneously considers effects of biological, psychological, and social factors (Black and Hoefft, 2015), the current study aims to fill the gaps in the literature by examining the longitudinal relationship between peer victimization in adolescence and subsequent antisocial behavior in young adulthood and by investigating whether sleep problems moderate or mediate this association after adjustment for various covariates including sex, parental education, family structure, family economic status, age, depression, stressful life events, prior antisocial behavior, and prior sleep problems.

1.1. Sleep problems as a moderator

Although research suggests that peer victimization has adverse effects, not all adolescents exposed to peer victimization have an elevated risk of developing risky behavior, indicating that the associations between peer victimization and the outcomes depend on moderators. Newly emerging evidence highlights the moderating role of sleep problems (Lemola et al., 2012; Tu et al., 2015), which is supported from a theoretical perspective (i.e., vulnerability-stress model) and by empirical evidence (El-Sheikh et al., 2010; Lemola et al., 2012). Specifically, a vulnerability-stress model (Hankin and Abela, 2005) suggests that psychosocial stressors would interact with the individuals' vulnerability factors in eliciting symptoms of psychopathology such as antisocial behavior. In the context of the current study, sleep problems may be a vulnerability factor that interacts with stressors (i.e., peer victimization) to influence the development of antisocial behavior.

Regarding empirical evidence, studies that have statistically tested the moderating role of sleep problems in the relationships between psychosocial stress and behavioral outcomes are scarce. Of a few that exist, sleep problems have been found to exacerbate the negative effects of family dysfunction on youth's internalizing and externalizing problems (El-Sheikh et al., 2010; Lemola et al., 2012). In a sample of 176 early adolescents, Lemola et al. (2012) found that the association between interparental conflict and adolescent aggression was moderated by sleep problems such that the negative effects of interparental conflict on aggression were only significant among adolescents with insufficient sleep but not among those with adequate sleep. Conversely, higher sleep efficiency in conjunction with higher socioeconomic status protected children against the negative effects of maternal psychological control on symptoms of anxiety, depression, and pre-sleep arousal (El-Sheikh et al., 2010). However, inconsistent findings exist when sleep problems were examined as a moderator in the context of peer victimization. Specifically, Tu et al. (2015) found that stronger association between victimization and externalizing problems was observed among adolescents with fewer than more sleep problems.

No other study has examined the potential role of sleep problems in moderating the relationships between peer victimization and other developmental outcomes. Because of the mixed findings regarding the moderating role of sleep problems and the methodological limitations (e.g., small sample sizes, cross-sectional study designs) in previous studies, the differential association between peer victimization and antisocial behavior in the presence of sleep problems remains uncertain, and a longitudinal examination of this association is warranted.

1.2. Sleep problems as a mediator

A recent meta-analysis suggested that sleep problems may be a potential mediator of the association between peer victimization and negative outcomes in adolescents (van Geel et al., 2015). Theoretically, exposure to peer violence may produce a traumatic stress response in children, which results in sleep problems that in turn have an adverse impact on health and functioning (Spilsbury, 2009). Empirical evidence linking violence exposure to sleep problems and sleep problems to various problematic behaviors also provides support for the potential mediating role of sleep problems. With regard to the link between peer victimization and sleep problems, fear and rumination caused by peer victimization may hinder a person's ability to relax and fall asleep (Kliewer et al., 1998; Lepore and Kliewer, 2013). Indeed, research has generally found that victims of peer violence report more sleep problems than nonvictims (van Geel et al., 2015). For example, Yen et al. (2014) found that being a victim of any type of bullying was significantly associated with insomnia. Using a longitudinal design, Biebl et al. (2011) demonstrated that chronically victimized adolescents report significantly more sleep problems than those who are not victimized or who experience less continuous peer victimization.

In addition, adolescents with more sleep problems have been found to be at elevated risks of behavioral problems (Gregory and Sadeh, 2016; Shochat et al., 2014). Specifically, poor sleep quality was associated with more internalizing and externalizing problem behaviors in adolescents (Meijer et al., 2010). Children with persistent and incident sleep problems showed poorer health-related quality of life and more problems in behavior, language, and learning than those with no sleep problems (Quach et al., 2009). Sleep problems during child development were also found to be associated with subsequent emotional and behavioral difficulties including anxiety, depression, attention problems, and aggression (Gregory et al., 2008). Although the reasons for the associations between observed sleep problems and behaviors are still unclear, researchers have hypothesized that sleep problems may impair prefrontal cortex functioning, thereby weakening the brain's ability to coordinate behavioral responses (Dahl, 1996; Kamphuis et al., 2012).

Little empirical analysis exists for the mediating role of sleep problems in the associations between peer victimization and negative outcomes. One study found that peer victimization was indirectly associated with poor academic performance via sleep problems (Lepore and Kliewer, 2013). However, no study has examined sleep problems as a potential mediator in the link between peer victimization and antisocial behavior.

1.3. The current study

Based on the existing theoretical and empirical evidence, we aimed to examine whether peer victimization during adolescence is associated with antisocial behavior in young adulthood and what the underlying mechanisms might be. Specifically, we aimed to (1) examine the effects of peer victimization during adolescence on antisocial behavior in young adulthood and (2) test whether sleep

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