Journal of
Sleep
Research

Sexual harassment and assault predict sleep disturbances and is partly mediated by nightmares: Findings from a national survey of all university students in Norway

Iris M. Steine[1,2] 🆔 | Jens Christoffer Skogen[3,4] | Mari Hysing[1] | Lidia Puigvert[5] | Viktor Schønning[3] | Børge Sivertsen[3,6,7]

[1]Department of Psychosocial Science, Faculty of Psychology, University of Bergen, Bergen, Norway

[2]Department of Psychology, UC Berkeley, Berkeley, CA, USA

[3]Department of Health Promotion, Norwegian Institute of Public Health, Bergen, Norway

[4]Alcohol and Drug Research Western Norway, Stavanger University Hospital, Norway

[5]Department of Sociology, University of Barcelona, Barcelona, Spain

[6]Department of Research and Innovation, Helse Fonna HF, Haugesund, Norway

[7]Department of Mental Health, Norwegian University of Science and Technology, Trondheim, Norway

Correspondence
Iris M. Steine, Department of Psychosocial Science, University of Bergen, Christiesgate 12, 5015 Bergen, Norway.
Email: iris.steine@gmail.com

Funding information
Norwegian Ministry of Health and Care Services, Grant/Award Number: NA; Norwegian Ministry of Education and Research, Grant/Award Number: NA

Summary

Sexual harassment and assault is common in most domains of society, and has been linked to several adverse outcomes, including reduced sleep quality. However, less is known about the possible impact of sexual harassment and assault on various sleep problems among university students. In a sample of 49,051 students in Norway (69.2% women), we examined i) the associations of varying extents of sexual harassment (unwanted sexual comments, looks or gestures, photographs, indecent exposure, and physical harassment) and sexual assault (attempted or completed rape), with meeting *Diagnostic and Statistical Manual of Mental Disorders*, fifth edition (DSM-5) diagnostic criteria of insomnia and with sleep duration, ii) the association of cumulative exposure to sexual harassment/assault with insomnia and sleep duration, and iii) to what extent nightmares could explain the association between sexual harassment and insomnia and sleep duration. For both genders, all forms of harassments with the exception of "indecent exposure" and "unwanted sexual photographs" for men were negatively associated with sleep duration, with the strongest associations being found for "rape" and "attempted rape". For both genders, the odds of insomnia increased as a function of cumulative harassment exposure. Similarly, a graded, negative association was found between cumulative harassment and sleep duration for both genders. Mediation analyses showed that 28% of the observed association between cumulative harassment and insomnia, and 15% of the association between cumulative harassment and sleep duration, was mediated by frequency of nightmares.

KEYWORDS
dose–response association, mediation, nightmare, insomnia, sexual abuse victims, sleep duration, student sample

1 | INTRODUCTION

Reports following the #MeToo movement have documented that sexual harassment and assault is a widespread challenge for university students, as it is in other domains of society. In a recent national survey of all students pursuing higher education in Norway, we found that almost one in four students reported lifetime sexual harassment of some form, while one in six students reported being sexually

harassed during the past year (Sivertsen, Nielsen, et al., 2019). In that study, "sexual harassment" was defined broadly, encompassing a wide range of unwanted sex-related behaviours appraised as offensive by the recipient, including both verbal and non-verbal harassment, as well as sexual assault (rape attempt, and rape) (Fitzgerald et al., 1997).

Several studies have shown that victims of sexual assault experience more mental and somatic health problems (Chen et al., 2010; Maniglio, 2009; Paras et al., 2009), and a systematic review also linked sexual abuse victimisation to increased risk of different sleep problems, including short sleep duration, insomnia, as well as nightmares (Steine et al., 2012). However, most previous studies in this field have been conducted on small and/or clinical samples (Steine et al., 2012), and relatively few studies have examined sleep outcomes associated with other forms of sexual harassment beyond sexual assault. To the best of our knowledge, no population-based studies have examined the extent to which different forms of sexual assault and harassment among university students is associated with sleep problems. Given the associations of disturbed sleep with the risk and persistence of mental health problems (Baglioni et al., 2011; Fan et al., 2017; Pigeon et al., 2012), executive function deficits (Ballesio et al., 2019), academic performance (Vedaa et al., 2019), functional impairment and reduced quality of life (Roth & Ancoli-Israel, 1999), it is important from a public health perspective to understand whether harassment types that may be considered as "less severe" (e.g. unwanted sexual comments) but that are highly prevalent in the population, are associated with sleep disturbances to the same extent as more severe assault types (e.g. rape). Moreover, although sexual harassment and assault may lead to impaired sleep in general, potential associations may also differ across specific sleep problems, e.g. symptoms of insomnia or shorter sleep duration, and it is therefore important to include a detailed and validated assessment of sleep.

Although previous studies have shown that the extent of sleep problems may vary as a function of exposure to an increasing number of adversities (*cumulative exposure*) in a "dose–response" manner (Kajeepeta et al., 2015), no previous studies have examined whether such graded associations exist between cumulative exposure to different types of sexual harassment/assault and levels of sleep problems, with the exception of one recent study reporting higher odds of poor sleep among women reporting sexual assault as compared to sexual harassment (Thurston et al., 2019). However, that study utilised a relatively small sample and included women only, limiting the generalisability of the findings.

Indeed, as for sexual harassment and assault, there are clear gender-specific patterns across different sleep problems, with higher rates of insomnia among women, while men typically have higher risk of short sleep duration (Sivertsen, Vedaa, et al., 2019). Still, less is known about how gender may be related to the *magnitude* of associations between sexual harassment/assault and health outcomes, emphasising the need for new studies to explore such associations separately for men and women.

Another sleep disturbance that may be relevant in this context is nightmares, which is a commonly reported consequence of sexual assault (Krakow et al., 2002; Steine et al., 2012). Nightmares also frequently co-occur with insomnia (Li et al., 2010; Paul et al., 2015), highlighting nightmares as one plausible pathway underlying the sexual assault/harassment–sleep link. Previous studies have suggested that nightmares may partly mediate the association between bully victimisation and depression in adolescents (Herkama et al., 2019), but to our knowledge no previous studies have examined the indirect effect of sexual harassment/assault on insomnia or short sleep duration through reports of nightmares.

To address these literature gaps, the aim of the present study was threefold. Firstly, we examined whether varying types of sexual harassment/assault representing different levels of severity and invasiveness were associated with insomnia and sleep duration. Based on previous studies, we hypothesised that sexual harassment/assault would be positively associated with fulfilling insomnia diagnostic criteria and negatively associated with sleep duration, and that the effects would be stronger with increasing harassment/assault severity (Thurston et al., 2019). Secondly, we examined the association of cumulative exposure to different sexual harassment/assault forms with insomnia and sleep duration. We hypothesised that the likelihood of fulfilling diagnostic criteria of insomnia would increase, and sleep duration decrease, as a function of cumulative exposure to sexual harassment/assault, informed by previous studies reporting "dose–response" associations of cumulative exposure to other types of adverse events with sleep disturbances (Kajeepeta et al., 2015). Thirdly, we examined the potential indirect effect of sexual harassment/assault on insomnia and sleep duration through nightmares. Finally, taking advantage of the large sample size of a national survey of all students enrolled in higher education in Norway (*n* = 50,054), we investigated possible gender-specific patterns by conducting all statistical analysis separately for men and women.

2 | METHODS

2.1 | Sample

The study sample came from the Students' Health and Wellbeing Study (SHoT2018), a national survey among full-time Norwegian students pursuing higher education (both in Norway and abroad), initiated by the three largest welfare organisations in Norway. The SHoT2018 study was completed electronically via a web-based platform from February to March 2018. All full-time Norwegian students aged 18–35 years taking higher education were invited to participate via email and text messages. In total, 162,512 students fulfilled the inclusion criteria, of whom 50,054 students agreed to participate, yielding a response rate of 30.8% (for a detailed description of the study, see Sivertsen, Råkil, et al., 2019).

The SHoT2018 study was approved by the Regional Committee for Medical and Health Research Ethics in Western Norway (no. 2017/1176). An electronic informed consent was obtained after the participants had received a detailed introduction to the study.

2.2 | Measures

2.2.1 | Demographic information

All participants indicated their age and gender.

2.2.2 | Sleep measures

Insomnia

The participants indicated the number of nights/week they experienced difficulties initiating sleep (DIS), difficulties maintaining sleep (DMS) and early morning awakenings (EMA), as well as daytime sleepiness and tiredness. Those with sleep problems were asked about duration of the problems. The following three criteria were used as an operationalisation for insomnia disorder, in line with the *Diagnostic and Statistical Manual of Mental Disorders*, fifth edition (DSM-5) criteria: (a) the presence of either DIS, DMS or EMA for ≥3 nights/week; (b) the presence of daytime sleepiness or tiredness for ≥3 days/week; and (c) a duration of the sleep problems for ≥3 months. Thus, insomnia was coded a binary variable in the present study ("No" coded as "0", "Yes" coded as "1").

Sleep duration

The participants' self-reported usual bedtime ("*When do you usually go to bed?*") and rise time ("*When do you usually get up in the morning?*") were indicated in hours and minutes, and data were reported separately for weekdays and weekends. Time in bed (TIB) was calculated as the difference between bedtime and rise time. Sleep-onset latency (SOL) ("*How long does it usually take from you lie down to sleep, until you actually fall asleep?*") and wake after sleep onset (WASO) ("*How long are you awake during the night, after you've fallen asleep?*") were also indicated separately for weekdays and weekends in hours and minutes. Sleep duration was defined as TIB – SOL and WASO. For the purpose of the present study, sleep duration was also used as a continuous variable indicating hours, and only weekday sleep duration was included in the analysis.

Frequency of nightmares

The frequency of nightmares was assessed using one item from the Nightmare Frequency Questionnaire (NFQ) (Krakow et al., 2002): "*Based on the last three months, how often would you say that you experience nightmares/bad dreams?*"; the response categories were "Never", "Yearly", "Monthly", and "Weekly".

2.2.3 | Sexual harassment and assault

Sexual harassment and assault was assessed using a seven-item self-report instrument covering three categories of harassment, ranging from milder forms of non-contact sexual harassment to severe forms of sexual assault, corresponding to the legal definition of sexual harassment in Norway (Sivertsen, Nielsen, et al., 2019). The three categories were: i) *Verbal harassment* (sexual expressions and suggestions, comments about one's body, appearance or private life), ii) *Non-verbal harassment* (close eye or body movements, being shown sexual images, including digital images, and indecent exposure), and iii) *Physical harassment* (unwanted touching, hugging or kissing, rape attempt, or rape). As a preamble to these questions, the participants were given the following definition of sexual harassment: "*unwanted sex-related behaviours that are appraised by the recipient as offensive or bothersome*".

In the present study, these seven items were transformed into binary variables ("No" coded as "0", "Yes" coded as "1") to indicate whether they had experienced any of the following types of sexual harassment and assault: 1) Comments, 2) Looks or gestures, 3) Photographs, 4) Indecent exposure, 5) Unwanted physical harassment (not including rape attempt or rape), 6) Attempted rape, and 7) Rape. For each of these seven forms of harassment/assault, the respondents indicated when the harassment/assault was experienced, with response categories being "past month", "past year", "more than a year ago, but after entering college/university", and "before entering college/university". Participants could select all the time categories that applied to them (for detailed prevalence rates of sexual harassment and abuse forms across the different time categories, see Figure 1 in Sivertsen, Nielsen, et al., 2019). All those reporting exposure to harassment/assault were included in the present study, independent of when the harassment/assault happened.

2.2.4 | Cumulative measures of harassment

To assess the association of cumulative sexual harassment/assault with insomnia and sleep duration, a count variable was created indicating how many types of these seven harassment categories the participants had experienced (ranging from "one experience" to "four or more experiences").

2.2.5 | Anxiety and depression symptoms

Anxiety and depression symptoms, which were included in sensitivity analyses for their potential role in the association between sexual harassment/assault and the sleep outcome measures, were measured using the Hopkins Symptoms Checklist 25 (HSCL-25) (Derogatis et al., 1974). The HSCL-25 is a 25-item questionnaire assessing anxiety and depression symptoms the past 2 weeks. For the purpose of the sensitivity analyses, a mean item score was calculated omitting one item assessing disturbed sleep.

2.3 | Statistical analysis

2.3.1 | Data preparation and descriptive statistics

Sleep variables were checked for validity of answers based on preliminary data analysis, resulting in *n* = 111 subjects being omitted
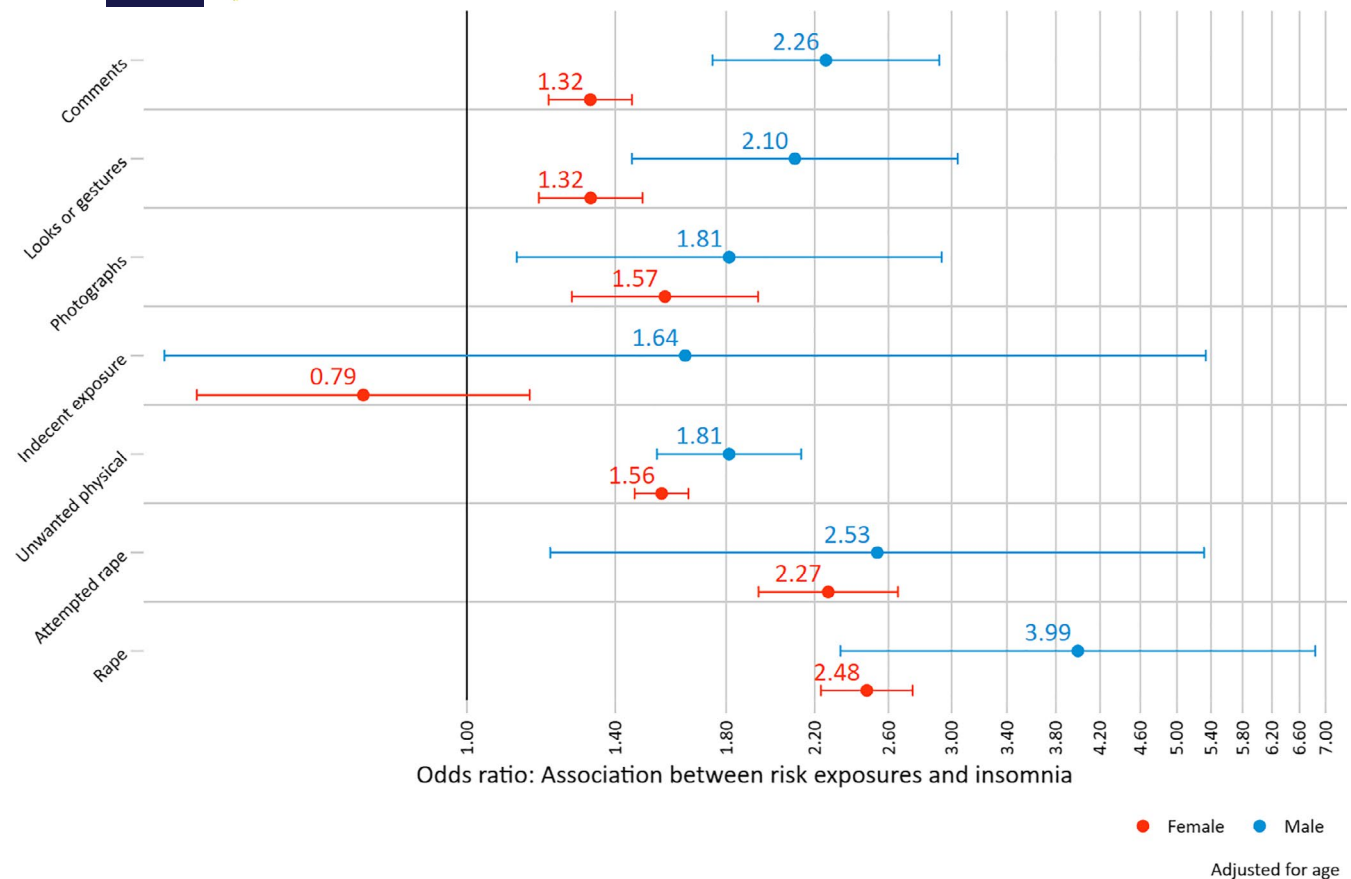
FIGURE 1 Association between separate risk factors and insomnia. Logistic regression models (bars denote 95% confidence intervals). N = 47,152

due to obvious invalid responses (e.g. negative sleep duration). The eligible sample for this study was defined as those with valid responses on sleep variables, age, and gender (N = 49,051). We employed list-wise deletion to handle missing responses on the variables of interest, leaving a final study sample of N = 47,152 (96.1%). Table 1 contains descriptive analysis of the included variables across gender. Independent two-sample t tests were employed for continuous variables (age and sleep duration) and chi-square tests were employed for binary variables to indicate gender differences.

2.3.2 | Sexual assault/harassment, insomnia and sleep duration

For insomnia as dependent variable, separate gender-stratified logistic regression models were computed with each of the harassment variables as independent variables while controlling for age (Figure 1). Similarly, for sleep duration as dependent variable, separate gender-stratified linear regression models were computed with each of the harassment variables as independent variables while controlling for age (Figure 2). In order to not confound the effect estimates of more common types of harassment ("comments", "looks or gestures", "photographs", "indecent exposure", "unwanted physical harassment") with more adverse and less prevalent types of sexual assault ("attempted

rape", "rape"), we recoded six of the seven harassment/assault variables for these regression analyses. Specifically, the sexual harassment variables of "comments", "looks or gestures", "photographs", "indecent exposure", "unwanted physical harassment" were coded as missing (to avoid misclassification) if the participant also reported the sexual assault variables of "attempted rape" and/or "rape". Also, "attempted rape" was coded as missing if the participant also reported "rape". We also tested for interactions between each harassment/assault variable and gender on the relationship with insomnia and sleep duration, respectively, using likelihood ratio tests.

2.3.3 | Cumulative assault/harassment, insomnia and sleep duration

Next, we used the cumulative harassment/assault variable as an independent factor variable in gender-stratified logistic (insomnia) and linear (sleep duration) regression models while adjusting for age to estimate the relationship of level of harassment/assault exposure with insomnia and sleep duration (Figures 3 and 4). For these regressions, we tested for interactions between cumulative harassment/assault and gender on the relationship with insomnia and sleep duration, respectively, using likelihood ratio tests. We also investigated the association between different types of sexual harassment and

TABLE 1 Descriptive statistics of included variables across gender (N = 47,152).

	Female (N = 32,631)	Male (N = 14,521)	p	Overall (N = 47,152)
Age, years, mean (SD)	23.1 (3.27)	23.5 (3.31)	<.001[a]	23.3 (3.29)
Sleep duration, hr, mean (SD)	7.43 (1.40)	7.41 (1.37)	.256[a]	7.42 (1.39)
DSM-5 Insomnia, n (%)			<.001[b]	
Insomnia	11,202 (34.3)	3,218 (22.2)		14,420 (30.6)
Weekly nightmares, n (%)			<.001[b]	
Less than weekly	26,967 (82.6)	13,424 (92.4)		40,391 (85.7)
Weekly	5,664 (17.4)	1,097 (7.6)		6,761 (14.3)
Comments, n (%)			<.001[b]	
Yes	6,688 (20.5)	552 (3.8)		7,240 (15.4)
Looks or gestures, n (%)			<.001[b]	
Yes	5,093 (15.6)	306 (2.1)		5,399 (11.5)
Photographs, n (%)			<.001[b]	
Yes	1583 (4.9)	156 (1.1)		1739 (3.7)
Indecent exposure, n (%)			<.001[b]	
Yes	733 (2.2)	46 (0.3)		779 (1.7)
Unwanted physical, n (%)			<.001[b]	
Yes	6,531 (20.0)	731 (5.0)		7,262 (15.4)
Attempted rape, n (%)			<.001[b]	
Yes	932 (2.9)	36 (0.2)		968 (2.1)
Rape, n (%)			<.001[b]	
Yes	1524 (4.7)	54 (0.4)		1578 (3.3)

[a]Independent two-samples t test.

[b]Chi-square test.

frequency of nightmares using multinomial logistic regression, using the same operationalisation of sexual harassment as described above (Table 2).

2.3.4 | Mediation by nightmares

Finally, we estimated two indirect models examining the effect of cumulative harassment/assault (independent variable) on insomnia and sleep duration (dependent variables) through nightmare frequency (Figure 5).

All analyses were carried out using Stata version 15.0 (StataCorp, 2017), and R (R Core Team, 2019) was used to produce the descriptive table using the package «gtsummary» (Sjoberg et al., 2020).

3 | RESULTS

3.1 | Descriptive statistics of sample and main variables

In the study sample, a total of N = 32,631 (69.2%) participants were women. The mean (SD) age was 23.3 (3.3) years, and men were slightly older than women (p < .001). The mean (SD) sleep duration was 7.42 (1.39) hr and there was no gender difference (p = .256). For insomnia and nightmares, a higher proportion was reported by women compared to men (p < .001). The most commonly reported types of sexual harassment were "comments" and "unwanted physical harassment" (both ~5.4%), and the least common was "attempted rape" (2.1%). For all harassment/assault variables, women reported a higher proportion of exposure compared to men (all p < .001). For sexual assault/harassment taking place before entering college/university, 3.3% of women and 0.2% men reported having been subjected to "rape", 1.8% of women and 0.1% men to "attempted rape", and 4.7% of women and 0.7% men to "unwanted physical harassment" before entering college/university (for an overview of the percentage of men and women endorsing the other sexual harassment/abuse forms across the four different time categories, see Figure 1 in Sivertsen, Nielsen, et al., 2019).

3.2 | Harassment and association with insomnia and sleep duration

For insomnia, all harassment/assault variables except "indecent exposure" were associated with increased odds of having insomnia for both genders (p values ranging from .015 to <.001). For
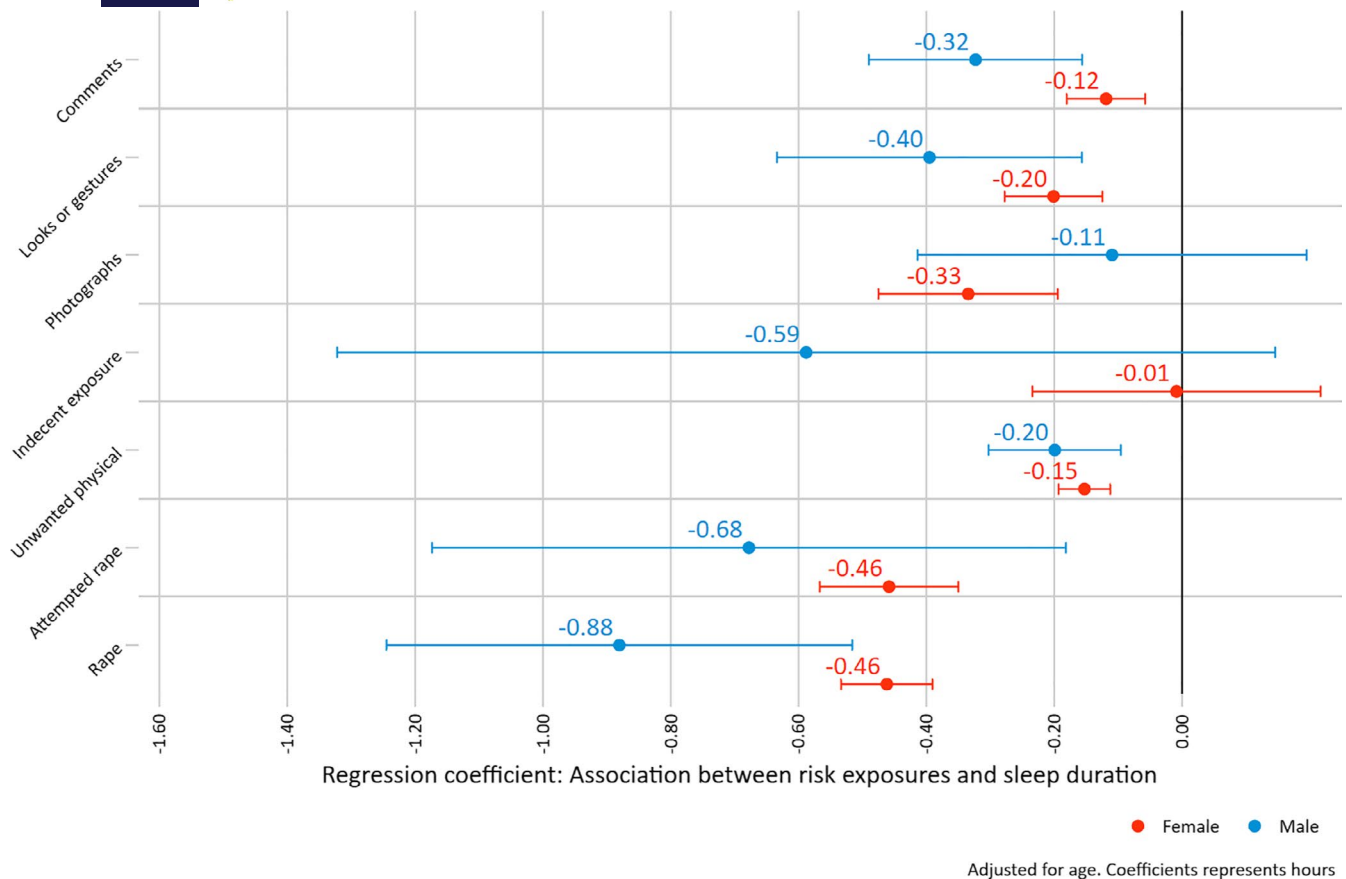
FIGURE 2 Association between separate risk factors and sleep duration. Linear regression models (bars denote 95% confidence intervals). *N* = 47,152. Unstandardised coefficient (B) represents hours

both genders, the highest odds were reported for "rape" (odds ratio [OR] in men was 3.99 and in women was 2.48), and "attempted rape" (OR in men 2.53 and in women 2.27). Due to a lower number of men reporting exposure to the different types of harassment/assault, the confidence intervals (CIs) were considerably larger compared to women. However, the odds of insomnia were significantly higher for men exposed to "looks or gestures" (likelihood ratio test [LRT], *p* < .001) and "photographs" (LRT, *p* = .023) compared to women. There were no other significant gender differences in the association between harassment and insomnia.

For sleep duration, there were negative statistically significant associations for both genders for "comments", "looks or gestures", "unwanted physical harassment", "attempted rape" and "rape" (*p* values ranging from .007 to <.001). For women, a statistically significant association between "photographs" and shorter sleep duration was also observed (*p* < .001). For both genders the strongest association with sleep duration was observed for "rape" (B value, men = −0.88 and B, women = −0.46) and "attempted rape" (B value, men = −0.68 and women = −0.46). As noted above, the CIs were considerably larger for men than women. However, the negative association with sleep duration was stronger for men than women for "comments" (LRT, *p* = .024) and "rape" (LRT, *p* = .029). There were no other significant gender

differences in the association between harassment and sleep duration.

3.3 | Cumulative harassment/assault and association with insomnia and sleep duration

For the association between cumulative harassment/assault and insomnia, the odds of fulfilling diagnostic criteria for insomnia increased as a function of cumulative harassment/assault for both genders (both *p* values for trend <.001). For men, the point estimates (ORs) were consistently higher compared to women, with a larger average increase across number of exposures (average OR 1.47 versus 1.28; LRT, *p* <.001). There was a similar relationship for the association between cumulative harassment/assault and sleep duration. There was a graded negative relationship for both genders (both *p* values for trend <.001), but with a larger average increase for men compared to women (average B value −0.18 versus 0.11; LRT, *p* = .031).

3.4 | Sensitivity analyses

To examine the potential role of depression and anxiety symptoms in the association between sexual harassment/assault and
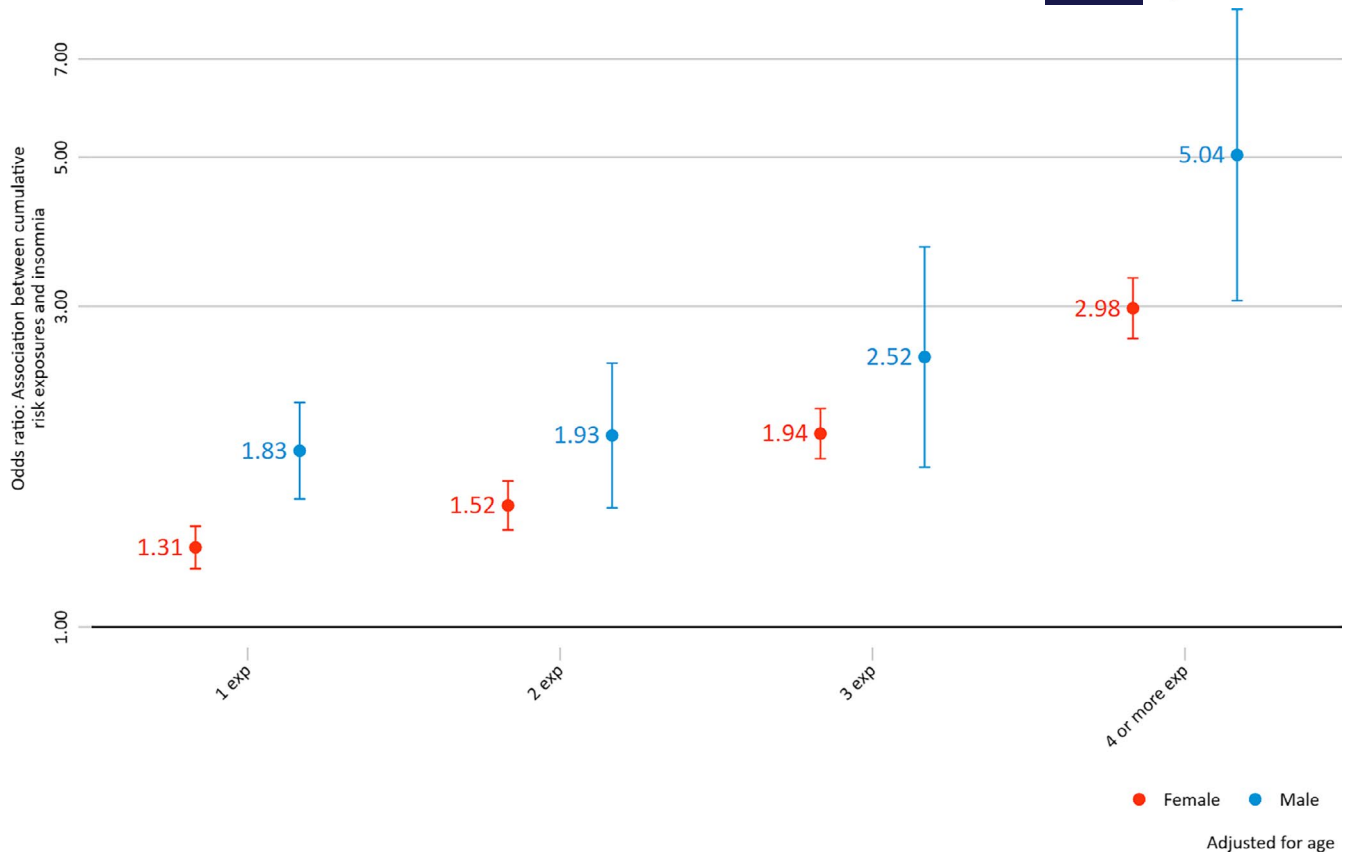
FIGURE 3 Association between cumulative risk factors and insomnia. Logistic regression models (bars denote 95% confidence intervals). *N* = 47,152

the sleep outcome measures, we reran these analyses separately for individuals scoring < versus > the median score on the HSCL-25 (excluding the sleep item). Results of these sensitivity analyses showed that the pattern of associations between cumulative harassment/assault and insomnia and sleep duration were similar for those scoring < versus > the median score on the HSCL-25 (See appendix for figures).

3.5 | Mediation by nightmares

All types of sexual harassment were associated with increased frequency of nightmares and the association was monotonous across frequency categories (Table 2). The strength of the association was more pronounced for more severe forms of sexual harassment, especially for the highest frequency of nightmares (weekly). For both insomnia and sleep duration, mediation analyses were estimated using cumulative harassment/assault as the independent variable and frequency of nightmares as a potential mediator. In both mediation analyses, all of the estimated path coefficients were significant at $p < .001$. For insomnia, 28% of the observed association with cumulative harassment/assault was mediated by frequency of nightmares, with an indirect/direct effect ratio of 0.39. The corresponding number for sleep duration was 15%

for mediation through nightmares, while the indirect/direct effect ratio was 0.17 (for mediation analyses stratified by gender, see Supporting Information file).

4 | DISCUSSION

In this large national survey inviting all Norwegian university students, sexual harassment and assault was associated with an increased risk of insomnia and short sleep duration, with the strongest associations for completed and attempted rape. Cumulative harassment/assault types showed a positive "dose–response" association with the likelihood of insomnia, and a negative "dose–response" association with sleep duration; both of which were partly mediated by the frequency of nightmares.

Sexual harassment/assault, with the exception of indecent exposure, was associated with insomnia, with the odds of insomnia increasing as a function of the severity of harassment and assault. Similarly, with the exception of indecent exposure for both genders, and of harassing sexual photographs for men, all the sexual harassment/assault variables negatively predicted total sleep duration, with effect sizes increasing with the severity of harassment and abuse. These finding are consistent with the only previous comparable study we identified that examined
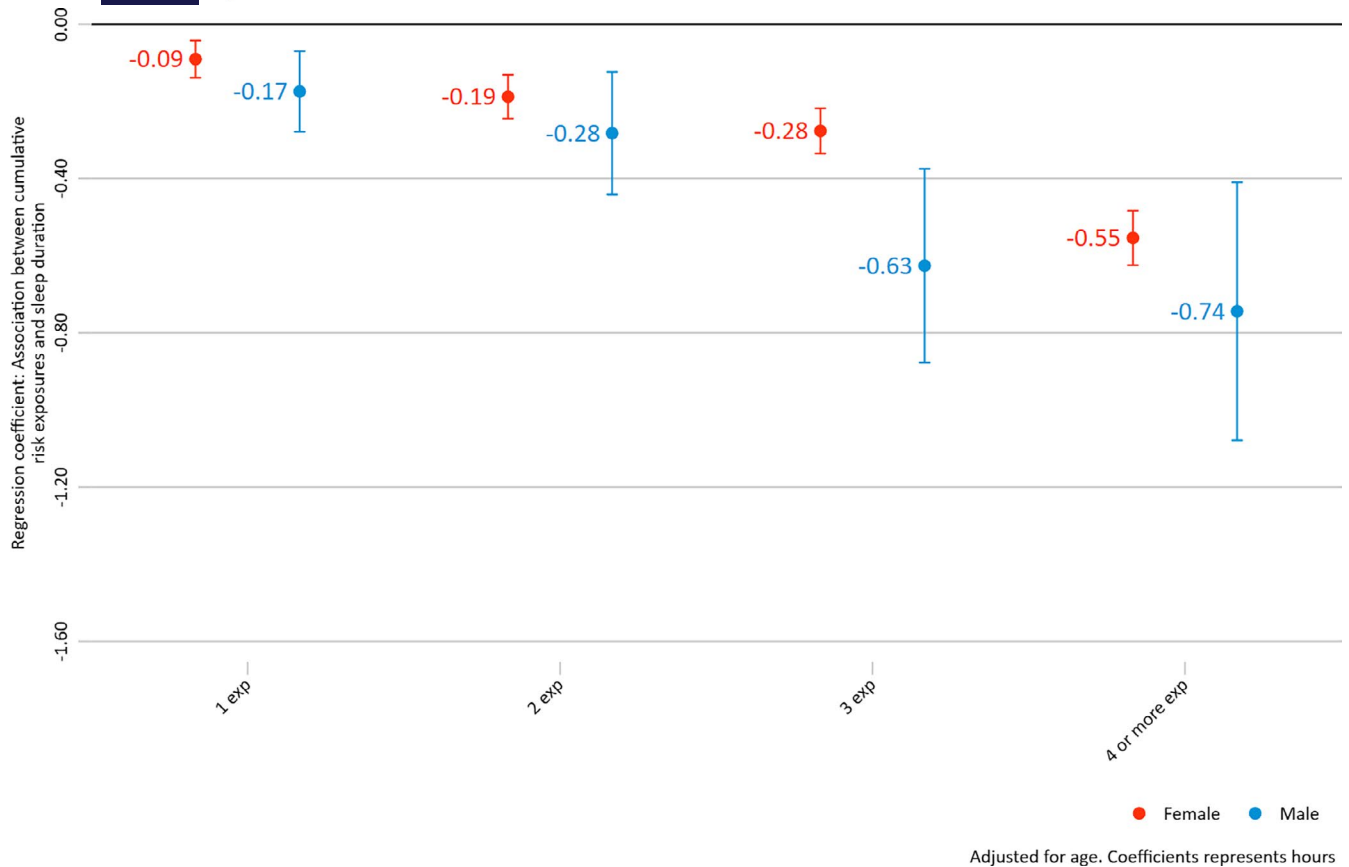
FIGURE 4 Association between cumulative risk factors and sleep duration. Linear regression models (bars denote 95% confidence intervals). *N* = 47,152. Unstandardised coefficient (B) represents hours

TABLE 2 Crude association between exposure to different types of sexual harassment and self-reported frequency of nightmares. Multinomial logistic regression with relative risk ratios (RRRs) and 95% confidence intervals (95% CIs)

	Frequency of nightmares			
Type of sexual harassment[a]	Never	Yearly RRR (95% CI)	Monthly RRR (95% CI)	Weekly RRR (95% CI)
Comments	1.00 (ref)	1.73 (1.52–1.96)	2.28 (2.02–2.57)	2.76 (2.40–3.17)
Looks or gestures	1.00 (ref)	1.78 (1.52–2.10)	2.33 (2.00–2.72)	2.98 (2.50–3.54)
Photographs	1.00 (ref)	1.50 (1.13–1.98)	2.10 (1.62–2.72)	2.23 (1.64–3.04)
Indecent exposure	1.00 (ref)	1.14 (0.69–1.88)	2.23 (1.45–3.45)	2.62 (1.60–4.33)
Unwanted physical	1.00 (ref)	1.78 (1.64–1.93)	2.54 (2.35–2.74)	3.18 (2.91–3.48)
Attempted rape	1.00 (ref)	1.70 (1.29–2.25)	3.15 (2.45–4.04)	5.38 (4.15–6.96)
Rape	1.00 (ref)	1.56 (1.30–1.88)	2.91 (2.47–3.43)	6.12 (5.18–7.22)

[a]"Comments", "looks or gestures", "photographs", "indecent exposure" and "unwanted physical harassment" were coded as missing (to avoid misclassification) if the participant also reported the sexual assault variables of "attempted rape" and/or "rape". Also, "attempted rape" was coded as missing if the participant also reported "rape".

associations of both sexual abuse and sexual harassment with sleep disturbances, which reported larger effect sizes for more severe forms of abuse than less severe forms of harassment in a sample of 304 women (Thurston et al., 2019). A parsimonious interpretation of these findings is that the severity of sexual abuse and harassment is linked to the severity of sleep disturbances in a systematic way. Such interpretation is further supported by our finding that cumulative harassment/assault types was associated with both insomnia and sleep duration in a "dose-dependent" way, which aligns with a large broader literature documenting such "dose–response" relation between cumulative adversity and the likelihood and severity of health outcomes in general (Copeland
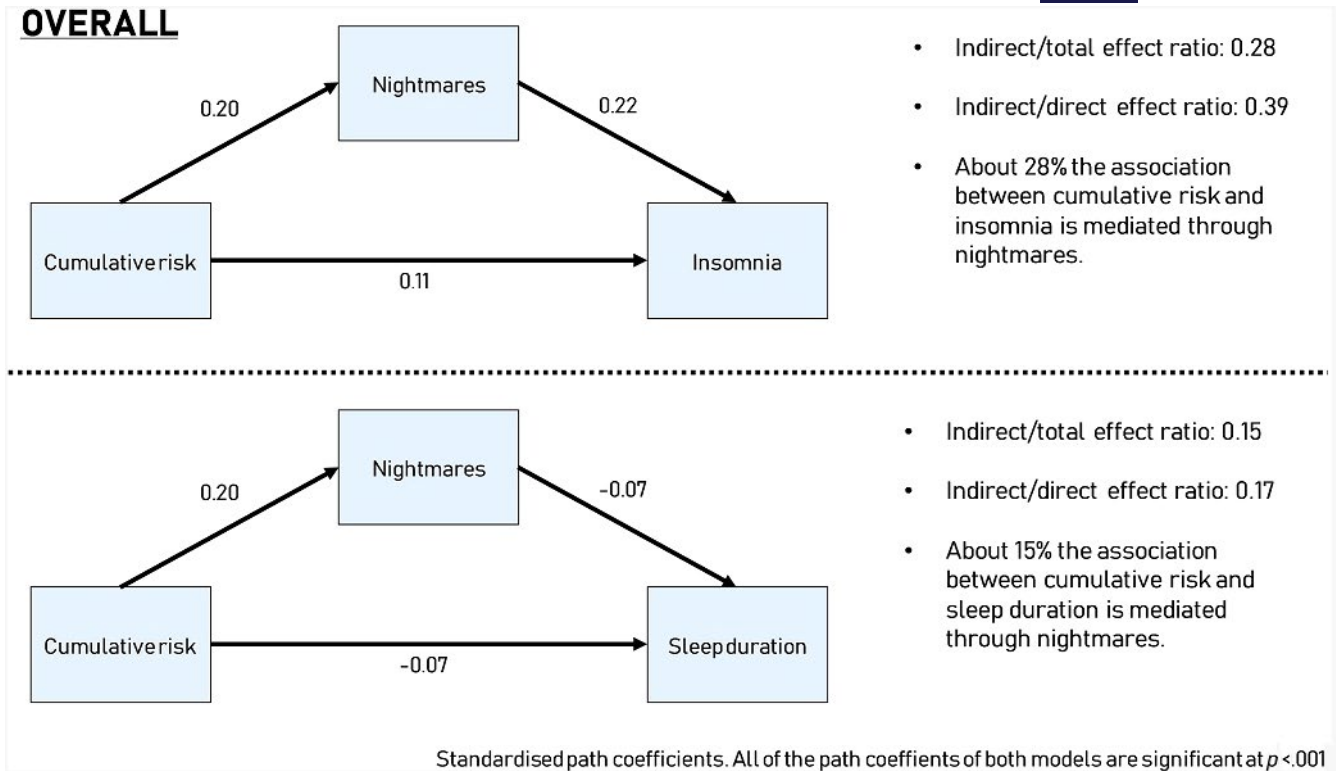
FIGURE 5 Mediation analyses of cumulative risk factors, insomnia and sleep duration. Nightmares as mediator. Structural equation models, maximum likelihood estimation. $N = 47,152$

et al., 2018; Hughes et al., 2017), and sleep disturbances specifically (Kajeepeta et al., 2015).

However, the same pattern was not found for the "indecent exposure" variable, which was associated with neither insomnia nor sleep duration. This finding is non-intuitive as one would expect an association also for this kind of sexual harassment based on the other findings in the present paper. Due to the lack of comparison studies, this finding is difficult to interpret. However, it may reflect that indecent exposure is a less severe type of harassment and consequently not predictive of sleep disturbances in and of itself. The same interpretation may also be applicable to the lack of association between harassing sexual photographs and sleep duration for men, although harassing sexual photographs did predict insomnia for both genders. Also, indecent exposure was the least common sexual harassment type (reported by 2.2% of females and 0.3% of males) and harassing sexual photographs was only reported by 1.1% of males in the present study. This leads to a lack of statistical precision, and this may in part explain these specific findings. Based on these considerations, we believe that replications of these findings are warranted before adequate interpretations can be made.

The associations of rape with sleep duration, and of cumulative harassment/assault types with both sleep duration and insomnia, were stronger for men than women in the present study. This result seems inconsistent with findings from a study of >150,000 young students in China, in which sexually assaulted girls had a higher likelihood of sleep disturbances than boys (Xiao et al., 2019), and

those from a study of >8,000 adults, which found no gender differences in insomnia symptoms among sexual assault victims (Lind et al., 2016). However, differences in analytical approaches, sample characteristics, sleep outcome measures, as well as sexual abuse assessment and timing, preclude direct comparisons with these studies. Moreover, given the lower statistical precision of our male-specific estimates, actual differences between males and females may have been concealed by large CIs for the male-specific estimates. The overall literature on gender differences in sleep disturbances among sexual assault victims is inconclusive, with most studies reporting no gender differences or more sleep disturbances among women compared to men (Lind et al., 2016; Steine et al., 2012; Xiao et al., 2019). To avoid premature interpretations, therefore, our present findings should be replicated in other samples before any conclusions regarding gender differences can be drawn.

The present study also showed that nightmares partly mediated the association of sexual harassment/assault with insomnia and sleep duration, indicating that nightmares are an important component of sleep disturbances among sexual harassment/assault victims. Both sexual abuse and sexual harassment predict post-traumatic stress symptoms (PTSS) (Dworkin, 2018; Willness et al., 2007), which has sleep disturbances and nightmares among its core symptoms (Campbell & Germain, 2016); raising the possibility that nightmares as measured in the present study may have captured PTSS. However, as the present study assessed neither PTSS nor nightmare content, we do not know if the reported

nightmares were related to PTSS. Still, the present finding further underscores the importance of a broad assessment of sleep, including sleep patterns, insomnia and nightmares, among students reporting sexual abuse or assault, and calls for interventions that target all of these symptom domains (see for example Casement & Swanson, 2012).

The association of sexual abuse and harassment with insomnia and sleep duration has clinical implications, as they highlight the importance of assessing sleep disturbances among students reporting sexual abuse or harassment. This is particularly imperative in light of the many negative consequences of short sleep duration and insomnia, including learning capacity and academic performance (Curcio et al., 2006; Gaultney, 2010), as well as the recognised role of sleep disturbances in the aetiology and maintenance of several other mental health disorders (Benca et al., 1992; Dolsen et al., 2014; Harvey, 2008; Harvey et al., 2011).

Moreover, although the present study also captured sexual harassment and assault that happened outside of the university setting, the present results stress the importance of universities implementing programmes and policies aimed at preventing sexual harassment and assault. This is particularly important given the association of sexual harassment and assault with mental health problems, adverse educational and work-related outcomes (Barrett et al., 2014; Dworkin, 2018; Dworkin et al., 2017; Hailes et al., 2019; Paolucci et al., 2001), and later academic career opportunities (Amon, 2017; Edmunds et al., 2016; Sharoni & Klocke, 2019).

4.1 | Study limitations

4.1.1 | Response rate and generalisability

The most important limitation is the response rate of 30.8%, which may limit the generalisability of the findings to the overall student population, as we cannot rule out that there may have been biases in who responded to the survey versus those who did not.

4.1.2 | Lack of assessment of childhood sexual abuse

Another limitation is that the study did not specifically assess sexual abuse taking place during childhood; the developmentally sensitive time period during which exposure to severe stressors produce particularly pervasive effects on development and health (Lupien et al., 2009). While sexual harassment/assault in childhood was most likely captured in the response category "before entering college/university" to the question about when the sexual harassment/assault had happened, the lack of a response category capturing childhood specifically prohibited an examination of whether the associations with the sleep outcome variables varied based on the timing of the harassment/assault. However, we did perform

sensitivity analyses where we reiterated all of our analyses using only pre-college/university harassment/assaults as the exposure variable. The results were similar to the results presented here, with no impact on the overall interpretation and conclusions of the present study (see Supporting Information file for results of the sensitivity analyses).

4.1.3 | Lack of assessment of exposure to other trauma types

On a similar note, another limitation is that the present study did not assess exposure to other types of potentially traumatic events in childhood or adulthood, which prohibited examining associations of a wider range of adverse events with the sleep outcome measures, which again may have attenuated the "dose–response" pattern obtained in the present study. For example, childhood adversities tend to co-occur (Kessler et al., 2010) and both childhood sexual abuse and multiple traumas are well-documented risk factors for sexual re-victimisation throughout life (Classen et al., 2005; Scoglio et al., 2019), all of which would affect cumulative adversity scores and the severity of sleep problems (Kajeepeta et al., 2015) and other health outcomes (Cividanes et al., 2019; Classen et al., 2005), but none of which were measured in the present study. Thus, future studies should assess a broader range of adversity variables, including cumulative childhood adversities and rates of re-victimisation specifically.

4.1.4 | Lack of inclusion of other types of psychopathology

Another limitation of the present study is the lack of inclusion of other types of psychopathology that could mediate the association between sexual assault and sleep. Particularly, sexual assault predicts post-traumatic stress disorder (PTSD) and depression, both of which have sleep disturbances among their diagnostic criteria. While the present study assessed depression symptoms, which were included in sensitivity analyses along with anxiety symptoms, PTSD symptoms were not assessed. Given the high prevalence of sexual assault in the present sample, it is likely that a substantial proportion of the sample could suffer from PTSD and/or depression, both of which may act as mediators between sexual assault and the sleep outcome measures. To further complicate the issue, sleep may act as a mediator between trauma exposure and adaptation to trauma (Kleim et al., 2016). Thus, in addition to nightmares, future studies should use longitudinal designs to examine PTSD and depression as mediators of sleep disturbances among sexual assault victims, as well as the mediating role of sleep for adaptation to trauma. Relatedly, we do not know whether our measure of insomnia reflects primary insomnia versus insomnia that is secondary to mental disorder, substances, or medical conditions (see for example Mai & Buysse, 2008; Morin & Benca, 2012). In order to assess this, future

studies conducted in smaller samples should consider obtaining clinically assessed insomnia diagnoses as their outcome measures.

4.1.5 | Gender categories

Another imitation is that the gender-specific analyses were restricted to men and women. Even though "transgender" was among the response categories for gender, we lacked statistical power to examine effects for this gender category due to low cell counts of both transgender individuals (n = 97) (see Anderssen et al., 2020) and individuals in this gender category reporting assault/harassment. Given the relatively higher prevalence of sexual assault and harassment in the transgender population (Mitchell et al., 2014; Stotzer, 2009), this binary gender model prohibited examination of sexual harassment/assault and sleep problems in the transgender population specifically. Thus, future studies should seek to examine these associations using a broader gender definition.

4.1.6 | Self-reported sleep outcome measures

Another limitation is that the sleep measures were based on self-report, and consequently lacks clinical evaluation or objective assessment. Although subjective sleep parameters, including SOL and WASO, may differ from those acquired by polysomnography or actigraphy (Lauderdale et al., 2008), studies have shown that self-reported sleep assessments are still useful for characterising sleep in both clinical and epidemiological research (Zinkhan et al., 2014). Of note, the accuracy of self-reported SOL and WASO have been found to be better in young individuals compared to older adults (Dillon et al., 2015).

4.1.7 | Cross-sectional study design

Last, the present study is cross-sectional, thus cause and effect cannot be established, which is particularly relevant for the question of whether nightmares mediated the association of sexual harassment/ assault with insomnia and sleep duration. Specifically, we cannot establish the temporal precedence of nightmares in relation to insomnia and sleep duration. Insomnia and nightmares could plausibly be unfolding together over time, influence each other from night to night, and both could affect sleep duration. To overcome this limitation, our present finding of nightmares mediating the association of sexual harassment/assault with insomnia and sleep duration should be replicated in a longitudinal study where the sleep variables are measured on multiple occasions over time. Additional confounding may also have impacted the results. For instance, mental health problems such as PTSD and depression are both related to trauma experience and sleep duration and insomnia. Relatedly, the mediation analyses must be interpreted with caution as all variables were reported at the same time.

4.2 | Study strengths

Important strengths of the present study include the unique and very large sample enabling gender-specific analyses, the broad assessment of sexual harassment/assault using specific, behavioural descriptions rather that subjective general categories (e.g. "were you ever sexually abused or harassed?"), and a detailed sleep assessment battery, including an approximation of the DSM-5 criteria to operationalise insomnia.

5 | CONCLUSIONS

In a sample of 49,051 higher education students in Norway, the present study showed that sexual abuse and sexual harassment was associated with an increased risk of insomnia and shorter sleep duration for both women and men, in a "dose-dependent" way, and that these associations were partly mediated by the frequency of nightmares. Results call for assessments and interventions targeting sleep disturbances among students reporting sexually abusive and harassing experiences.

CONFLICT OF INTEREST
IMS reports no conflicts of interest or financial disclosures. JCS reports no conflicts of interest or financial disclosures. MH reports no conflicts of interest or financial disclosures. LP reports no conflicts of interest or financial disclosures. VS reports no conflicts of interest or financial disclosures. BS reports no conflicts of interest or financial disclosures.

AUTHOR CONTRIBUTIONS
IMS, JCS and BS came up with the basic idea for the study, and developed the analytical strategy together. JCS carried out the data analysis in collaboration with IMS and BS. IMS, BS and JCS drafted the manuscript. All of the authors contributed with comments and amendments to drafts of the manuscript. The submitted version is approved by all authors.

DATA AVAILABILITY STATEMENT
Research data are not shared.

ORCID
Iris M. Steine https://orcid.org/0000-0002-5591-258X

REFERENCES

Amon, M. J. (2017). Looking through the glass ceiling: A Qualitative Study of STEM Women's Career Narratives. *Frontiers in Psychology*, *8*, 236. https://doi.org/10.3389/fpsyg.2017.00236

Anderssen, N., Sivertsen, B., Lønning, K. J., & Malterud, K. (2020). Life satisfaction and mental health among transgender students in Norway. *BMC Public Health*, *20*(1), 138. https://doi.org/10.1186/s12889-020-8228-5

Baglioni, C., Battagliese, G., Feige, B., Spiegelhalder, K., Nissen, C., Voderholzer, U., Lombardo, C., & Riemann, D. (2011). Insomnia as a predictor of depression: A meta-analytic evaluation of longitudinal epidemiological studies. *Journal of Affective Disorders*, *135*(1), 10–19. https://doi.org/10.1016/j.jad.2011.01.011

Ballesio, A., Aquino, M. R. J. V., Kyle, S. D., Ferlazzo, F., & Lombardo, C. (2019). Executive functions in insomnia disorder. A systematic review and exploratory meta-analysis. *Frontiers in Psychology*, *10*, 101. https://doi.org/10.3389/fpsyg.2019.00101

Barrett, A., Kamiya, Y., & Sullivan, V. O. (2014). Childhood sexual abuse and later-life economic consequences. *Journal of Behavioral and Experimental Economics*, *53*, 10–16. https://doi.org/10.1016/j.socec.2014.07.001

Benca, R. M., Obermeyer, W. H., Thisted, R. A., & Gillin, J. C. (1992). Sleep and psychiatric disorders. A meta-analysis. *Archives of General Psychiatry*, *49*(8), 669–670. discussion 669–670. https://doi.org/10.1001/archpsyc.1992.01820080059010

Campbell, R. L., & Germain, A. (2016). Nightmares and posttraumatic stress disorder (PTSD). *Current Sleep Medicine Reports*, *2*(2), 74–80. https://doi.org/10.1007/s40675-016-0037-0

Casement, M. D., & Swanson, L. M. (2012). A meta-analysis of imagery rehearsal for post-trauma nightmares: Effects on nightmare frequency, sleep quality, and posttraumatic stress. *Clinical Psychology Review*, *32*(6), 566–574. https://doi.org/10.1016/j.cpr.2012.06.002

Chen, L. P., Murad, M. H., Paras, M. L., Colbenson, K. M., Sattler, A. L., Goranson, E. N., Elamin, M. B., Seime, R. J., Shinozaki, G., Prokop, L. J., & Zirakzadeh, A. (2010). Sexual abuse and lifetime diagnosis of psychiatric disorders: Systematic review and meta-analysis. *Mayo Clinic Proceedings*, *85*, 618–629. https://doi.org/10.4065/mcp.2009.0583

Cividanes, G. C., Mello, A. F., & Mello, M. F. (2019). Revictimization as a high-risk factor for development of posttraumatic stress disorder: A systematic review of the literature. *Brazilian Journal of Psychiatry*, *41*, 82–89. https://doi.org/10.1590/1516-4446-2017-0013

Classen, C. C., Palesh, O. G., & Aggarwal, R. (2005). Sexual revictimization: A review of the empirical literature. *Trauma, Violence, & Abuse*, *6*(2), 103–129. https://doi.org/10.1177/1524838005275087

Copeland, W. E., Shanahan, L., Hinesley, J., Chan, R. F., Aberg, K. A., Fairbank, J. A., van den Oord, E. J. C. G., & Costello, E. J. (2018). Association of childhood trauma exposure with adult psychiatric disorders and functional outcomes. *JAMA Network Open*, *1*(7), e184493. https://doi.org/10.1001/jamanetworkopen.2018.4493

Curcio, G., Ferrara, M., & De Gennaro, L. (2006). Sleep loss, learning capacity and academic performance. *Sleep Medicine Reviews*, *10*(5), 323–337. https://doi.org/10.1016/j.smrv.2005.11.001

Derogatis, L. R., Lipman, R. S., Rickels, K., Uhlenhuth, E. H., & Covi, L. (1974). The Hopkins Symptom Checklist (HSCL): A self-report symptom inventory. *Behavioral Science*, *19*(1), 1–15. https://doi.org/10.1002/bs.3830190102

Dillon, H. R., Lichstein, K. L., Dautovich, N. D., Taylor, D. J., Riedel, B. W., & Bush, A. J. (2015). Variability in self-reported normal sleep across the adult age span. *Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*, *70*(1), 46–56. https://doi.org/10.1093/geronb/gbu035

Dolsen, M. R., Asarnow, L. D., & Harvey, A. G. (2014). Insomnia as a transdiagnostic process in psychiatric disorders. *Current Psychiatry Reports*, *16*(9), 471. https://doi.org/10.1007/s11920-014-0471-y

Dworkin, E. R. (2018). Risk for mental disorders associated with sexual assault: A meta-analysis. *Trauma, Violence, & Abuse*, *21*(5), 1011–1028. https://doi.org/10.1177/1524838018813198

Dworkin, E. R., Menon, S. V., Bystrynski, J., & Allen, N. E. (2017). Sexual assault victimization and psychopathology: A review and meta-analysis. *Clinical Psychology Review*, *56*, 65–81. https://doi.org/10.1016/j.cpr.2017.06.002

Edmunds, L. D., Ovseiko, P. V., Shepperd, S., Greenhalgh, T., Frith, P., Roberts, N. W., Pololi, L. H., & Buchan, A. M. (2016). Why do women choose or reject careers in academic medicine? A narrative review of empirical evidence. *The Lancet*, *388*(10062), 2948–2958. https://doi.org/10.1016/S0140-6736(15)01091-0

Fan, F., Zhou, Y., & Liu, X. (2017). Sleep disturbance predicts posttraumatic stress disorder and depressive symptoms: A cohort study of chinese adolescents. *Journal of Clinical Psychiatry*, *78*(7), 882–888. https://doi.org/10.4088/JCP.15m10206

Fitzgerald, L. F., Swan, S., & Magley, V. J. (1997). But was it really sexual harassment?: Legal, behavioral, and psychological definitions of the workplace victimization of women. *Sexual harassment: Theory, research, and treatment* (pp. 5–28). Allyn & Bacon.

Gaultney, J. F. (2010). The prevalence of sleep disorders in college students: Impact on academic performance. *Journal of American College Health*, *59*(2), 91–97. https://doi.org/10.1080/07448481.2010.483708

Hailes, H. P., Yu, R., Danese, A., & Fazel, S. (2019). Long-term outcomes of childhood sexual abuse: An umbrella review. *The Lancet Psychiatry*, *6*(10), 830–839. https://doi.org/10.1016/S2215-0366(19)30286-X

Harvey, A. G. (2008). Insomnia, psychiatric disorders, and the transdiagnostic perspective. *Current Directions in Psychological Science*, *17*, 299–303. https://doi.org/10.1111/j.1467-8721.2008.00594.x

Harvey, A. G., Murray, G., Chandler, R. A., & Soehner, A. (2011). Sleep disturbance as transdiagnostic: Consideration of neurobiological mechanisms. *Clinical Psychology Review*, *31*(2), 225–235. https://doi.org/10.1016/j.cpr.2010.04.003

Herkama, S., Turunen, T., Sandman, N., & Salmivalli, C. (2019). Sleeping problems partly mediate the association between victimization and depression among youth. *Journal of Child and Family Studies*, *28*(9), 2477–2486. https://doi.org/10.1007/s10826-018-1249-3

Hughes, K., Bellis, M. A., Hardcastle, K. A., Sethi, D., Butchart, A., Mikton, C., Jones, L., & Dunne, M. P. (2017). The effect of multiple adverse childhood experiences on health: A systematic review and meta-analysis. *The Lancet Public Health*, *2*(8), e356–e366. https://doi.org/10.1016/S2468-2667(17)30118-4

Kajeepeta, S., Gelaye, B., Jackson, C. L., & Williams, M. A. (2015). Adverse childhood experiences are associated with adult sleep disorders: A systematic review. *Sleep Medicine*, *16*(3), 320–330. https://doi.org/10.1016/j.sleep.2014.12.013

Kessler, R. C., McLaughlin, K. A., Green, J. G., Gruber, M. J., Sampson, N. A., Zaslavsky, A. M., Aguilar-Gaxiola, S., Alhamzawi, A. O., Alonso, J., Angermeyer, M., Benjet, C., Bromet, E., Chatterji, S., de Girolamo, G., Demyttenaere, K., Fayyad, J., Florescu, S., Gal, G., Gureje, O., … Williams, D. R. (2010). Childhood adversities and adult psychopathology in the WHO World Mental Health Surveys. *British Journal of Psychiatry*, *197*(5), 378–385. https://doi.org/10.1192/bjp.bp.110.080499

Kleim, B., Wysokowsky, J., Schmid, N., Seifritz, E., & Rasch, B. (2016). Effects of sleep after experimental trauma on intrusive emotional memories. *Sleep*, *39*(12), 2125–2132. https://doi.org/10.5665/sleep.6310

Krakow, B., Schrader, R., Tandberg, D., Hollifield, M., Koss, M. P., Yau, C. L., & Cheng, D. T. (2002). Nightmare frequency in sexual assault survivors with PTSD. *Journal of Anxiety Disorders*, *16*(2), 175–190. https://doi.org/10.1016/s0887-6185(02)00093-2

Lauderdale, D. S., Knutson, K. L., Yan, L. L., Liu, K., & Rathouz, P. J. (2008). Self-reported and measured sleep duration: How similar are they?

STEINE ET AL.

Journal of
Sleep
Research

ESRS

13 of 13

Epidemiology, 19(6), 838–845. https://doi.org/10.1097/EDE.0b013e318187a7b0

Li, S. X., Zhang, B., Li, A. M., & Wing, Y. K. (2010). Prevalence and correlates of frequent nightmares: A community-based 2-phase study. *Sleep, 33*(6), 774–780. https://doi.org/10.1093/sleep/33.6.774

Lind, M. J., Aggen, S. H., Kendler, K. S., York, T. P., & Amstadter, A. B. (2016). An epidemiologic study of childhood sexual abuse and adult sleep disturbances. *Psychol Trauma, 8*(2), 198–205. https://doi.org/10.1037/tra0000080

Lupien, S. J., McEwen, B. S., Gunnar, M. R., & Heim, C. (2009). Effects of stress throughout the lifespan on the brain, behaviour and cognition. *Nature Reviews Neuroscience, 10*(6), 434–445. https://doi.org/10.1038/nrn2639

Mai, E., & Buysse, D. J. (2008). Insomnia: Prevalence, impact, pathogenesis, differential diagnosis, and evaluation. *Sleep Medicine Clinics, 3*(2), 167–174. https://doi.org/10.1016/j.jsmc.2008.02.001

Maniglio, R. (2009). The impact of child sexual abuse on health: A systematic review of reviews. *Clinical Psychology Review, 29*(7), 647–657. https://doi.org/10.1016/j.cpr.2009.08.003

Mitchell, K. J., Ybarra, M. L., & Korchmaros, J. D. (2014). Sexual harassment among adolescents of different sexual orientations and gender identities. *Child Abuse and Neglect, 38*(2), 280–295. https://doi.org/10.1016/j.chiabu.2013.09.008

Morin, C. M., & Benca, R. (2012). Chronic insomnia. *The Lancet, 379*(9821), 1129–1141. https://doi.org/10.1016/S0140-6736(11)60750-2

Paolucci, E. O., Genius, M. L., & Violato, C. (2001). A meta-analysis of the published research on the effects of child sexual abuse. *The Journal of Psychology, 135*, 17–36. https://doi.org/10.1080/00223980109603677

Paras, M. L., Murad, M. H., Chen, L. P., Goranson, E. N., Sattler, A. L., Colbenson, K. M., Elamin, M. B., Seime, R. J., Prokop, L. J., & Zirakzadeh, A. (2009). Sexual abuse and lifetime diagnosis of somatic disorders. A Systematic Review and meta-analysis. *JAMA, 302*, 550–560. https://doi.org/10.1001/jama.2009.1091

Paul, F., Schredl, M., & Alpers, G. W. (2015). Nightmares affect the experience of sleep quality but not sleep architecture: An ambulatory polysomnographic study. *Borderline Personality Disorder and Emotion Dysregulation, 2*(1), 3. https://doi.org/10.1186/s40479-014-0023-4

Pigeon, W. R., Pinquart, M., & Conner, K. (2012). Meta-analysis of sleep disturbance and suicidal thoughts and behaviors. *Journal of Clinical Psychiatry, 73*(9), e1160–e1167. https://doi.org/10.4088/JCP.11r07586

R Core Team. (2019). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. Retrieved from https://www.R-project.org/

Roth, T., & Ancoli-Israel, S. (1999). Daytime consequences and correlates of insomnia in the United States: Results of the 1991 National Sleep Foundation Survey II. *Sleep, 22*(Suppl 2), S354–S358.

Scoglio, A. A. J., Kraus, S. W., Saczynski, J., Jooma, S., & Molnar, B. E. (2019). Systematic review of risk and protective factors for revictimization after child sexual abuse. *Trauma, Violence, & Abuse, 22*(1), 41–53. https://doi.org/10.1177/1524838018823274

Sharoni, S., & Klocke, B. (2019). Faculty confronting gender-based violence on campus: Opportunities and challenges. *Violence against Women, 25*(11), 1352–1369. https://doi.org/10.1177/1077801219844597

Sivertsen, B., Nielsen, M. B., Madsen, I. E. H., Knapstad, M., Lonning, K. J., & Hysing, M. (2019). Sexual harassment and assault among university students in Norway: A cross-sectional prevalence study. *British Medical Journal Open, 9*(6), e026993. https://doi.org/10.1136/bmjopen-2018-026993

Sivertsen, B., Råkil, H., Munkvik, E., & Lønning, K. J. (2019). Cohort profile: The SHoT-study, a national health and well-being survey of Norwegian university students. *British Medical Journal Open, 9*(1), e025200. https://doi.org/10.1136/bmjopen-2018-025200

Sivertsen, B., Vedaa, Ø., Harvey, A. G., Glozier, N., Pallesen, S., Aarø, L. E., Lønning, K. J., & Hysing, M. (2019). Sleep patterns and insomnia in young adults: A national survey of Norwegian university students. *Journal of Sleep Research, 28*(2), e12790. https://doi.org/10.1111/jsr.12790

Sjoberg, D. D., Hannum, M., Whiting, K., & Zabor, E. C. (2020). *gtsummary: Presentation-Ready Data Summary and Analytic Result Tables*. R package version 1.3.2. Retrieved from: http://www.danieldsjoberg.com/gtsummary/

StataCorp. (2017). *Stata Statistical Software: Release 15*. StataCorp LLC.

Steine, I. M., Harvey, A. G., Krystal, J. H., Milde, A. M., Grønli, J., Bjorvatn, B., & Pallesen, S. (2012). Sleep disturbance in sexual abuse victims: A systematic review. *Sleep Medicine Reviews, 16*, 15–25. https://doi.org/10.1016/j.smrv.2011.01.006

Stotzer, R. L. (2009). Violence against transgender people: A review of United States data. *Aggression and Violent Behavior, 14*(3), 170–179. https://doi.org/10.1016/j.avb.2009.01.006

Thurston, R. C., Chang, Y., Matthews, K. A., von Känel, R., & Koenen, K. (2019). Association of sexual harassment and sexual assault with midlife women's mental and physical health. *JAMA Internal Medicine, 179*(1), 48–53. https://doi.org/10.1001/jamainternmed.2018.4886

Vedaa, Ø., Erevik, E. K., Hysing, M., Hayley, A. C., & Sivertsen, B. (2019). Insomnia, sleep duration and academic performance: A national survey of Norwegian college and university students. *Sleep Medicine: X, 1*, 100005. https://doi.org/10.1016/j.sleepx.2019.100005

Willness, C., Steel, P., & Lee, K. (2007). A meta-analysis of the antecedents and consequences of workplace sexual harassment. *Personnel Psychology, 60*, 127–162. https://doi.org/10.1111/j.1744-6570.2007.00067.x

Xiao, D. I., Wang, T., Huang, Y., Wang, W., Zhao, M., Zhang, W.-H., Guo, L., & Lu, C. (2019). Gender differences in the associations between types of childhood maltreatment and sleep disturbance among Chinese adolescents. *Journal of Affective Disorders, 265*, 595–602. https://doi.org/10.1016/j.jad.2019.11.099

Zinkhan, M., Berger, K., Hense, S., Nagel, M., Obst, A., Koch, B., Penzel, T., Fietze, I., Ahrens, W., Young, P., Happe, S., Kantelhardt, J. W., Kluttig, A., Schmidt-Pokrzywniak, A., Pillmann, F., & Stang, A. (2014). Agreement of different methods for assessing sleep characteristics: A comparison of two actigraphs, wrist and hip placement, and self-report with polysomnography. *Sleep Medicine, 15*(9), 1107–1114. https://doi.org/10.1016/j.sleep.2014.04.015

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.