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# Bullying Victimization and Friendship as Influences on Sleep Difficulty among Brazilian Adolescents

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## ABSTRACT

Bullying victimization is associated with poor health-related outcomes, including sleeping problems. The present study aimed to investigate the impact of bullying victimization on sleep difficulty, and the moderating effect of the number of close friends on this association, also exploring differences across genders. The study was based on a nationally-representative survey on adolescent health conducted in Brazilian schools, involving a total of 109,104 participants, enrolled at the 9th year in 2012. The measures used in the analysis included socio-demographic characteristics, bullying victimization, sleep difficulty, and number of close friends. In the multilevel models, reporting more peer victimization was associated with more sleep difficulties ( $b = .18$ ,  $t = 50.17$ ,  $p < .05$ ), with girls

reporting more sleep difficulties in association with peer victimization than boys. Reporting having more friends was inversely linked to sleep difficulties ( $b = -.08$ ,  $t = -15.26$ ,  $p < .05$ ), and the association between peer victimization and sleep difficulties was significantly buffered by the number of friends. Moreover, in a three way interaction, there was a marginally significant difference in the effect of friends on the link between victimization and sleep difficulties between boys and girls ( $b = .02$ ,  $t = 1.86$ ,  $p = .06$ ), with the buffering effect of friendships being negligible among girls as opposed to boys. The results indicate a significant association between bullying victimization and sleep difficulties, which seems to be more pronounced among girls, also suggesting that the number of close friends may buffer this association, mainly for boys.

## **KEYWORDS**

Adolescence; bullying; friendship; sleep; social support

## **Introduction**

### ***Bullying and health-related outcomes***

Bullying is a very common form of violence among youth populations around the world. Prevalence rates range from 2% to 32%, with estimates varying in relation to the characteristics of the sample studied, such as gender, age group, and country (Tsitsika et al., 2014; Valle, Williams, & Stelko-Pereira, 2020). The term bullying refers to when one individual is the recipient of physical, emotional, verbal, or relational aggression perpetrated by others who have more power or some level of dominance over the victim, in a repetitive manner over an extended period of time (Olweus, 1993). Several studies have described that individuals involved in bullying and victimization situations, regardless of the age group, are associated with specific mental health and medical conditions, including sleep problems, anxiety, depression, suicide ideation, psychosomatic problems, loneliness, fatigue, lower school performance, loss of appetite, dizziness,

pain, among others (Gini & Pozzoli, 2013; Lepore & Kliewer, 2013; Menesini, Modena, & Tani, 2009; Sansone & Sansone, 2008; van Geel, Goemans, & Vedder, 2016). Such symptoms and conditions can manifest either during childhood or adolescence, and frequently persist into adulthood (Karatas & Ozturk, 2011; Sansone & Sansone, 2008; Vaillancourt & McDougall, 2013).

Boys are more likely to engage in bullying situations, either as perpetrators or victims, than girls (Hellström & Beckman, 2020; Seals & Young, 2003). In addition, bullying tends to be associated with different social functions for each gender (Espelage, Meban, & Swearer, 2004). For instance, boys perpetrate bullying in an externalized manner, as a way to show physical dominance, while girls engage more in indirect bullying, such as gossip or teasing as a means to exclude others from social connections, as well as to damage reputation or relationships (Kretschmer, Veenstra, Dekovic, & Oldehinkel, 2017; Silva, Pereira, Mendonça, Nunes, & de Oliveira, 2013). Although boys and girls develop several mental health symptoms in association with bullying involvement, including depression and anxiety, girls show higher levels of these symptoms, with evidence suggesting more persistence of such poor outcomes in adulthood for them in comparison with boys (Espelage et al., 2004; Kretschmer et al., 2017).

### ***Social support and its moderating effect on bullying***

Social support refers to all types of information – verbal and non-verbal – that leads a person to feel cared for, affecting positively their well-being (Sarason & Sarason, 2009). This type of support can be provided by family, friends and peers (Cohen & Wills, 1985). Adolescents tend to be overly dependent on their friends and peers, rather than their families and parents, for social support during this developmental phase (Guo, Li, Wang, Ma, & Ma, 2020). In addition, support from friends improves adolescents' psychological well-being based on a positive affect, according to the stress-buffering theory (Cohen & Wills, 1985). Besides that, in face of victimization and bullying, friend's support acts as a protective factor, enhancing emotional well-being and coping strategies (Guo et al., 2020, Davidson & Demaray, 2007). Social support may also present a beneficial effect on sleep, as

suggested by a meta-analysis (Kent de Grey, Uchino, Trettevik, Cronan, & Hogan, 2018), which described that the quality of social support can predict a better sleep pattern, with social support being significantly associated with better sleep outcomes.

The level of social support perceived by adolescents in the school scenario is associated with the student's self-esteem and satisfaction with the school environment (Aldrup, Klusmann, Lütke, Göllner, & Trautwein, 2018). In addition, adolescents who perceive more social support from friends and peers are less likely to suffer peer victimization and bullying, as well as with its potential consequences (Attar-Schwartz, Mishna, & Khoury-Kassabri, 2019). For instance, according to Guo et al. (2020) support from friends and peers within the school environment had a moderating effect on depressive symptoms in adolescents who were bullied.

Research has suggested that social support may present a distinct buffering effect in the potential consequences of bullying in boys and girls according to their gender, which can be partially explained by their different social needs and expectations (Hellström & Beckman, 2020; Rethon, Head, Klineberg, & Stansfeld, 2011). As already described, during adolescence, boys and girls usually spend more unsupervised time with peers and as a result the support provided by friends becomes more important than other sources (Rethon et al., 2011); however, girls are more likely to ask for support or to comfort victims of bullying, showing better strategies to deal with bullying victimization than boys (Osterman et al., 1997).

### ***Sleep in adolescence***

Sleep is a complex physiological function and biological need, requiring the reduction of the connection with the external environment, in terms of responsiveness and awareness, as well as the reduction of arousal levels (Dahl & Lewin, 2002; Fadzil, 2021; Wulff, Gatti, Wettstein, & Foster, 2010). This process prevents the perception of stimuli, such as potential threats, and the responsiveness to it in behavioral and physical terms (Dahl & Lewin, 2002; Fadzil, 2021). Even though the ultimate function of sleep is yet to be unfolded, several studies described that sleep is vital for survival, being associated with brain

development and maturation, learning and academic achievement, restoration and energy conservation, less propensity to obesity and a sedentary life- style, adequate functioning of the immune system, physical growth, as well as for the maintenance of several distinct bodily functions (Agostini & Centofanti, 2021; Dahl & Lewin, 2002; Fadzil, 2021).

The definition of adequate sleep is quite heterogeneous and complex, usually being defined in terms of sleep quantity and sleep quality (Agostini & Centofanti, 2021; Fadzil, 2021; Krystal & Edinger, 2008). On the one hand, sleep quantity is a more objective concept, with the duration of needed sleep declining across development, reaching up to 16 hours per day during the first years of infancy, and 8–10 hours/day during adolescence (Agostini & Centofanti, 2021; Fadzil, 2021). On the other hand, sleep quality is a subjective measure, in which good quality sleep means that the individual feels rested, satisfied and refreshed after waking up (Kline, 2013). Regardless of the definition, inadequate sleep was shown to present a significant impact on well being, social development, and health related outcomes, including higher incidence of several mental health and behavioral problems, lower neurocognitive function, increased risk of suicide, as well as increased risk of diabetes and cardiovascular disease (Agostini & Centofanti, 2021; Fadzil, 2021).

Several studies, from different countries, pointed out a significant association between bullying and victimization involvement and sleeping problems in adolescents and children (Donoghue & Meltzer, 2018; Kubiszewski, Fontaine, Potard, & Gimenes, 2014; Lepore & Kliever, 2013; Politis, Bellou, Belbasis, & Skapinakis, 2014; Sampasa-Kanyinga, Chaput, Hamilton, & Colman, 2018; Yen et al., 2014; Zhou et al., 2015). A meta-analysis (van Geel et al., 2016), which included 21 cross- sectional studies, corresponding to a total of 363,539 children and adolescents between the ages of 7 and 19, summarized that peer-victimized children significantly reported more sleep problems than non victimized children, with an OR of 2.21. In this study, however, authors did not find significant differences in effect sizes for the relationship between sleep problems and bullying between genders (van Geel et al., 2016). Another meta-analysis investigated the

association between exposure to bullying in the workplace and sleep problems in adults (Nielsen, Harris, Pallesen, & Einarsen, 2020). This study reported a significant association between both variables, with an OR of 2.31 in cross-section studies, and an OR of 1.62 in prospective studies; highlighting the increased risk of developing sleep problems after being exposed to bullying (Nielsen et al., 2020).

The pathophysiological mechanism through which bullying may be related or even cause sleep problems is not known. Nevertheless, one potential explanation would be the sustained physiological activation, hyperarousal, as well as chronic stress with an altered cortisol release pattern; all these changes undermine the capacity of the brain to relax and to reduce responsiveness to the external environment during sleeping hours (Bonnet & Arand, 2010; Hansen et al., 2006; Nielsen et al., 2020; van Geel et al., 2016). Excessive worrying, fear and rumination may also compromise the physiology of sleep (Lepore & Kliever, 2013; Nielsen et al., 2020; van Geel et al., 2016).

### ***The present study***

In Brazilian samples, the prevalence of bullying ranges from about 11% to approximately 30% (Valle et al., 2020). A few studies, which investigated the relationship between bullying and sleep problems in Brazilian samples, also described a positive association between these variables (Escobar, Noll, Jesus, & Noll, 2020; Jomar, Fonseca, & Ramos, 2021; Malta et al., 2014; Silva et al., 2018). Nevertheless, to the best of our knowledge, no study has investigated how the number of close friends may attenuate this association in Brazilians yet.

Therefore, the main objective of this study was to examine the association between school-based bullying victimization and sleep difficulty, in a nationally-representative sample of adolescents in Brazil. Using multilevel modeling, we accounted for classroom level and school level differences in sleep difficulties and the association with peer victimization. Moreover, the influence of friendship as a moderator of this association was also investigated after accounting for the effects of various covariates, and the differences across genders were investigated in a

three-way interaction. It was hypothesized that bullying as a form of peer victimization would have an impact on sleep difficulty, and that the number of friends would attenuate this association. In addition, it was hypothesized that the association between these variables would significantly differ across genders.

## **Methods**

### ***Participants and procedures***

The study was based on secondary analysis of publicly available data from a cross-sectional nationwide adolescent health survey, the 2012 edition of the National Survey of School Health (Instituto Brasileiro de Geografia e Estatística (IBGE), 2012), developed and organized by the Brazilian Ministry of Health and the Brazilian Institute of Geography and Statistics. Participants were recruited from public and private schools from all the 27 Brazilian states. The students were, at the time of the survey, regularly enrolled at the Ninth Year of elementary education (IBGE, 2012). The sample used in this study corresponds to a total of 109,104 adolescents (aged between 13 and 15, in 86% of the sample), with 52.2% girls. In terms of the racial profile of the sample, based on the Brazilian Census categories, 42.2% were *pardo* (brown), 36.8% *branco* (white), 13.4% *preto* (black), 4.1% *amarelo* (yellow), and 3.5% *indigenas* (indigenous). All told, the participants came from 4091 classes in 2,842 schools. A more detailed description of the study participants and sampling methodology can be seen in a previous publication (IBGE, 2012).

The data was collected between April and September 2012, and the schools were visited by agents of the Brazilian Institute of Geography and Statistics. All of the visited schools were chosen based on probabilistic sampling criteria that allowed them to obtain a nationally-representative sample of adolescents, explained in detail in the original report of the survey (IBGE, 2012). The survey followed ethical guidelines for research, and the collected data, regarding all the parts involved in the survey, were anonymized. Furthermore, the investigation received the approval of the Research Ethics Committee at the Federal Ministry of Health, and each student provided informed consent before proceeding to answer the



questionnaire (IBGE, 2012).

### ***Measures***

The National Survey of School Health 2012 consisted of several self-report questions organized into a specific questionnaire, which was uploaded to smartphones and later filled out by the students. The questionnaire was used to assess several aspects of adolescents' life and well-being, including the items which were used in the analysis for this study. In addition, in order to allow for comparisons with other studies, most of the questions were based on established cross-sectional surveys, namely the Global School-Based Student Health Survey (GSHS) and the Youth Risk Behavior Surveillance System (YRBSS) developed by the World Health Organization (WHO) and The Centers for Disease Control and Prevention (CDC) (Centers for Disease Control and Prevention (CDC), 2011). The Portuguese version of the questionnaire is available in the full report of the dataset (IBGE, 2012).

### ***Socio-demographic characteristics***

Age was measured using a nominal scale (1 "11 or younger" through 9 "19 or older"). Ethnicity was dummy coded with white participants coded as 0 and all other ethnicities as 1. A standardized index of socio-economic status (SES) was created using a combination of both parents' education and the presence of a telephone in the home, having a cellphone, computer, internet access, a car and the number of bathrooms ( $\alpha = .81$ ). Finally, schools were coded as either public (making up 78.60% of the schools) or private (21.40%).

### ***Bullying victimization***

Bullying victimization was assessed through a single item, namely "Over the last 30 days, how often did any of your school colleagues embarrass, mock, make fun of, intimidate or tease you so much that made you feel hurt/upset/annoyed/offended/humiliated?," rated in a 5 points Likert scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always). On average, participants reported

little peer victimization ( $M = 1.61$ ,  $S.D. = 1.02$ )

### ***Sleep difficulty***

Sleep difficulty was assessed through the item “Over the past 12 months, how often were you not able to sleep at night because something was troubling you?” (rated in a 5 points scale: 1 = never, 2 = rarely, 3 = sometimes, 4 = most of the time, 5 = always). On average, participants reported few sleep difficulties ( $M = 2.05$ ,  $S.D. = 1.10$ )

### ***Friendship and number of close friends***

Friendship was indirectly measured through the number of self-reported close friends, examined through the item “How many close friends do you have?” (single item; 4 points scale: 0 = no friends, 1 = 1 friend, 2 = 2 friends, 3 = 3 or more friends). In this sample, 80.60% of respondents reported having three or more friends.

### ***Data analysis***

Initially, we used IBM SPSS Statistics 25.0 to run an independent t-test to check for gender differences in the scores of the main study variables, and a bivariate Pearson’s correlation between all the study variables to determine the possible associations between them. Further, the data analysis was conducted using Mplus 7 (Muthen & Muthen, 2012). Data were analyzed using a three level multilevel modeling framework. Individuals (at level 1) were nested in their classrooms (at level 2) which were themselves nested within schools (at level 3).

First we started with an unconditional model, devoid of predictors to provide the percentage of variance at each level (the intra-class correlation). Then, we added the covariates (gender, age, ethnicity and SES) as correlates of sleep difficulties. At this point, peer victimization was included in the model to show the effect above and beyond the covariates. We also tested for differences in the effect of victimization as a function of the covariates. This now allowed us to test for the main effect of number of friends and separately, its buffering effect of the

association between victimization and sleep difficulties. We also tested for differences between public and private schools on this effect. Finally, differences in the role of friends across genders were compared using a three way interaction. Only statistically significant effects ( $p < .05$ ) that led to a proportional reduction in prediction error (PRPE) AND significantly improved the model (as measured using a  $Dv^2$  test) were interpreted.

Table 1. Descriptive statistics for the study participants.

	Score range	Mean (SD)		$p$ value
		Boys	Girls	
Sleep difficulties	1-5	2.02 (1.11)	2.07 (1.09)	<0.01
Bullying Victimization	1-5	1.66 (1.07)	1.56 (.98)	<0.01
Number of Friends	0-3	2.70 (.74)	2.67 (.71)	<0.01

## Results

Gender differences in the scores of the main study variables (bullying victimization, sleep difficulties and number of friends) are provided in Table 1. In addition, the bivariate correlation matrix between all study covariates can be found in Table 2.

### *Multilevel modeling*

The unconditional model revealed that almost all of the variability in sleep difficulties (98.93%) was at the individual level, leaving a small proportion at the classroom (.55%) and school (.52%) levels. Nevertheless, there was significant variability at both the classroom ( $\chi^2_{(1,249)} = 1,460.98, p < .05$ ) and school ( $\chi^2_{(2,841)} = 3,353.75, p < .05$ ) levels justifying a multilevel modeling approach.

We could now add the covariates (gender, age, ethnicity and SES) as correlates of sleep difficulties. The associations mirrored the correlations with girls, older children and higher SES being associated with more sleep difficulties (PRPE = 5.00%;  $Dv^2_{(4)} = 5,927.18, p < .05$ ). More interesting though is that above and beyond the effects of the covariates, peer victimization was positively related to

sleep difficulties (PRPE = 3.74%;  $Dv^2_{(3)} = 4203.30$ ,  $p < .05$ ). In other words, reporting more peer victimization was associated with more sleep difficulties ( $b = .18$ ,  $t = 50.17$ ,  $p < .05$ ). We also tested for differences in the effect of victimization as a function of the covariates. However, adding these to the model only reduced prediction error by .06% and though this reflected a significant improvement to the estimation of sleep difficulties ( $Dv^2_{(15)} = 84.14$ ,  $p < .05$ ), the only effect that was significant was that girls reported more sleep difficulties in association with peer victimization than boys.

Now we could test for the main effect of number of friends and separately, its buffering effect of the association between victimization and sleep difficulties. Reporting having more friends was linked to sleep difficulties (PRPE = .74%;  $Dv^2_{(4)} = 589.22$ ,  $p < .05$ ) in that those with more friends stated having less difficulty sleeping ( $b = -.08$ ,  $t = -15.26$ ,  $p < .05$ ). As hypothesized however, the association between peer victimization and sleep difficulties was buffered by the number of friends (PRPE = .58%;  $Dv^2_{(5)} = 154.82$ ,  $p < .05$ ). To explain, the effect of peer victimization on sleep difficulties was weaker among children with more friends (Figure 1).

To ensure that there were no differences between public and private schools in these associations we added the school type variable on sleep difficulties overall, on the effect of peer victimization, the effect of friends and the interaction between the two. Children in private schools reported slightly more sleep difficulties overall ( $b = .22$ ,  $t = 2.27$ ,  $p < .05$ ), there were no significant improvements to the estimation of any of the effects with this addition of the distinction between public and private schools.

Finally, we explored differences in the role of friends across genders using a three way interaction. Although testing for this only reduced prediction error by .05%, this still reflected a significant improvement to the estimation of sleep difficulties ( $Dv^2_{(6)} = 78.30$ ,  $p < .05$ ). There was a marginally significant difference in the effect of friends on the link between victimization and sleep difficulties between boys and girls ( $b = .02$ ,  $t = 1.86$ ,  $p = .06$ ). As illustrated in Figure 2, the buffering effect of friendships was negligible among girls as opposed to boys. This

might be explained in that unfriended girls reported more sleep difficulties noticeably even when rarely victimized by their peers (again Figure 2).

Table 2. Correlation matrix with the inclusion of all the study covariates.

	Sleep diff.	Gender	Ethnicity	Age	SES	Victim.	Friends
Sleep diff.	1	.211*	-0.004	.040*	.031*	.157*	-.067*
Gender	.211*	1	.031*	-.099*	-.070*	-.046*	-.021*
Ethnicity	-0.004	.031*	1	.105*	-.232*	-.008*	-.006*
Age	.040*	-.099*	.105*	1	-.247*	-.039*	-.053*
SES	.031*	-.070*	-.232*	-.247*	1	.025*	.063*
Victim.	.157*	-.046*	-.008*	-.039*	.025*	1	-.080*
Friends	-.067*	-.021*	-.006*	-.053*	.063*	-.080*	1

Note: Sleep diff. = sleep difficulties. Victim. = bullying victimization. SES = socio-economic status. Friends = number of friends.

\* =  $p < .01$ .

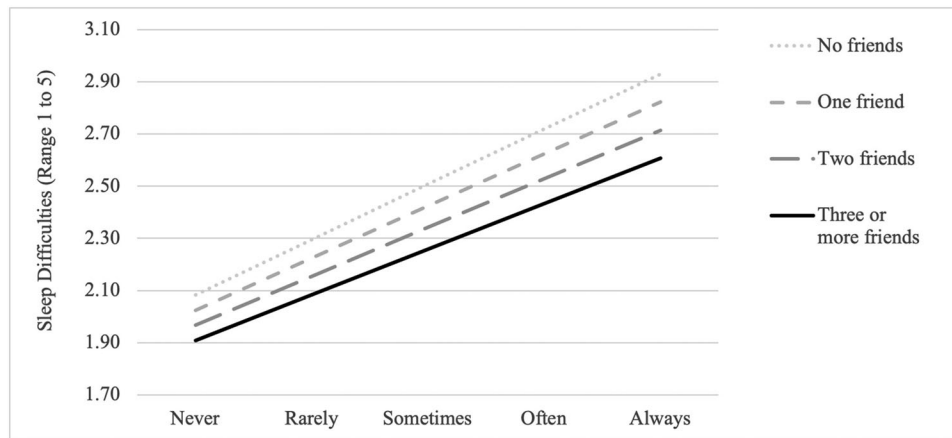


Figure 1. The moderating effect of number of friends on the association between peer victimization (x-axis) and sleep difficulties (y-axis). Note: The y-axis was cropped to highlight the effects.

## Discussion

The current study aimed to investigate the association between bullying victimization and sleep difficulty, investigating the influence of the number of friends as a moderator of this association, after accounting for the effects of specific covariates. Investigators also aimed to explore the differences across genders in the relationship among bullying victimization, sleep difficulty and number of friends.

The main findings of this study are that sleep difficulties are weakly negatively correlated with number of friends, whereas bullying victimization, and female gender are weakly positively associated with sleep difficulties in the bivariate analysis. In the multilevel models, reporting more peer victimization was associated with more sleep difficulties, with girls reporting more sleep difficulties in association with peer victimization than boys. Moreover, reporting having more friends was inversely linked to sleep difficulties, and the association between peer victimization and sleep difficulties was significantly buffered by the number of friends. Lastly, in a three way interaction, there was a marginally significant difference in the effect of friends on the link between victimization and sleep difficulties between boys and girls, with the buffering effect of friendships being negligible among girls as opposed to boys.

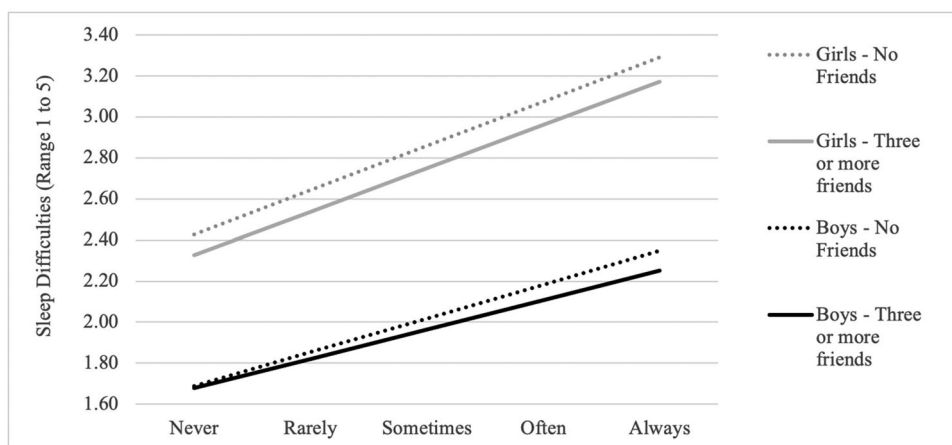


Figure 2. The three-way interaction between peer victimization (x-axis), friendship and gender on sleep difficulties (y-axis).

As suggested by the results of this investigation, bullying victimization is significantly associated with sleep difficulty, as well as with other sleep problems. Such association was significantly highlighted in several previous studies across the globe (Biebl, DiLalla, Davis, Lynch, & Shinn, 2011; Karatas & Ozturk, 2011; Yen et al., 2014), including two meta analysis with large samples, which suggested that individuals from childhood to adulthood may suffer sleep problems in association with bullying victimization (Nielsen et al., 2020; van Geel et al., 2016). As described in the introduction, one meta-analysis of cross-sectional studies (van Geel et al.,

2016), which assessed a total of 363,539 children and adolescents, summarized that peer-victimized children and adolescents significantly reported more sleep problems than non victimized children, with an OR of 2.21. Another comprehensive meta-analysis (Nielsen et al., 2020), which investigated the association between exposure to bullying in the workplace and sleep problems in adults, further suggested the increased risk of developing sleep problems after being exposed to bullying, reporting a significant association between both variables, with an OR of 2.31 in cross-sectional studies assessing a total of 69,199 adults, and an OR of 1.62 in prospective studies assessing a total of 26,164 adults. Regarding differences across genders, both meta-analysis did not find significant differences in the association between bullying victimization and sleep problems across genders (Nielsen et al., 2020; van Geel et al., 2016).

In Brazilian samples, bullying victimization has also been significantly associated with sleep difficulty and other sleep problems. For instance, a recent study (Jomar et al., 2021), which was based on the analysis of the 2015 edition of the National Survey of School Health, described a significant and positive association between sexual orientation-based bullying and sleep difficulty, in a sample composed by 101,646 students. According to their results, the association between sleep difficulty and sexual orientation-based bullying was significantly higher in comparison with the association between sleep difficulty and other forms of bullying victimization. In this study (Jomar et al., 2021) bullying victimization and sleep difficulty were measured using the same questions used for our study; nevertheless, the investigation of sexual orientation-based bullying was beyond the scope of our study.

Other Brazilian investigations explored the association between sleep difficulty and bullying victimization in the 2012 edition of the National Survey of School Health (Malta et al., 2014; Silva et al., 2018) One of the studies (Malta et al., 2014) described that bullying victimization was significantly associated with sleep difficulty, after adjusting the model for other covariates, with a magnitude of an OR of 1.92. The other study (Silva et al., 2018) presented a slightly different model, describing an OR of 1.87 for boys and 2.05 for girls in the association

between bullying victimization and sleep difficulty ( $p < 0.001$  for both). Nevertheless, these studies are substantially different from our paper, in which the relationship among the study variables was explored in robust multilevel models. In addition, the association between number of friends and sleep difficulty, and its potential buffering effect on the association between bullying victimization and sleep difficulty, was explored only in our study.

Another Brazilian study investigated factors associated with suicide ideation in a cross-sectional survey of Brazilian adolescents from public schools, with more than 6000 participants from only one Brazilian state, namely Pernambuco (Soares et al., 2020). In this study, low social support (considering all sources of social support) and poor sleep quality were among the variables most strongly associated with suicide ideation for both genders, whereas being exposed to bullying and violence, which were assessed in conjunction as one dimension, was significantly associated with suicide ideation only for girls (OR of 1.31). Even though this is a preliminary study (Soares et al., 2020) as well, it suggests that girls may be at greater risk of developing mental health symptoms, including suicide ideation, in association with exposure to violence and bullying. In addition, the findings from this study (Soares et al., 2020), highlighting the significant association of poor sleep quality and low social support with suicide ideation, once again suggest the important role of good sleep quality and adequate social support in the life of Brazilian adolescents.

As highlighted in the results of our study, girls reported more sleep difficulties in association with peer victimization than boys. This finding is consistent with previous research with adolescents. Specifically, one longitudinal study (Biebl et al., 2011), pointed out that chronic peer victimized girls presented significantly more mental health problems (such as sleep difficulties), in comparison with same gender non-peer victimized populations; quite different than for boys, in which the difference was not found to be significant. This phenomenon can be partially explained by the characteristic of bullying among girls, in which girls more frequently behave with passive behaviors toward bullying, being more likely to internalize and develop more symptoms in comparison with the boys who oppose



being victimized more frequently and openly (Biebl et al., 2011).

Social support has been extensively associated with several mental health-related outcomes across populations of adolescents from different parts of the world. For instance, low social support (from a non specified source) has been associated with a 1.81 greater risk of presenting clinically relevant depressive symptoms, after controlling for potential confounding variables, in a sample of vulnerable and orphaned adolescents living in childcare homes in Nepal (Bhatt, Apidechkul, Srichan & Bhatt, 2020). In addition, a systematic review (Dessauvague et al., 2020), which investigated the prevalence of mental health conditions, and associated factors, in HIV-positive adolescents living in Sub-Saharan Africa, described social support (from friends, family and community) as a protective factor for this population, being associated with positive mental health outcomes.

The relationship between social support, bullying victimization and sleep quality has also been explored in samples of adolescents from other countries. A Canada cross-sectional study (Bilodeau et al., 2020), which assessed a total of 1150 children at the age of 8, investigated the potential moderating effect of social support on the association between peer victimization and sleep problems, specifically parasomnias. In their results, they reported a positive association between parasomnias and peer victimization for both genders. Nevertheless, social support from friends moderated the association between peer victimization and parasomnias only for girls.

Using the self reported number of close friends, our study indirectly assessed the potential moderating effect of social support on the association between bullying victimization and sleep difficulty, suggesting that the number of close friends attenuated the relationship between these variables. One potential explanation for this association is within the stress-buffering theory, which proposes that social support exerts beneficial effects on health-related outcomes only in states of considerable high stress, and the main-effect theory which suggests that social support is beneficial for several health related outcomes in spite of the stress level being experienced; both theories complement each other and may interact together producing positive effects (Cohen, 2004; Cohen & Wills, 1985).

Comparatively, a Dutch study (van Schalkwijk, Blessinga, Willemen, Van Der Werf, & Schuengel, 2015) described that social support, including support from friends, had a positive impact on sleep quality of the investigated sample of adolescents, also significantly attenuating the association between academic-related stress and poor sleep quality in their sample. In our study, the main-effects are suggested in the association between number of close friends and sleep difficulty, with a negative and significant correlation linking both variables. In addition, the stress-buffering theory can be seen in the association between bullying victimization, which can be thought of as a high and chronic stress state as discussed in the introduction of this manuscript, and sleep difficulty being moderated by the number of close friends, an indirect measure of social support from friends.

### ***Limitations***

As this is a preliminary study based on cross-sectional data, no causality claims can be made. In addition, as this study is based on secondary analysis of a nationwide public health survey, the measures used were not specifically designed to assess the study questions, and the questions used in the analysis present intrinsic limitations. For instance, it was possible to measure social support only indirectly through the number of friends, and sleep difficulty was measured based on only one question, which asked about difficulty sleeping at night due to worries. In addition, sleep difficulty was based on a question which covered a period of 12 months, whereas bullying victimization was measured based on a question which covered a period of 30 days. Lastly, it is essential to consider additional potential confounding variables, including psychiatric symptoms and technology usage, which were not measured during data collection. However, considering this as an exploratory and preliminary study, further research may address such limitations, applying a prospective study design, using more appropriate and validated measures for the variables investigated, and also exploring how additional aspects of adolescents' lives are associated with sleeping problems in the context of school-based bullying victimization.

### ***Implications and conclusions***

This study adds to the evidence that suggests a link between bullying victimization and sleep problems, describing a significant association between bullying victimization and sleep difficulty in a large and nationally representative sample of Brazilian adolescents. This study also highlighted the potential buffering effect of the number of friends in the association between victimization and sleep difficulty, suggesting this as a potential protective benefit of peer social support in the school context. In addition, our results suggest that girls may be more vulnerable to developing sleep difficulties in situations of bullying victimization, and therefore should receive special attention from teachers, parents and health professionals. Further research is needed, in order to address intrinsic limitations of this preliminary study, and explore the relationship among the studied variables in a prospective study design. Such study design would allow for inferences about the causality in the association between bullying victimization and sleep problems, also investigating a longitudinal buffering effect of social support from peers and potential differences across genders.

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### **Disclosure statement**

We declare no conflicts of interest.

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