

# Bullying and Parasomnias: A Longitudinal Cohort Study



**WHAT'S KNOWN ON THIS SUBJECT:** Being bullied can lead to adverse physical and mental health outcomes. Individuals who experience a sudden traumatic event often have short-term disturbances in their sleep patterns. Ongoing trauma may result in extended periods of sleep disruption.



**WHAT THIS STUDY ADDS:** Being bullied in elementary school predicts parasomnias, such as nightmares and night terrors, years later. General practitioners, pediatricians, parents, and teachers may consider parasomnias as potential signs of being bullied.

## abstract

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**BACKGROUND AND OBJECTIVES:** Environmental factors such as serious trauma or abuse and related stress can lead to nightmares or night terrors. Being bullied can be very distressing for children, and victims display long-term social, psychological, and health consequences. Unknown is whether being bullied by peers may increase the risk for experiencing parasomnias such as nightmares, night terrors, or sleepwalking.

**METHODS:** A total of 6796 children of the Avon Longitudinal Study of Parents and Children (ALSPAC) birth cohort were interviewed at elementary school age (8 and 10 years) about bullying experiences with a previously validated bullying interview and at secondary school age (12.9 years) about parasomnias such as nightmares, night terrors and sleepwalking by trained postgraduate psychologists.

**RESULTS:** Even after adjusting for pre-existing factors related to bullying and parasomnias, being bullied predicted having nightmares (8 years odds ratio [OR], 1.23; 95% confidence interval [CI], 1.05–1.44; 10 years OR, 1.62; 95% CI, 1.35–1.94) or night terrors (8 years OR, 1.39; 95% CI, 1.10–1.75; 10 years OR, 1.53; 95% CI, 1.18–1.98) at age 12 to 13 years. Especially being a chronic victim was associated with both nightmares (OR, 1.82; 95% CI, 1.46–2.27) and night terrors (OR, 2.01; 95% CI, 1.48–2.74). Being a bully/victim also increased the risk for any parasomnia at ages 8 or 10 years (8 years OR, 1.42; 95% CI, 1.08–1.88; 10 years OR, 1.75; 95% CI, 1.30–2.36). In contrast, bullies had no increased risk for any parasomnias.

**CONCLUSIONS:** Being bullied increases the risk for having parasomnias. Hence, parents, teachers, school counselors, and clinicians may consider asking about bullying experiences if a child is having parasomnias. *Pediatrics* 2014;134:e1040–e1048

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### KEY WORDS

victimization, bullying, parasomnias, nightmares, night terrors, sleepwalking, ALSPAC

### ABBREVIATIONS

ALSPAC—Avon Longitudinal Study of Parents and Children

CI—confidence interval

DAWBA—Development and Well-Being Assessment

DSM-IV—Diagnostic and Statistical Manual of Mental Disorders – IV

HPA—hypothalamic-pituitary-adrenal

IQ—intelligence quotient

OR—odds ratio

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Bullying is characterized by repetitive aggressive behavior, engaged in by an individual or peer group who has more power than the victim.<sup>1</sup> Bullying is a global problem with an average of 32% of children being bullied across 38 countries/regions.<sup>2</sup> Being a victim of bullying increases the risk for adverse outcomes, including physical<sup>3,4</sup> or mental health problems such as anxiety and depression,<sup>5–7</sup> psychotic experiences,<sup>8</sup> and borderline personality symptoms.<sup>9</sup> Furthermore, being bullied is associated with an increased risk for self-harm, suicidal ideation, and attempting and completing suicides.<sup>10–12</sup> The targets of bullying are victims<sup>13,14</sup> and those who both bully others and are victims of bullying are called bully/victims<sup>14,15</sup>

Although general sleep disturbance such as problems falling asleep or night waking problems have been reported to be increased in relation to bullying,<sup>4,16</sup> unknown is whether parasomnias such as nightmares or night terrors are related to being bullied. Parasomnias are sleep-related, repetitive undesirable behaviors, which happen during different stages of sleep and different periods of the night. Nightmares, night terrors, and sleepwalking are the most common types of parasomnias.<sup>17</sup> Nightmares occur during rapid eye movement sleep and are unpleasant dreams that typically include horror, despair, anxiety, or great sadness. Sufferers usually awake in a state of distress and may be unable to return to sleep for a prolonged period of time. In contrast, night terrors and sleepwalking are attributable to a sudden arousal from non-rapid eye movement sleep and are considered to be manifestations of the same nosologic continuum.<sup>18</sup> There is usually amnesia for the turmoil during night terrors (eg, fighting monsters, screaming) but occasionally waking in panic occurs.

Sleep is restricted to times and places that feel safe. Threats to safety after

a natural disaster (eg, earthquake, hurricane), after the loss of a close relative, or after witnessing violence may cause short-term disturbances in sleep patterns.<sup>19</sup> Ongoing threats to safety often result in extended periods of sleep disruption.<sup>20</sup> Hence, environmental factors such as trauma and stress are related to both nightmares and night terrors.<sup>21</sup> Stress may lead to physiologic hyperarousal or continuation of processing of threat information and problems with fear extinction during sleep.<sup>22</sup> Moreover, dysregulated hypothalamic-pituitary-adrenal (HPA) axis, attributable to acute or chronic stress, may lead to sleep problems.<sup>23–25</sup>

To date there has been limited research on the association between bullying involvement and sleep.<sup>26</sup> We investigated the association between bullying involvement at age 8 and 10 years and the most common parasomnias in childhood, namely nightmares, night terrors, and sleepwalking at age 12 years using data from a large UK birth cohort. Moreover, we were able to control for pre-existing sleep problems and nightmares, other trauma, emotional and behavioral problems, along with diagnosable psychiatric disorders. It was hypothesized that children who were bullied during elementary school would be more likely to experience parasomnias during adolescence.

## METHODS

### Participants

The Avon Longitudinal Study of Parents and Children (ALSPAC) is a birth cohort study set in the United Kingdom, examining the determinants of development, health, and disease during childhood and beyond.<sup>27</sup> Briefly, women who were residents in Avon while pregnant and who had an expected delivery date between April 1, 1991 and December 31, 1992 were approached to participate in the study, leading to

14 775 live births and 14 701 alive at 1 year of age. Please note that the study website contains details of all the data that are available through a fully searchable data dictionary, available at: <http://www.bris.ac.uk/alspac/researchers/data-access/data-dictionary/>. This study is based on 6796 children who had attended the interview about parasomnias at age 12.9 years. Ethical approval for the study was obtained from the ALSPAC Ethics and Law Committee and the Local Research Ethics Committees and informed consent was provided by all participants.

### Outcome Variable

Sleep problems were assessed via face-to-face semi-structured interviews with the children when they were aged on average 12.9 years.<sup>28</sup> Children were asked a series of questions concerning sleeping problems (nightmares: “Since your 12th birthday have you had any dreams that woke you up? Were they frightening?”; night terrors: “Has anyone ever told you, since you were 12, that you scream out at night, sit up in bed, seem to fight or wrestle with unseen creatures, or shout at them in your sleep?”; sleepwalking: “Has anyone ever told you, since you were 12, that you got out of bed and walked around while you were fast asleep?”). Positive responses were probed to obtain further information to distinguish between nightmares and night terrors (eg, when they occurred at night, amnesia on awakening).<sup>29</sup> The trained psychology graduates who interviewed the children rated them on whether they had experienced nightmares, night terrors, or sleepwalking during the 6 months before the interview. An overall rating of not present (0), suspected (1; most but not all criteria were fulfilled), or definitely present (2; all criteria for a specific parasomnia) was then made for each type of parasomnia based on all the information obtained. The average  $\kappa$  value for inter-rater reliability

was 0.72. Sleeping problems coded over-all as suspected or definitely present were used in the current analysis. In other words, if a child had nightmares rated as suspected or definitely present, s/he was coded as having nightmares. Another variable was derived (any parasomnia) to reflect whether the children had reported any of these parasomnias (nightmare and/or night terror and/or sleepwalking) at 12 years of age.

### Predictor Variables

Bullying variables were constructed from child reports at age 8 and 10 years, using the Bullying and Friendship Interview Schedule.<sup>30</sup> The structured interview on bullying behavior has high inter-rater reliability<sup>31</sup> and predictive validity.<sup>32</sup> Nine questions were asked about experience of bullying (for giving and receiving): personal belongings taken; threatened or blackmailed; hit or beaten up; tricked in a nasty way; called bad/nasty names; exclusion to upset the child; coercive pressure to do things s/he didn't want to; lies/nasty things said about others (rumors spread); games spoiled. Owing to the skewed distribution, victimization was coded as present if the child confirmed that at least 1 of the 9 behaviors occurred repeatedly (4 or more times in the past 6 months) or very frequently (at least once per week in the past 6 months). The same criteria were applied for bullying perpetration.

A bullying status variable was constructed by summing any victimization and any bullying perpetration. The following categories were derived: neutral; bully/victim (any reported victimization and any reported bullying perpetration); pure victim; and pure bully. A chronic victimization variable was also constructed: no victimization; unstable (victimization [victim or bully/victim] at age 8 or 10 years); and stable victimization (at both 8 and 10 years of age).

### Confounders

We controlled for pre-existing sleep problems and nightmares, other trauma, emotional and behavioral problems, along with diagnosable psychiatric disorders to rule out the potentially confounding effects of depression, anxiety, and attention deficit hyperactivity disorder, all of which have previously been linked to parasomnias<sup>33,34</sup> and bullying experiences.<sup>35</sup>

Sleep problems during preschool and elementary school were derived from postal questionnaires completed by the mothers when the children were aged 2.5, 3.5, 4.75, and 6.75 years. Specifically, mothers were asked, "In the past year, has your child regularly had nightmares?" (nightmares); "In the past year, has your child regularly had difficulty going to sleep?" (sleep onset problems); "In the past year, has your child regularly woken in the night?" (night waking). The preschool/school nightmare variable was entered as a continuous variable with 3 categories (children not experiencing any nightmares; children experiencing nightmares at 1–3 time points; and children experiencing nightmares at more than 3 time points). Children were excluded from the analysis if they did not have nightmare data available for at least 3 time-points. Identical definitions of persistence and missingness were used for sleep onset problems and night waking.<sup>28</sup>

An abbreviated form of the Wechsler Intelligence Scale for Children-III (UK version)<sup>36</sup> was used to derive an overall IQ at age 8 years.

Multiple family risk factors (eg, financial difficulties, crime involvement) were assessed during pregnancy with the Family Adversity Index.<sup>37</sup>

Diagnostic and Statistical Manual of Mental Disorders – IV (DSM-IV) psychiatric diagnoses were made at age 7 years using the Development and

Well-Being Assessment (DAWBA)<sup>38</sup> based on parent and teacher reports. The presence of any Axis I diagnosis of attention-deficit/hyperactivity disorder, conduct disorder, oppositional defiant disorder, depression, or anxiety versus no diagnosis were considered.

Internalizing/externalizing behavior was estimated using the sum of negative emotionality, hyperactivity, and conduct problems taken from the Strengths and Difficulties Questionnaire<sup>39</sup> completed by parents at ages 4, 6.75, and 9.5 years.<sup>40</sup>

Physical and sexual abuse was reported by the mothers when the children were aged 2.5, 3.5, 4.8, 5.8, and 6.8 years.

Preschool maladaptive parenting was constructed using mother reported hitting (daily or weekly at age 2 and/or 3.5 years), shouting (daily at age 2 and/or 3.5 years), and hostility (age 1.8 and/or 4 years; eg, "Mum often feels irritated by child," "Mum has battle of wills with child").<sup>41</sup> Maladaptive parenting was categorized as none, mild (1 or 2 indicators), and severe (3 indicators).<sup>42</sup>

Lastly, domestic violence was considered present if mother/partner reported there was emotional and/or physical domestic violence (age 0.7, 1.8, 2.8, and 4 years) and/or conflictual partnership (age 2.8 years; eg, "shouting or calling partner names").<sup>42</sup>

### Statistical Methods

Selective dropout was determined by comparing those who completed the parasomnia interview at age 12 years to those who did not, using binary logistic regression in the Statistical Package for the Social Sciences (SPSS) version 20 (IBM SPSS Statistics, IBM Corporation) and ORs are reported with 95% CIs (Table 1). To assess whether being bullied at school is associated with parasomnias at age 12 years, 2 sets of binary logistic regression analyses

were conducted (Table 2 and 3). Table 2 shows unadjusted analyses and Table 3 displays analyses controlled for gender, nightmares, sleep onset problems, and night waking before age 8 years, IQ, family adversity, any DSM-IV Axis I diagnosis (DAWBA), internalizing/externalizing behavior at preschool or elementary school age (Strengths and Difficulties Questionnaire), physical or sexual abuse during childhood, preschool domestic violence, and preschool maladaptive parenting.

## RESULTS

### Differences Between Participants With and Without Parasomnia Interview

The frequencies of socio-demographic factors, family environment, and child

characteristics are shown for ALSPAC participants with and without the interview about parasomnias at age 12 years in Table 1. Those who did not complete the parasomnia interview were more often boys from families who had more social adversity. They also had lower IQ at age 8 years, more behavioral problems during childhood, and any DSM-IV psychiatric diagnosis at age 7 years. The non-completers were, however, less likely to have been exposed to harsh parenting and physical or sexual abuse. They were less likely to have experienced nightmares and sleep-onset problems in childhood. Moreover, those who dropped out were more likely to experience persistent night waking and being bullied at school. This study reports the

results only for children who completed the interview about parasomnias at 12 years of age ( $N = 6796$ ; 3462 girls, 50.9%).

### Prevalence of Sleep Problems and Bullying

At age 12.9 years, 1655 (24.4%) children reported nightmares, 633 (9.3%) had night terrors, and 853 (12.6%) reported sleepwalking. Altogether, 2462 (36.2%) had at least 1 parasomnia in the last 6 months (nightmares, night terrors, or sleepwalking). At age 8 years, 1805 (32.2%) children were victims, 58 (1.0%) were bullies, and 376 (6.7%) were bully/victims. At age 10 years, 1133 (18.5%) children were victims, 50 (0.8%) were bullies, and 336 (5.5%) were bully/victims. A total of 1887 (35.3%) children

**TABLE 1** Dropout Analysis With Regard to Availability of Parasomnia Interview

	Interview Available, <i>n</i> (%)	Interview not Available, <i>n</i> (%)	Available versus Not Available, OR (95% CI)
Gender			
Male	3334 (49.1)	4206 (53.3)	reference
Female	3462 (50.9)	3689 (46.7)	1.18 (1.11–1.26) <sup>a</sup>
FAI, mean (SD)	1.05 (1.42)	1.47 (1.69)	0.84 (0.82–0.86) <sup>a</sup>
IQ, mean (SD)	105.27 (16.31)	99.14 (16.47)	1.02 (1.02–1.03) <sup>a</sup>
Any Axis I disorder (DAWBA)			
No	5661 (94.8)	4260 (92.1)	reference
Yes	310 (5.2)	366 (7.9)	0.64 (0.55–0.75) <sup>a</sup>
Total SDQ, mean (SD)	18.16 (9.44)	19.89 (10.33)	0.98 (0.98–0.99) <sup>a</sup>
Physical or sexual abuse			
No	5632 (89.1)	5225 (91.0)	reference
Yes	692 (10.9)	518 (9.0)	1.24 (1.10–1.40) <sup>a</sup>
Preschool domestic violence			
No	4164 (66.3)	3823 (65.1)	reference
Yes	2120 (33.7)	2046 (34.9)	0.95 (0.88–1.03)
Preschool maladaptive parenting			
None	2274 (38.0)	1819 (39.6)	reference
Mild	2993 (50.0)	2284 (49.7)	1.05 (0.97–1.14)
Severe	714 (11.9)	496 (10.8)	1.15 (1.01–1.31) <sup>a</sup>
Persistent nightmares, mean (SD)	1.34 (1.14)	1.23 (1.13)	1.09 (1.05–1.13) <sup>a</sup>
Persistent sleep onset problems, mean (SD)	1.60 (1.11)	1.54 (1.14)	1.04 (1.00–1.08) <sup>a</sup>
Persistent night waking, mean (SD)	0.32 (0.67)	0.37 (0.73)	0.90 (0.85–0.96) <sup>a</sup>
Bullying involvement, age 8 years <sup>b</sup>			
Neutral	3362 (60.0)	823 (55.3)	reference
Pure victim	1805 (32.2)	522 (35.1)	.73 (.58–.90) <sup>a</sup>
Bully/victim	376 (6.7)	127 (8.5)	.85 (.75–.96) <sup>a</sup>
Pure bully	58 (1.0)	15 (1.0)	.95 (.53–1.68)
Bullying involvement, age 10 years <sup>b</sup>			
Neutral	4617 (75.2)	896 (71.7)	reference
Pure victim	1133 (18.5)	260 (20.8)	0.85 (0.73–0.99) <sup>a</sup>
Bully/victim	336 (5.5)	81 (6.5)	0.81 (0.63–1.04)
Pure bully	50 (0.8)	13 (1.0)	0.75 (0.40–1.38)

FAI, Family Adversity Index; SDQ, Strengths and Difficulties Questionnaire.

<sup>a</sup> Indicates significant associations.

<sup>b</sup> Overt or relational victimization.

**TABLE 2** Involvement in Bullying at Elementary School and Specific or Any Parasomnia at Age 12 to 13 Years; Unadjusted Analysis

Involvement in Bullying	Nightmare, OR (95% CI)	Night Terror, OR (95% CI)	Sleepwalking, OR (95% CI)	Any Parasomnia, OR (95% CI)
Child report (age 8 y)	(n = 5598)	(n = 5598)	(n = 5598)	(n = 5601)
Neutral	reference	reference	reference	reference
Pure victim	1.32 (1.16–1.50) <sup>a</sup>	1.42 (1.17–1.72) <sup>a</sup>	1.25 (1.06–1.48) <sup>a</sup>	1.36 (1.21–1.53) <sup>a</sup>
Pure bully	0.90 (0.47–1.70)	0.62 (0.19–2.00)	1.05 (0.47–2.33)	1.04 (0.60–1.80)
Bully/victim	1.24 (0.98–1.59)	1.47 (1.05–2.07) <sup>a</sup>	1.66 (1.25–2.20) <sup>a</sup>	1.45 (1.17–1.80) <sup>a</sup>
Child report (age 8 y)	(n = 1861)	(n = 1861)	(n = 1861)	(n = 1863)
Pure victim	reference	reference	reference	reference
Pure bully	0.68 (0.36–1.29)	0.44 (0.14–1.41)	0.84 (0.38–1.87)	0.77 (0.44–1.33)
Child report (age 8 y)	(n = 2179)	(n = 2179)	(n = 2179)	(n = 2181)
Pure victim	reference	reference	reference	reference
Bully/victim	0.94 (0.74–1.21)	1.04 (0.73–1.47)	1.32 (0.98–1.78)	1.07 (0.85–1.34)
Child report (age 8 y)	(n = 434)	(n = 434)	(n = 434)	(n = 434)
Pure bully	reference	reference	reference	reference
Bully/victim	1.39 (0.71–2.73)	2.37 (0.71–7.90)	1.58 (0.69–3.63)	1.39 (0.78–2.48)
Child report (age 10 y)	(n = 6132)	(n = 6133)	(n = 6133)	(n = 6136)
Neutral	reference	reference	reference	reference
Pure victim	1.72 (1.49–1.99) <sup>a</sup>	1.59 (1.29–1.95) <sup>a</sup>	1.35 (1.12–1.62) <sup>a</sup>	1.77 (1.55–2.01) <sup>a</sup>
Pure bully	1.02 (0.52–1.99)	0.97 (0.35–2.71)	0.83 (0.33–2.10)	1.15 (0.65–2.06)
Bully/victim	1.62 (1.27–2.06) <sup>a</sup>	1.59 (1.13–2.24) <sup>a</sup>	1.16 (0.83–1.60)	1.60 (1.28–2.00) <sup>a</sup>
Child report (age 10 y)	(n = 1182)	(n = 1182)	(n = 1182)	(n = 1183)
Pure victim	reference	reference	reference	reference
Pure bully	0.59 (0.30–1.17)	0.61 (0.22–1.72)	0.62 (0.24–1.58)	0.65 (0.36–1.18)
Child report (age 10 y)	(n = 1468)	(n = 1468)	(n = 1468)	(n = 1469)
Pure bully	reference	reference	reference	reference
Bully/victim	0.94 (0.72–1.22)	1.00 (0.70–1.45)	0.86 (0.60–1.22)	0.90 (0.71–1.16)
Child report (age 10 y)	(n = 386)	(n = 386)	(n = 386)	(n = 386)
Pure bully	reference	reference	reference	reference
Bully/victim	1.59 (0.78–3.23)	1.64 (0.56–4.80)	1.39 (0.53–3.69)	1.38 (0.75–2.56)
Chronicity of victimization	(n = 5337)	(n = 5337)	(n = 5337)	(n = 5340)
None	reference	reference	reference	reference
Unstable	1.34 (1.17–1.54) <sup>a</sup>	1.32 (1.07–1.62) <sup>a</sup>	1.15 (0.96–1.37)	1.29 (1.14–1.46) <sup>a</sup>
Stable	1.98 (1.66–2.37) <sup>a</sup>	1.95 (1.51–2.51) <sup>a</sup>	1.67 (1.33–2.09) <sup>a</sup>	2.16 (1.83–2.55) <sup>a</sup>

The reference group in all analyses consists of participants who are not involved in bullying behavior.

<sup>a</sup> Indicates significant associations.

were victims at 1 time point (at age 8 or 10 years) and 723 (13.5%) children were stable victims (at age 8 and 10 years).

### Bullying at School and Parasomnias at Age 12 Years

Prospective associations between bullying involvement at school and occurrence of parasomnias are presented in Tables 2 and 3. Being bullied at age 8 or 10 years was associated with any type of parasomnia (nightmares, night terrors, or sleepwalking) (Table 2). Especially those who were chronically victimized were more likely to experience parasomnias at age 12 years. Bully/victims at age 8 and 10 years were more likely to have night terrors. In contrast, bullies had no increased risk for any parasomnias. The

comparisons between pure victims, pure bullies, and bully/victims failed to reach conventional levels of statistical significance; however, bullies tended to show the lowest odds for parasomnias.

After adjusting for potential confounders (Table 3), being a victim predicted having nightmares (age 8 years OR, 1.23; 95% CI, 1.05–1.44; age 10 years OR, 1.62; 95% CI, 1.35–1.94) or night terrors (age 8 years OR, 1.39; 95% CI, 1.10–1.75; age 10 years OR, 1.53; 95% CI, 1.18–1.98) at age 12 to 13 years. Especially being a chronic victim was associated with nightmares (OR, 1.82; 95% CI, 1.46–2.27), night terrors (OR, 2.01; 95% CI, 1.48–2.74), and any type of parasomnia (OR, 2.10; 95% CI, 1.72–2.58). Being a bully/victim also increased the risk for any parasomnia at

ages 8 or 10 years (age 8 years OR, 1.42; 95% CI, 1.108–1.88; age 10 years OR, 1.75; 95% CI, 1.30–2.36). Again, being a bully did not increase the odds of developing parasomnias. Female gender, persistent nightmares or persistent night waking at preschool or school age, low IQ, low family adversity, and higher behavior problems were also related to parasomnias at age 12 years.

### DISCUSSION

This study investigated the prospective association between being bullied and parasomnias. We found a significant association between being bullied in elementary school and parasomnias in early adolescence. This association

**TABLE 3** Involvement in Bullying at Elementary School and Specific or Any Parasomnia at Age 12 to 13 Years; Adjusted Analysis

Involvement in Bullying	Nightmare		Night Terror		Sleepwalking		Any Parasomnia	
	Sig. Covariates	OR (95% CI)	Sig. Covariates	OR (95% CI)	Sig. Covariates	OR (95% CI)	Sig. Covariates	OR (95% CI)
Child report (age 8 y)	Female gender; persistent nightmares	(n = 4026) reference	Female gender; low IQ; persistent nightmares	(n = 4023) reference	Female gender; persistent nightmares	(n = 4024) reference	Female gender; high SDQ score; at 6.8; persistent nightmares	(n = 4026) reference
Neutral		1.23 (1.05–1.44) <sup>a</sup>		1.39 (1.10–1.75) <sup>a</sup>		1.22 (0.99–1.50)		1.28 (1.11–1.47) <sup>a</sup>
Pure victim		0.92 (0.43–1.94)		0.29 (0.04–2.15)		0.83 (0.29–2.35)		0.77 (0.39–1.52)
Pure bully		1.19 (0.87–1.63)		1.81 (1.19–2.75) <sup>a</sup>		1.68 (1.17–2.41) <sup>a</sup>		1.42 (1.08–1.88) <sup>a</sup>
Bully/victim								
Child report (age 10 y)	Female gender; persistent nightmares; persistent night waking	(n = 4054) reference	Female gender; low IQ; persistent nightmares	(n = 4052) reference	Persistent nightmares	(n = 4053) reference	Female gender; high SDQ score; at 6.8; low FAI; persistent nightmares	(n = 4055) reference
Neutral		1.62 (1.35–1.94) <sup>a</sup>		1.53 (1.18–1.98) <sup>a</sup>		1.40 (1.11–1.76) <sup>a</sup>		1.75 (1.48–2.07) <sup>a</sup>
Pure victim		1.11 (0.48–2.61)		1.25 (0.37–4.19)		1.09 (0.38–3.15)		1.32 (0.64–2.73)
Pure bully		1.87 (1.36–2.56) <sup>a</sup>		1.49 (0.93–2.38)		1.23 (0.80–1.87)		1.75 (1.30–2.36) <sup>a</sup>
Bully/victim								
Chronicity of victimization	Female gender; persistent nightmares; persistent night waking	(n = 3904) reference	Female gender; low IQ; persistent nightmares	(n = 3901) reference	Persistent nightmares	(n = 3902) reference	Female gender; high SDQ score; at 6.8; low FAI; persistent nightmares	(n = 3904) reference
None		1.30 (1.10–1.53) <sup>a</sup>		1.29 (1.01–1.65) <sup>a</sup>		1.10 (0.89–1.36)		1.25 (1.08–1.44) <sup>a</sup>
Unstable		1.82 (1.46–2.27) <sup>a</sup>		2.01 (1.48–2.74) <sup>a</sup>		1.71 (1.31–2.25) <sup>a</sup>		2.10 (1.72–2.58) <sup>a</sup>
Stable								

The reference group in all analyses consists of participants who are not involved in bullying behavior.

Adjusted analysis controlled for gender of child; Family Adversity Index (FAI), 18 items, pregnancy; preschool and school persistent nightmares (assessed at age 2.5, 3.5, 4.8, or 6.8 y); preschool and school sleep onset problems (assessed at age 2.5, 3.5, 4.8, or 6.8 y); preschool and school persistent night waking (assessed at age 2.5, 3.5, 4.8, or 6.8 y); sexual or physical abuse at age 2.5, 3.5, 4.8, or 6.8 y; preschool maladaptive parenting and preschool domestic violence; Wechsler Intelligence Scale for Children full scale quotient (WISC-III at age 8 y); behavior problems assessed with the Strengths and Difficulties Questionnaire (SDQ) score at age 4, 6, 7.5, and 9.5 y (negative emotionality, conduct problems, hyperactivity); any axis I psychiatric diagnosis (DSM-IV) assessed with the DAWBA at 7 y.

<sup>a</sup> Indicates significant associations.

held regardless of any psychiatric diagnosis, family adversity, IQ, emotional or behavioral problems, sexual or physical abuse, preschool maladaptive parenting, domestic violence, and persistent nightmares, sleep onset problems, and night waking before 8 years of age. Children who were bullied at age 8 or 10 years were more likely to have nightmares, night terrors, or sleepwalking at age 12 years. Moreover, those who were bullied and bullied others (bully/victims) were more likely to have any parasomnia. The strongest associations were found for those who were chronically victimized by peers at age 8 and 10 years. In contrast, bullies had no increased risk for any parasomnia.

Consistent with previous studies, being a female,<sup>43,44</sup> having persistent sleep problems,<sup>34</sup> and emotional and behavior problems in childhood<sup>45</sup> additionally increased the risk for parasomnias at age 12 years. Previous findings that parasomnias are related to emotional problems such as a child's daytime anxiety<sup>46,47</sup> and behavioral problems<sup>22</sup> indicate that stress may be an important mechanism for the association between being bullied and parasomnias. Firstly, being bullied and in particular, chronic victimization, might create a sense of learned helplessness,<sup>48</sup> making this subgroup more vulnerable to stress symptoms.<sup>49</sup> Traumatic events may alter the HPA function.<sup>50</sup> The HPA axis is a central component of the body's neuroendocrine response to stress, with cortisol as its major end product.<sup>51</sup> Exposure to bullying at school has been associated with increased HPA axis reactivity.<sup>52,53</sup> Both animal and human research found strong bidirectional associations between alterations in sleep and regulation of the HPA axis.<sup>25,54–56</sup> Activation of the HPA axis has been associated with sleep problems such as night waking, disturbed sleep, and sleeplessness.<sup>23–25</sup>

Dysregulation of the HPA axis caused by being bullied at school may not only be related to general sleep problems<sup>16</sup> but also parasomnias. Bullying can be viewed as a traumatic event and may increase the risk for nightmares or night terrors. Indeed, we found a dose–response effect, with those who were bullied chronically over years having the highest risk for nightmares and night terrors.

Secondly, stress from bullying may not only lead to physiologic hyperarousal but also to the continuation of processing of threat information, which may interfere with sleep patterns.<sup>22</sup> Nightmares may occur when anxiety exceeds a threshold level<sup>57</sup>; and several studies have suggested that trait anxiety may be related to the frequency of parasomnias.<sup>58–61</sup> However, even after controlling for pre-existing anxiety problems, our results showed that being bullied may increase the risk for parasomnias.

Finally, previous studies suggest that excessive digital media use<sup>62</sup> and stories, movies, and books with frightening content may be played out in children's dreams.<sup>63</sup> In particular, media use before going to sleep or in the bedroom is associated with higher arousal and insufficient amounts of sleep.<sup>62</sup> Poor parental monitoring has been found to contribute to more media use and less sleep and is associated with both parasomnias<sup>64</sup> and bullying experiences.<sup>65,66</sup> Thus, insufficient sleep may be a common pathway to increased parasomnias for different reasons, including being bullied.

The strengths of the study are the longitudinal nature of the data collection, the large sample size, and the ability to adjust for a range of potential confounders. These allowed us to pre-

dict long-term effects of bullying on parasomnias after adjusting for a wide range of potential confounders. However, there are also limitations. Firstly, the rating of parasomnia symptoms at age 12 years was based on a semi-structured interview eliciting an example of the phenomenon and detailed probing. However, the prevalence of night terrors (9.3%) and sleepwalking (12.6%) found in the current sample at age 12 years was higher than previously reported for children of a similar age. One possible reason for this discrepancy is that the current study used self-report rather than parental reports of sleep disturbances,<sup>67</sup> but parents may not be aware of any sleep problems if the child does not alert the parents.<sup>68</sup> There is a possibility that the self-report of night terrors and sleepwalking especially (where there is classically little memory for the event) may be subject to error. However, there is some evidence that the correlation between self-report and informant report for sleep difficulties in children is good<sup>69,70</sup> and our assessment used a semi-structured interview with trained raters, achieving good inter-rater reliability. Secondly, our data did not allow us to investigate the frequency of parasomnias and bullying involvement. Therefore, we are unable to comment on the involvement of bullying in relation to frequency of parasomnias. Thirdly, relevant data were not available for the whole ALSPAC cohort; reducing statistical power and selective dropout may have biased the results. Nevertheless, empirical simulations demonstrate that even when dropout is correlated with predictor/confounder variables, the relationship between predictors and outcome is unlikely to be substantially altered by selective dropout processes.<sup>71</sup> Fourthly, it is also possible

that the findings could have been attributable to the presence of post-traumatic stress disorder in the children.<sup>60</sup> However, examination of the cohort revealed that only 1 of the children was diagnosed with post-traumatic stress disorder by 12 years of age and this individual did not report any bullying experiences, thus ruling this out as an explanation for the results of this study. Finally, sleep duration was not measured across childhood in our sample and may be a potential unmeasured mediator between being bullied and parasomnias.

## CONCLUSIONS

This large birth cohort found robust associations between being bullied and parasomnias. These findings suggest that these rapid eye movement and non-rapid eye movement sleep arousal disorders may indicate continuous stress processed at night. This stress may be attributable to being bullied at school. Future work should try to elucidate the mechanism between being bullied and parasomnias. If a child is experiencing frequent parasomnias, parents, teachers, school counselors, and clinicians may consider asking about bullying.<sup>72</sup> This would allow detecting bullied children and providing the help they need at an early time to reduce the negative effects of being bullied.<sup>73</sup>

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