



CLINICAL REVIEW

Workplace bullying and sleep – A systematic review and meta-analysis of the research literature



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ARTICLE INFO

Article history:

Received 8 April 2019

Received in revised form

8 August 2019

Accepted 15 December 2019

Available online 25 February 2020

Keywords:

Harassment

Insomnia

Sleep

Aggression

Bullying

Review

SUMMARY

This systematic review and meta-analysis 1) clarifies and quantifies existing results on the association between exposure to workplace bullying and sleep, 2) evaluates the methodological quality of existing studies, 3) identifies theoretical frameworks used in research, 4) determines moderating and mediating variables, and 5) provides guidelines for future research. Searches for primary studies were conducted in Pubmed, Medline, Embase, PsycINFO and Web of Science. Of the 406 studies identified, 26 fulfilled the inclusion criteria for the qualitative synthesis whereas sixteen studies were included in the meta-analysis (cross sectional effect sizes: 15; N = 69,199/prospective effect sizes: 6; N = 26,164). Workplace bullying was significantly related to sleep problems in all studies. Across cross-sectional studies, targets of bullying had 2.31 higher odds of reporting sleep problems compared to non-bullied workers. The odds across the prospective studies was 1.62. The quality of evidence for the association between workplace bullying and sleep problems was low to moderate. Only eight studies had a predefined theoretical rationale for the association, and few studies examined mediating and moderating variables or bidirectional associations. The methodological quality of the studies was moderate. Further research is needed to establish the nature, directionality, mechanisms, and conditions of the association between bullying and sleep.

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Introduction

Sleep quality is positively associated with mental and physical health and well-being and inversely associated with daytime sleepiness and fatigue [1]. Typical indicators of subjective sleep quality, either alone or in combination, encompass parameters such as sleep onset latency, sleep maintenance, total sleep time, early morning awakening, restlessness during the night, movement during sleep, calmness when trying to sleep, sleep efficiency, perceived depth of sleep, and tiredness upon awakening and during the day [2,3]. Poor subjective sleep quality subsequently leads to impaired daytime functioning. It is therefore of concern that sleep problems are among the most common health complaints in the general population [4]. Estimates show that between six and 30

percent, depending on operationalization, suffer from insomnia [5], which is the most common sleep disorder. Findings further suggest that sleep problems are increasing in the general population [6–8]. Although the causes of sleep problems are complex and multifactorial, previous systematic reviews and meta-analyses have established psychosocial stress at the workplace as an important precursor [9,10]. Work related stress has in fact been reported as the most frequent self-reported cause of sleep problems [11] and sufferers often attribute their sleeping problem to different work related factors [10]. Thus, identifying and preventing work-related precursors of sleep problems are therefore highly important with regard to reducing sleep related costs for individuals, employers, and society.

Workplace bullying is a central psychosocial predictor of mental health problems [12,13] and sickness absence [14] and has also been suggested as a particularly potent work-related antecedent to sleep problems [15]. Workplace bullying refers to a situation where an employee persistently and systematically is exposed to harassment and non-physical mistreatment at work over a prolonged time-period and where the target finds it difficult to defend him- or

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herself against the harassment [16]. Compared to other forms of more incidental mistreatment at the workplace, such as incivility and physical violence, workplace bullying is not about single episodes of conflict or harassment, but a form of persistent and repeated psychological aggression where the target finds it difficult to withstand the abuse [16]. Bullying is not a clear-cut “either/or phenomena” but a gradually escalating processes where the target becomes continually more affected and victimized by the experiences. Prevalence estimates show that as many as 15 percent of workers is exposed to some level of workplace bullying at any time [17]. As shown in several meta-analytic reviews of cross-sectional and prospective studies, workplace bullying relates to impaired mental and somatic health [18,19], post-traumatic stress disorder [20], reduced job satisfaction and commitment [21], and increased risk of sickness absence [22]. It is also reasonable to expect that exposure to bullying increases the likelihood of sleep problems, and that sleep problems thereby is a mechanism that can explain the impact of bullying on other outcomes. As supported by findings on disturbances in cortisol regulation among bullied workers [23,24], bullying influences levels of arousal and causes prolonged physiological activation. According to the cognitive activation theory of stress [25], cognitive activation is a key factor in the cycle of emotional and physiological arousal. Theories more specifically related to sleep disorders, such as insomnia, have similarly pointed to psychosocial stressors as typical precipitating factors [26], and hyperarousal [27] as a hallmark of the sleep disturbance.

Being exposed to workplace bullying challenges the targets basic assumptions about their own worth as well as about the world as meaningful and benevolent [28]. This shattering of assumptions is assumed to lead to persistent work-related worrying and rumination, characterized by repetitive negative thoughts directed to issues related to work [29]. Worrying and rumination have further been found to be intrusive and disruptive to sleep and recovery [30]. Worrying is also common in people suffering from sleeplessness [31] and is also a central end-point in line with the internalization hypothesis of insomnia [32]. Still, there may be individual differences in responses to bullying and a range of risk and protective factors, both at the individual and organizational level, may therefore moderate the impact of workplace bullying on sleep [33].

Taken together, sleep problems are both a likely outcome of workplace bullying and a possible mediating variable that may explain how exposure to bullying may lead to other health problems and reduced workability [34]. However, despite theoretical reasons for expecting an association between bullying and sleep problems, the existing literature on this association is fragmented and inconclusive. Consequently, there is a need for an updated systematic synthesis of the evidence. To this date, the relationship between bullying and sleep has only been included as secondary findings in two more general reviews. In one of these, concerning the effect of work environment on future sleep disturbances, Linton and colleagues [10] found, across three studies, that bullying was related to an increased risk of sleep problems. In contrast, a meta-analytic review on outcomes of workplace bullying that included four studies on sleep problems, found no association [21]. However, none of these reviews provided any further information on the association between bullying and sleep problems. Furthermore, there has been an explosive growth in the number of studies on workplace bullying in general and in particular regarding health related issues during the last years [33]. An updated and detailed overview of the literature is therefore necessary. This systematic review and meta-analysis extends previous reviews by including a larger number of studies and thereby increasing the statistical power of the meta-analysis. By including a quality assessment of the studies to date, this review will also provide information about the methodological value of the existing research. The specific aims

were to: 1) Identify the theoretical frameworks that have been used in research on how bullying relates to sleep, 2) evaluate the quality and potential bias of the evidence, 3) establish the nature and magnitude of the association, and 4) examine which moderators and mediators that can explain when and how bullying relates to sleep.

Methods

This review was pre-registered at the International prospective register of systematic reviews (PROSPERO; registration number: CRD42018082192). The background for the review, its data sources, search terms and strategy, inclusion and exclusion criteria, and methodological approaches have previously been described in a study protocol [15]. The review was structured in accordance with the PRISMA guidelines [35]. For reporting, we adhered to the MOOSE guidelines [36].

Identification of eligible studies and search strategy

This literature review was based on systematic searches in Pubmed, Medline, Embase, PsycINFO and Web of Science. Additional searches were performed in Google Scholar. The main search was conducted by a professional librarian in November and December 2017. An update was performed in August 2018. The systematic searches were performed by combining every possible combination of three groups of keywords (Table 1). The first group comprised keywords related to “work” (e.g., “job”, “occupational”, “employee”), the second group comprised the keywords describing workplace bullying (e.g., “mobbing”, “harassment”, “incivility”, and “social exclusion”), while the final group consisted of keywords related to “sleep” (e.g., “insomnia”, “sleepiness”, and circadian”). The searches were not limited by historical time-constraints. The reference lists of identified articles were examined to identify additional relevant studies. The systematic procedure substantiates that the literature search comprised all published studies on the relationship between workplace bullying and sleep problems. The search strategy was considered as adequate to reduce the risk of selection and detection bias. The search results were exported to Endnote X8 where duplicates were excluded. Non-relevant studies were then excluded based on title and abstract. The full-text of remaining studies was manually screened based on the inclusion and exclusion criteria described below.

Inclusion and exclusion criteria

Primary observational studies with cross-sectional, prospective, or retrospective research design, case-control studies, and studies

Table 1
Search terms used in literature search.

Category 1	Category 2	Category 3
Work*	Bullying	Sleep*
Job	Mobbing	Insomnia
Occupational	Victimization	Awakening
Employee	Emotional abuse	Asleep
Worker	Incivility	Circadian
	Psychological aggression	Hypersomnia
	Mistreatment	Parasomnia
	Ostracism	Somnambulism
	Exclusion	Nightmare
	Undermining	Dreams
	Harassment	Somniphobia

Note. Work* captures “workplace” “working” etc. Sleep* captures “sleep problems”, “sleep disorders”, “sleep complaints”, “sleepiness” etc.

with experimental designs were included. We did not consider qualitative studies, case designs, or other forms of single-events studies. Eligible studies had to report empirical findings on the association between exposure to workplace bullying (or any overlapping construct) and an explicit indicator of sleep (e.g., disturbed sleep, early awakening, insomnia etc.). We excluded studies for which no relevant data could be extracted. Review articles and intervention studies were considered for inclusion in the discussion of the results from the current review. The review was limited to articles published in peer-reviewed journals written in English, German, French, or the Scandinavian languages (Danish, Norwegian, and Swedish). Data from conference abstract, dissertations, gray literature, and unpublished literature was not included. Hence, the present review concerns published peer reviewed studies only.

To be included in the meta-analytic part of the study, studies had to provide the zero-order associations (e.g., correlations, Odds Ratios; group differences etc.) between bullying and sleep problems, or provide sufficient information for these correlations (effect sizes) to be calculated. Studies that lacked this information or reported effect sizes that could not be transformed into correlations were excluded. To avoid double-counting data, the sample in a given study should not have been used in a previous study of those included. In cases with overlap, we used data from the largest sample.

Participants and settings

The study population was restricted to adults (18 y or older) with a current or previous employment in a full- or part-time position. We considered workers in any trade and occupation. No restrictions were placed with regard to the age, gender, ethnicity, or other demographic characteristics of the subjects.

Data extraction

Relevant information from the included studies were extracted and coded using an adapted version of a previously tested coding sheet [21,22]. The coding sheet assessed information about bullying and sleep, demographic characteristics of participants (average age, gender distribution, job type, and educational level), study characteristics (country of origin, study design, sample size, measurement methods and instruments, response rate, year of study, sampling method (random vs. non-random), mediators and moderators, and theoretical frameworks used). Effect sizes were extracted and 95% confidence intervals were calculated.

Assessment of study quality, risk of bias, and quality of evidence

Quality and risk of bias in the primary studies were assessed by the first and second author using an adaptation of an existing checklist for research on outcomes of workplace bullying [22]. The checklist comprises 14 items related to sampling, representativeness, measurement issues, and confounders. The complete checklist is available in the study protocol [15]. The quality and bias was scored on a scale from 0 (lowest possible quality) to 14 (highest possible quality). Scores from 0 to 5 was considered as low quality, 6–10 as moderate, and 11–14 as high quality, respectively. Kappa was calculated as an indicator of interrater agreement.

The quality of the overall evidence across studies (i.e., all studies taken together) for an association between bullying and sleep problems was evaluated in accordance with the GRADE system [37]. GRADE has four levels of certainty in evidence [38]: very low, low, moderate, and high. For high evidence, it is very likely that true effect lies close to that of the estimate of the effect and further

research is very unlikely to change the confidence of the estimated effect. For moderate evidence, the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different. For low evidence, the true effect may be substantially different from the estimate of the effect, hence further research is likely to change the estimate. For very low evidence, the true effect is likely to be substantially different from the estimate of effect. For high evidence, studies should be randomized, double-blinded with no selection biases. For observational or correlation studies, moderate evidence, i.e., exceptionally strong evidence from unbiased studies, is considered the strongest possible level of proof of an association.

Meta-analytic approach

The meta-analysis was conducted with the Comprehensive Meta-Analysis (version 2) software developed by Biostat [39]. Odds Ratios (OR) with 95% confidence intervals (95% CI) and correlations are reported as the overall synthesized measures of effect size. Composite scores were calculated in studies where several effect sizes were reported from the same sample. Several of the included studies had overlapping samples. Four of the studies from Denmark were based on combinations of the Work Bullying and Harassment cohort and the Psychosocial Risk Factors for Stress and Mental Disease (PRISME) cohort [34,40–42], whereas two other studies used respondents from a survey of Belgian workers [43,44]. Due to interdependency in data, the study with the largest number of respondents was included in the meta-analysis.

In studies reporting effect sizes from independent subgroups (e.g., when moderators are included), each subgroup was included as a unique sample in the meta-analysis. Moderation analyses were conducted to compare associations from cross-sectional and prospective data. Studies were weighted by the inverse of the variance. As the individual studies included cannot be expected to reflect the same population of studies, pooled mean effect sizes were calculated using a random effects model. The Q_{within} -statistic was used to assess the heterogeneity of studies. An I^2 -statistic was computed as an indicator of heterogeneity reflecting the proportion of true variance to total variance across the observed effect estimates. An I^2 of 0% indicate no heterogeneity, 25% indicating low heterogeneity, 50% indicate moderate heterogeneity, and 75% indicating high heterogeneity, respectively [45]. The "one-study-removed" procedure was used to determine whether the overall estimates between bullying and sleep were influenced by outliers. Effect sizes that fell outside the 95%^t confidence interval of the average effect size were considered as outliers. Four indicators of publication bias were examined: Funnel plot, Orwin's Fail-Safe N, Duval and Tweedie's trim and fill procedure, and Egger's Regression Intercept [46].

Results

Study screening

The electronic search provided 406 articles. Seven additional articles were identified through other sources (Google Scholar and reference lists). Relevant articles were first considered on the basis of their title and abstract. Of 413 articles screened, 364 were excluded as they did not meet the inclusion criteria. As a second step, the full-text versions of the 58 remaining papers were independently assessed for eligibility by the first and second author. Altogether 32 of these were excluded as they did not provide relevant information on the association between bullying and

sleep. Hence, the qualitative synthesis included 26 studies. Fig. 1 shows a flow diagram of the study selection process.

Characteristics of the included studies

The 26 included studies, and their characteristics, are presented in Table 2. The studies originated from 13 different countries (Australia, Belgium, Denmark, France, Germany, Japan, Norway, Poland, Puerto Rica, Sweden, Switzerland, and USA) and were published in the period 1996–2018. One study was published in the 1990s, four in the 2000s, and 21 in the 2010s, suggesting a steadily increased research, yet also rather recent, interest in the association between workplace bullying and sleep.

Design and measurement methods

Sixteen of the identified studies had cross-sectional designs, eight studies had prospective designs, one study used a retrospective/case–control design, whereas one study employed a quantitative diary study approach. Fifteen studies used a bullying experience checklist to measure exposure to bullying behaviors, six studies used a single item self-labeling question with a definition of bullying, whereas three studies used a single item self-labeling question without a definition (for a description of the different methods, see [47]). Two studies did not provide

information about how bullying was assessed. The Negative Acts Questionnaire [48] was the most frequently used bullying experience checklist.

Fifteen studies used an inventory to measure sleep problems, seven studies used a single item, one study was based on objective sleep assessment (actigraphy), one study included a formal diagnosis by a medical doctor, while two studies used a combination of methods. The Karolinska Sleep Questionnaire [49] was the most common indicator of sleep problems, followed by the Pittsburgh Sleep Quality Index [50] and the Jenkins Sleep Problems Scale [51].

The average number of respondents in the included studies was 5333 (Range: 64–37,646). Eleven studies were based on a random sample of respondents, whereas 16 studies used a non-randomized sample. In the prospective studies, the time-lag varied between two weeks [52] and seven years [53].

Settings

Eighteen studies were based on a sample of the general working population or a heterogeneous sample of workers from various occupations [34,40–42,44,52–64]. Four studies included respondents from healthcare occupations only [63,65–67], whereas four studies were based on other specific occupations or groups (university employees [68], forest service [69], working students [70] and patients exposed to workplace bullying [71]).

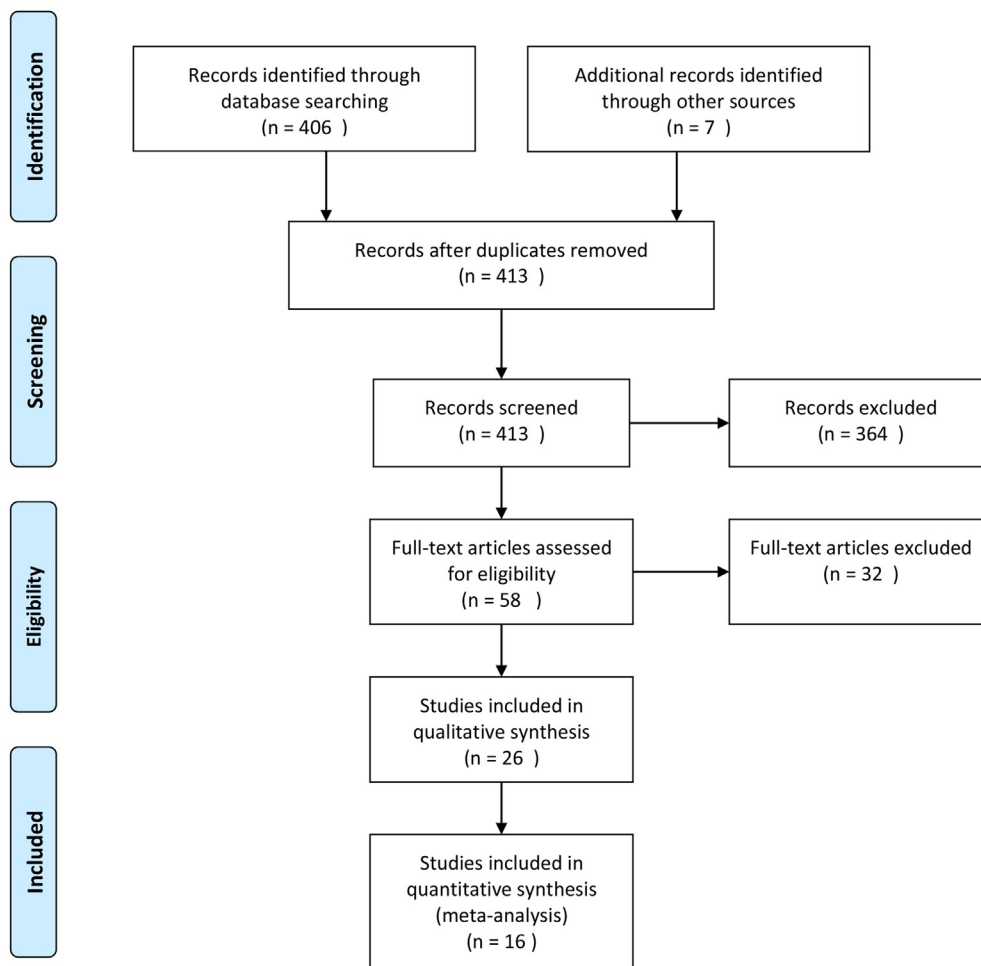


Fig. 1. Flow diagram for study retrieval and selection of relevant studies.

Table 2
Overview of the studies included in the systematic literature review.

Reference (year)	Country	Study design (time-lag)	Quality score	Assessment bullying	Assessment sleep	N	Sample type	Reverse relationship examined?	Note
Bonde et al. [40] (2016)	Denmark	Prospective (24 mo)	10	Single item with definition	Single item sleep quality/Karolinska Sleep Questionnaire (4 items)	7502	Non-random	No	Sample overlaps with [34,41,42]
Demsky et al. [69] (2019)	USA	Cross-sectional	6	Workplace Incivility Scale	Insomnia symptoms (4 items)	699	Random	NA	
Eriksen et al. [65] (2008)	Norway	Prospective (3 mo)	13	Single item with definition	Single item sleep quality	4771	Random	No	
Fortunato & Harsh [70] (2006)	USA	Cross-sectional	6	Interpersonal Conflict Scale (4 items)	LeBourgeois Sleep Quality Scale (30 items)	467	Non-random	No	
Giorgi [54] (2010)	Japan	Cross-sectional	8	Negative Acts Questionnaire (17 items)	Single item average hours of sleep	715	Non-random	NA	
Hansen et al. [42] (2014)	Denmark	Prospective (24 mo)	9	Single item with definition	Karolinska Sleep Questionnaire (6 items)	3382/1671	Non-random	Sleep difficulties predicted bullying	Sample overlaps with [34,40,41]
Hansen et al. [41] (2016)	Denmark	Prospective (24 mo)	9	Single item with definition	Karolinska Sleep Questionnaire (6 items)	7733	Non-random	No	Sample overlaps with [34,40,42]
Hietapakka et al. [66] (2013)	Finland	Cross-sectional	9	Single item without definition	Jenkins Scale (4 items)	1729	Random	NA	
Johannesen & Sterud [55] (2017)	Norway	Prospective (48 mo)	11	Two single item without definition	Single item sleep problems	5760	Random	Sleep problems not related to subsequent risk of bullying	
Khubchandani & Price [56] (2015)	USA	Cross-sectional	7	Single item without definition	Single item sleep duration	17,524	Random	NA	
Kostev et al. [71] (2014)	Germany	Retrospective Case-control	7	Not reported	Primary care diagnosis sleep disorder	2625 patients/2625 controls	Non-random	No	
Lallukka et al. [53] (2011)	Finland	Prospective (60–84 mo)	11	Single item with definition	Jenkins Scale (4 items)	7332	Non-random	No	
Leymann & Gustafsson [57] (1996)	Sweden	Cross-sectional	4	Leymann Inventory of Interpersonal Terror (Number of items not reported)/ Assessment by medical doctor	Karolinska Sleep Questionnaire (13 items)	2428 in representative sample/64 patients	Random	NA	
Magee et al. [75] (2015)	Australia	Cross-sectional	8	Negative Acts Questionnaire (22 items)	Pittsburgh Sleep Quality Index (21 items)	1454	Non-random	NA	
Nabe-Nielsen et al. [34] (2016)	Denmark	Prospective (24 mo)	9	Single item with definition	Karolinska Sleep Questionnaire (4 items)	7650	Non-random	No	Sample overlaps with [40–42]
Niedhammer et al. [59] (2009)	France	Cross-sectional	10	Leymann Inventory of Interpersonal Terror (45 items)	Two items on difficulties falling asleep and premature awakening	7694	Random	NA	
Notelaers et al. [60] (2006)	Belgium	Cross-sectional	6	Negative Acts Questionnaire (22 items)	14 items from Questionnaire on the Experience and Evaluation of Work (QEEW)	6175	Non-random	NA	Sample overlaps with [44]
Pereira et al. [52] (2013)	Switzerland	Quantitative diary study (two weeks)	10	Workplace Social Exclusion scale (7 items)	Single item sleep quality/sleep actigraphy	90	Non-random	No	
Rodriguez-Munoz et al. [44] (2011)	Belgium	Cross-sectional	6	Negative Acts Questionnaire (9 items)	5 items from Questionnaire on the Experience and Evaluation of Work (QEEW)	4068	Non-random	NA	Sample overlaps with [60]
Rosario-Hernandez et al. [61] (2018)	Puerto Rico	Cross-sectional	6	Leymann Inventory of Interpersonal Terror (60 items)	Sleep Well-Being Indicator (12 items)	1046	Non-random	NA	

(continued on next page)

Table 2 (continued)

Reference (year)	Country	Study design (time-lag)	Quality score	Assessment bullying	Assessment sleep	N	Sample type	Reverse relationship examined?	Note
Sakurai et al. [72] (2014)	Japan	Cross-sectional	11	Brief Job Stress Questionnaire (3 items)	Unnamed Insomnia Questionnaire (3 items)	37,646	Random	NA	
Slopen & Williams [63] (2014)	USA	Cross-sectional	11	Job harassment (2 items)/Unfair treatment on the job (3 items)	Single item sleep duration/Sleep difficulties (3 items)	2983	Random	NA	
Sorensen et al. [73] (2011)	USA	Cross-sectional	11	Unnamed inventory on harassment (5 items)	Pittsburgh Sleep Quality Index	1572	Random	NA	
Takai et al. [64] (2010)	Japan	Cross-sectional	9	Negative Acts Questionnaire (22 items)	Pittsburgh Sleep Quality Index	2062	Non-random ^a	NA	
Vedaa et al. [67] (2016)	Norway	Prospective (24–36 mo)	12	Negative Acts Questionnaire (9 items)	Bergen Insomnia Scale	799	Random	Insomnia not related to subsequent risk of bullying	
Ziemska et al. [68] (2013)	Poland	Cross-sectional	4	Not answered	Single item sleep disturbances	1096	Non-random	NA	

^a Non-random at organizational level, but randomized at individual level.

Quality assessment and risk of bias

The interrater agreement of the rating of study quality/risk of bias was very high (99% agreement). Kappa indicated very high to full inter-rater agreement for all studies. Disagreement was resolved through discussion between the raters. On the scale from 0 to 14, the methodological quality of the reviewed studies ranged from 4 to 13 with a mean score of 8.65 and a median of 9. The assessment showed a low to moderate risk of bias related to selection, representativeness, measurement, and confounders. The lowest quality studies had all cross-sectional designs. The deficits were mainly related to sampling bias and measurement issues such as poor indicators of bullying and sleep. Overall, the ratings suggest that the methodological quality of the included studies was moderate.

The nature of the relationship between bullying and sleep problems

A significant association between exposure to bullying and indicators of sleep existed in all studies. Bullying was associated with sleep problems both in cross-sectional and prospective studies. Bullying was related to sleep problems across occupational settings and cultures, and the association was relatively robust between the different instruments used to assess both exposure to bullying and sleep problems. Ten studies provided estimates of the association between bullying and sleep adjusted for other variables. The association remained significant in the studies that adjusted for demographic variables such as age and gender (e.g., [42, 52, 53]), whereas the studies that adjusted for other work exposures provided somewhat mixed findings (e.g., [52, 72]). For instance, in a prospective study of 5760 Norwegian employees Johannesen and Sterud [55] found that bullying was related to sleep problems after adjusting for age, family status, chronic health problems, and smoking, but not after including work schedule, physical workload, and working hours as additional control variables. In contrast, another prospective study from Norway found that bullying was associated with poor sleep after adjusting for demographic factors as well as multiple work related exposures [65]. Similarly, in a cross-sectional study from USA based on 1225 respondents, Sorensen and colleagues showed that the indicator for workplace harassment was related to sleep deficiency after adjusting for work factors such as supervisor support, job demands, and decision latitude [73].

Three of the prospective studies examined whether sleep problems predicted subsequent risk of bullying. While Hansen and colleagues [42] found that sleep problems were associated with subsequent exposure to bullying, Johannesen and Sterud [55] as well as Vedaa and colleagues [67] found no evidence for a reverse association. It should be noted that all three studies investigated the latter association in separate direction specific analyses rather than examining the normal and the reverse association simultaneously in a reciprocal cross-panel model. The lack of support for reverse causality in the included studies may be due to the low incidence of individuals suffering from insomnia diagnosis.

Only three studies examined associations between exposure to bullying and duration of sleep. In his study of Japanese employees, Giorgi [54] found a significant, but small, negative association between bullying and sleep duration ($r = -.08$; $p < .05$). Similarly, in two different studies of US adults, bullied respondents had a significantly higher risk of shorter sleep duration compared to non-bullied participants [56,63]. In the study by Slopen and Williams [63], the association between bullying and sleep duration was insignificant after adjusting for socioeconomic status, other forms of discrimination and several other stressors (e.g., financial strain, employment stress, acute events, and relationship stress).

The majority of the studies included confounding variables. The most commonly examined confounders were demographic characteristics (e.g., age, gender, and education), psychosocial work exposure (e.g., job demands and job control), lifestyle factors (e.g., BMI, smoking, and alcohol use), and health problems (e.g., anxiety depression, and somatic complaints). A general trend was that the magnitude of the association between bullying and sleep problems was attenuated with increasing number of control variables, possible due to over-adjustment [74].

Theoretical frameworks

Eight of the studies in the review included an explicit theoretical framework for explaining the association between exposure to workplace bullying and sleep problems (Table 3). Used in three studies, the cognitive activation theory of stress was the most common framework. Although the researchers may have had theoretical reasons for examining the associations between bullying and sleep, altogether 18 studies did not describe a specific theoretical framework explaining how bullying may relate to sleep problems. This may be due to the fact that several papers were published in epidemiological journals with strict word limits and that the authors therefore had to omit theoretical contributions and explanations and merely focus on presenting empirical findings. As the present review only aimed to provide an overview of the utilized theoretical frameworks, the reader should refer to the individual studies for a further explanation of the specific theoretical models.

Moderators and mediators

Table 4 provides an overview of the studies that examined potential mediators and moderators of the relationship between bullying and sleep problems, as well as their study designs. Of the five studies that examined mediators, four focused on the indirect effect through rumination and the related concept of worrying. Three of these found support for a mediating effect of rumination

Table 3
Overview of theoretical frameworks used in studies on workplace bullying and sleep.

Study	Theoretical framework used
Demsky et al. [69]	Perseverative Cognition Model of Stress
Fortunato & Harsh [70]	Hyper-responsivity hypothesis
Magee et al. [75]	Outcomes of workplace bullying model
Nabe-Nielsen et al. [34]	Conservation of Resources Cognitive Activation Theory of Stress Effort-Recovery model
Pererira et al. [52]	Need to belong theory
Rodriguez-Munoz et al. [44]	Cognitive Activation Theory of Stress
Rosario-Hernandez et al. [61]	Cognitive Activation Theory of Stress
Ziemska et al. [68]	General psychobiological stress model

Table 4
Moderators and mediators examined in studies on workplace bullying and sleep.

Study	Moderator(s) bullying - sleep	Mediator(s) bullying - sleep	Study design
Demsky et al. [69]	Psychological detachment relaxation	Negative work rumination	Cross-sectional
Fortunato & Harsh [70]	Positive and negative affectivity		Cross-sectional
Hansen et al. [41]	Leisure-time physical activity		Prospective
Lallukka et al. [53]	Gender		Prospective
Magee et al. [75]		Psychological distress	Cross-sectional
Pererira et al. [52]		Work related worries	Quantitative diary study
Rodriguez-Munoz et al. [44]		Worries and need for recovery	Cross-sectional
Rosario-Hernandez et al. [61]		Rumination	Cross-sectional
Sakurai et al. [72]	Employment type		Cross-sectional

[61,69] and worry [44], while one study did not find any indirect association through worry [52]. The latter study did not examine rumination. In another study on mediation effects, the findings showed that bullying had an indirect effect on sleep quality through psychological distress [75]. Finally, Rodriguez-Munoz and colleagues [44] showed that need for recovery mediated the impact of bullying on sleep. With exception of one study that employed a quantitative diary design, all studies on mediation used cross-sectional designs.

Four studies investigated moderating effects on the observed association between indicators of bullying and sleep problems. In a cross-sectional study of 467 US undergraduate students with work experience, Fortunato and Harsh [70] found that negative affectivity moderated the association between exposure to sustained workplace interpersonal conflict and five indicators of sleep problems (going to bed), falling asleep, maintaining sleep, reinitiating sleep, and waking up), whereas positive affectivity moderated the associations between conflict and falling asleep and reinitiating sleep. In a prospective study of Danish workers, Hansen and colleagues [41] found no moderating effect of leisure time physical activity on the association between workplace bullying and subsequent sleep problems. In a prospective study from Finland, the authors found no interactions between gender and workplace bullying with regard to sleep problems [53]. Finally, a cross-sectional study of 37,646 Japanese employees, which examined the moderating role of employment type, found that the relationship between sustained workplace interpersonal conflict and sleep was significantly stronger among temporary workers than among permanent employees [72]. The authors explained this finding by suggesting that temporary workers perceive interpersonal conflict as a greater threat to their job security when compared to permanent employers and that this kind of worrying influence sleep quality.

In the only study that investigated a moderated mediation model, the findings showed that the association between workplace incivility and increased insomnia symptoms via increased negative work rumination was moderated by recovery experiences [69]. Specifically, the association was weakest for employees reporting high levels of recovery during non-work time, thus indicating that recovery has a protective effect on the effects of incivility on sleep problems through rumination.

Meta-analysis

The main results from the meta-analysis are presented in Table 5. Ten studies from the qualitative synthesis did not include necessary information for the calculation of effect sizes and were excluded from the meta-analysis which comprised the 16 remaining studies. With regard to the cross-sectional association between bullying and sleep problems, fifteen independent effect sizes from 13 studies (N = 69,199) provided an overall average OR of 2.31 ($p < .001$; 95% CI 1.93–2.75), equaling a correlation of .22 (95%

Table 5
Meta-analytic findings on the magnitude of the association between workplace bullying and sleep problems (Random effects model).

Estimate	Subgroup	K	N	Mean OR	95% CI OR	r	95% CI r	95% PI r	Q _{within}	I ²	Tau	Tau ²
Cross-sectional studies		15	69,199	2.31	1.93–2.75	.22	.18–.27	-.39 – .70	141.57	90.1	.32	.10
	Men	3	5561	3.04	1.79–5.17	.29	.16–.41	-.87 – .96	10.55	81.0	.42	.18
	Women	3	11,762	2.55	1.50–4.33	.25	.11–.38	-.91 – .97	23.45	91.5	.45	.20
Prospective studies		6	26,164	1.62	1.00–2.63	.14	.02–.26	-.28 – .52	51.10	90.2	.56	.31

K= Number of effect sizes; N=Number of respondents; OR= Odds Ratio; 95% CI = 95% Confidence Interval; r = Pearson correlation; 95% PI = 95% Prediction Interval.

CI .18–.27). A forest plot of the cross-sectional estimates is displayed in Fig. 2. A sensitivity analysis removing one study at a time resulted in 15 point estimates (one for each removal) with point estimates ranging from 2.20 to 2.45. This result indicates that the association between bullying and sleep was not dependent upon a single study. A cumulative analysis by the year the included studies were published indicated high consistency in estimates. The studies had high levels of heterogeneity ($Q_{within} = 141.57$; $p < .001$; $I^2 = 90.10$). Orwin's Fail Safe N indicated that 45 missing studies with an effect size of zero are needed in order to reduce the OR to 1.2, whereas 12 missing studies with an effects size of zero are needed to reduce the OR to 1.5. A funnel plot indicated relative symmetry among the included studies, thus suggesting that the established estimate is comparable to the population effect. The Duval and Tweedie's trim and fill procedure indicated that there were no missing studies to the right or the left of the mean. Following Egger's regression test, the intercept was not significantly different from zero (Intercept = 1.34; Standard Error = 1.17; 95% CI -1.18 – 3.87), thereby indicating that the estimate is not likely to be influenced by potential publication bias.

Analyses of the six studies with prospective design gave an overall OR of 1.62 ($p < .001$; 95% CI 1.00–2.63). A forest plot of the

prospective estimates is displayed in Fig. 3. A moderator analyses showed that the overall estimate from the prospective studies was not statistically different from the overall effect size from the cross-sectional studies ($Q_{between} = 1.80$; $df = 1$; $p = .18$). Based on three cross-sectional studies, analyses of gender showed no significant differences ($Q_{between} = .22$; $df = 1$; $p = .64$) between men and women regarding the association between exposure to bullying and sleep problems (Table 5). With regard to assessment method, moderator analyses showed no significant differences in the magnitude of the association between bullying (11 estimates with multiple item and 6 with single item) and sleep problems (11 estimates with multiple item and 6 with single item) with regard to whether bullying ($Q_{between} = .64$; $df = 1$; $p = .43$) and sleep ($Q_{between} = 3.08$; $df = 1$; $p = .08$) were measured with multiple items or a single item. However, for both bullying and sleep, the confidence intervals were much smaller for the multiple items method than for the single item method, thus indicating that the former method provided a more precise estimate of the association. There were no significant differences in the strength of the association between bullying and sleep for estimates based on random (11 estimates) and non-random (6 estimates) samples ($Q_{between} = .02$; $df = 1$; $p = .97$).

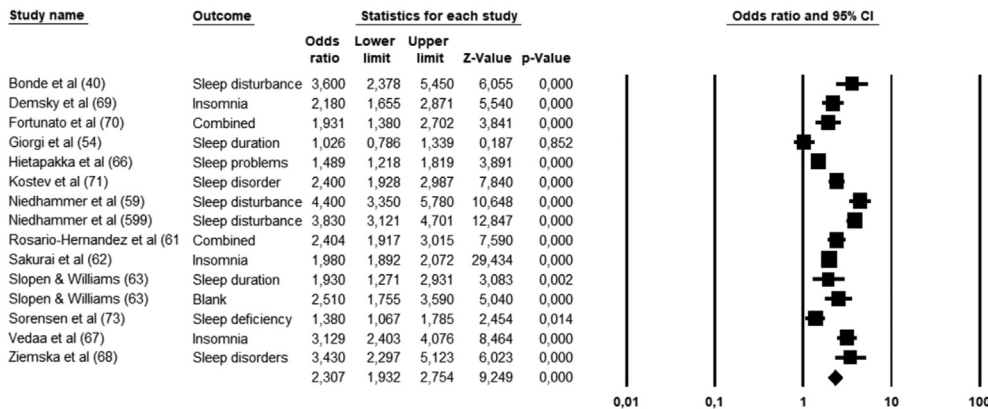


Fig. 2. Forest plot for cross-sectional estimates.

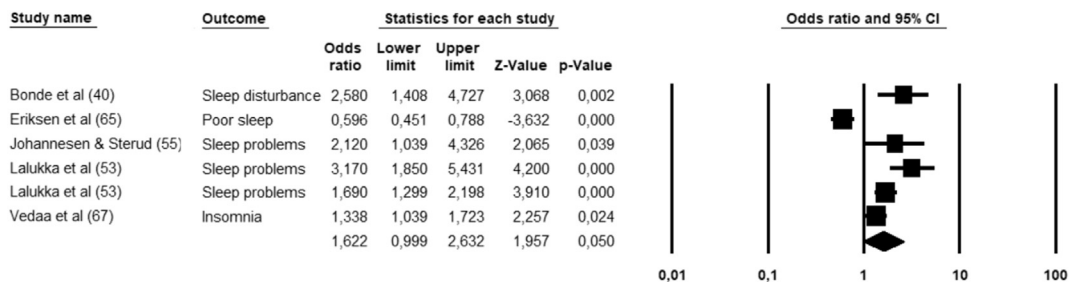


Fig. 3. Forest plot for prospective estimates.

Discussion

This systematic review and meta-analysis is the first to provide a thorough and systematic synthesis of research on the association between exposure to workplace bullying and reported sleep problems. Exposure to workplace bullying was significantly related to sleep problems in all identified studies, and the meta-analysis showed that targets of bullying had 2.13 higher odds for reporting sleep problems compared to non-bullied workers. Workplace bullying was also associated with shorter sleep duration in the three studies that included this outcome, although the magnitude of this association was small. The majority of the included studies were based on cross-sectional self-report designs based on non-randomized samples. In the separate analysis of prospective studies, the odds ratio for developing subsequent sleep problems following exposure to bullying was 1.62. This finding was, however, based on only six studies and the confidence intervals were relatively wide. Hence, although the findings from the individual studies were consistent, the likelihood for imprecision in measurement method and potential bias with regard to research design and sampling suggests that the quality of evidence for the association between workplace bullying and sleep problems can be rated as low to moderate according to the GRADE guidelines [37].

With some notable exceptions [53,55,63,65,67,72,73], the methodological quality of the reviewed studies were rated as low to moderate. One reason for the moderate quality was the overuse of cross-sectional research designs. While cross-sectional designs are beneficial for establishing prevalence rates and the overall magnitude of associations between variables, this kind of design does not allow for inferences about any directionality or causality. While the prospective studies in the present review pointed to bullying as a precursor for later sleep problems, these studies were also associated with methodological biases that limit their contribution. First, most of the studies employed long time lags between assessment of predictor and outcome (24–84 mo). As sleep problems may be an immediate or short-term response to strain and distress [76], long time lags between stressor and outcomes may preclude valid estimates of the relationships. A quantitative diary study with a day-to-day or week-to-week information, such as used by Pereira [52], would probably be more beneficial as this kind of design provides data on less stable fluctuations in moods and sleep. Another limitation of the identified prospective studies is that only three examined reciprocal relationships between bullying and sleep problems. Furthermore, none of these studies used a full panel design with all associations tested simultaneously. Although it has previously been claimed that reverse causation is unlikely in the relationship between workplace bullying and sleep [75], one should be careful dismissing sleep as a potential antecedent to perceived bullying. It is for example conceivable that workers suffering from loss of sleep and poor sleep quality have a lower threshold for interpreting experiences at the workplace as harassing and that they therefore have a higher likelihood for reporting negative episodes as bullying in a questionnaire survey. Alternatively, employees suffering from sleep problems, may be more easily frustrated and provoked and therefore behave or react in a manner that provoke others, e.g., being too tired to conduct work tasks properly. This may trigger aggression and bullying. Lack of sleep may also affect ones performance which again may lead to negative reactions from peers and superiors that may be perceived as or escalate into a bullying situation. Supporting the notion of sleep deprivation as a potential risk factor for bullying, recent experimental studies show that impaired sleep may lead to social isolation and withdrawal

[77]. Although these studies do not examine exposure to bullying (according to the definition given in the introduction), social isolation has been considered both as a form of, and as an outcome of, bullying [16,78].

Research on workplace bullying is in general characterized by a reliance on self-report methods [79]. Our review shows that this limitation is also typical in studies on bullying and sleep. Although self-report methods are cost-effective and easy to administer, this approach has several disadvantages such as being influenced by perceptions, moods, social desirability and common method bias. With regard to sleep, comparisons of self-report and objective indicators show that perceived sleep quality and quantity may be quite different from objective measures [80,81] and the use of subjective methods may therefore lead to both type I and/or type II errors, depending on the degree of misclassification.

Gaps in knowledge and suggestions for future research

The findings from the present review identify several gaps in the current knowledge about the relationship between bullying and sleep that should be addressed in future research. First, a comprehensive theory that can explain the impact of bullying on sleep is currently lacking. Such a theory would be important as a basis and a guide in future research as it could provide suggestions for research questions and hypotheses and explanations for how and why and under which circumstances specific events may lead to specific outcomes [33]. In this review, only eight studies provided an explicit a-priori theoretical framework for explaining the association between bullying and sleep. The utilized frameworks were mainly general stress theories rather than models tailored to explain the bullying-sleep relationship. Most of the theories identified in the search stem from the stress research field, whereas none seems to be thoroughly rooted within established sleep paradigms. Hence, upcoming research should address this issue by focusing on the development of sound theoretical models that can add to our understanding of how and when bullying relates to sleep problems and should bridge both stress and sleep perspectives. The cognitive activation theory of stress [82] was the most commonly utilized theoretical framework in the reviewed studies and further exploration of this model may be beneficial.

A theoretical framework will be especially beneficial with regard to detecting mediating and moderating variables in the relation between bullying and sleep. Of the 26 studies included in the current review, only nine included moderating or mediating variables. Hence, although we know that there is an association between exposure to bullying and sleep, there is a significant shortage of knowledge about the mechanisms that can explain the associations and the boundary conditions. To establish causality and a sound empirical and theoretical basis for the development of effective interventions to counteract the negative effects of being exposed to workplace bullying it is necessary to better understand the impact of third variables in the bullying process [33]. Determining such factors should therefore be a main objective in future research. Although dispositional trait variables such as personality and genetics may be important determinants of the impact of bullying on sleep, previous research on health outcomes of bullying indicate that individual dispositions do not protect against the detrimental impact of bullying in the manner one would expect [83,84]. Upcoming research should therefore also focus on organizational as well as situational factors as potential moderators of the bullying-sleep relationship.

As shown above, there is a shortage of knowledge about the possible reverse impact of sleep problems on subsequent risk of bullying and this association also needs to be addressed. This kind of relationship can be examined with several research designs. One approach is to use a quantitative diary study, preferably in combination with an objective assessment of sleep such as actigraphs, and examine whether respondents with sleep problems have a higher likelihood for reporting exposure to bullying the following day. The use of experimental approaches should also be called for, for example by examining differences in reactions to social exclusion among sleep deprived and rested test persons in the well-established Cyberball experimental set-up [85].

Limitations

Most of the identified studies were based on non-random sampling procedures, thereby limiting external validity. Thus, there is a need for further studies based on randomized and representative population samples with appropriate sample sizes in order to improve the external validity of research on bullying and sleep. Further, the majority of the associations between bullying and sleep reported in the primary studies was based on self-report data. This kind of data is prone to common method bias as well as response set bias such as expectations, previous experiences, or health status [86]. This may cause both non-differential and differential misclassification, resulting in under- and over-estimations of effects [87]. However, sleep data based on actigraphy, such as used in the study by Pereira and colleagues [52], can be regarded as unbiased. As all of the reviewed studies originated from Western or other industrial countries with relatively high living standards, the findings may further be biased by sociocultural factors.

While results from studies based on cross-sectional data cannot be used to account for cause and effect relationships, the findings on time-lagged data provide indications of the effects of bullying on sleep over time. While prospective data is considered as better than cross-sectional data, we included the latter in order to demonstrate an overall magnitude of the association between bullying and sleep, whereas the prospective data was used to determine directions of associations. As discussed above, the effect sizes found in prospective studies are influenced by the utilized time-lag between the measurement points [88]. Although it is likely that the effect of bullying on sleep are also immediate or at least short-term, most of the included prospective studies utilized a relatively long time-lag, hence there is a risk of bias in the estimate. Although it should be acknowledged that cross-sectional data has important limitations, such as unmeasured third variables, the simple knowledge that variables are associated, even without knowing the causal connections, is extremely valuable as a basis for theory and the target of intervention [89]. However, with regard to mediation effects, estimating a mediational model would per definition require a longitudinal design and cross-sectional designs thus provide very limited evidence for mediation effects [90]. It should therefore be highlighted that the cross-sectional studies on mediation included in this review should not be taken as evidence for an actual causal mediation process since they do not rule out alternative causal pathways. Nonetheless, despite their limitations, cross-sectional studies on mediation may at least indicate useful theoretical accounts of associations that can be further investigated in studies with more advanced designs. It should be noted that cross-sectional designs have important strengths with regard to detecting interaction effects, something which is difficult with prospective designs [91].

In most of the included studies subjective sleep quality was assessed by single items or sleep questionnaires, reflecting

retrospective reports of sleep. Studies have however shown low correspondence between such measures and objective assessment of sleep [2]. Further, retrospective subjective sleep assessment has been shown also to reflect other constructs, such as negative mood [92]. This should be kept in mind when interpreting the current findings, and futures studies on this topic should systematically use well-validated (preferably concurrent/prospective) measures of subjective sleep quality as well as objective (e.g., polysomnography) sleep assessment."

This review was limited to published papers in peer reviewed scientific journals, thus excluding grey literature in the form of unpublished studies and non-peer reviewed literature (e.g., reports). Although it has been suggested that researchers should aim at including unpublished literature in meta-analyses and systematic reviews, the inclusion of data from unpublished studies can itself introduce bias [93]. First, unpublished studies that can be located are likely to reflect an unrepresentative sample of all unpublished studies [93]. Secondly, unpublished studies may be of lower methodological quality than published studies. In a study of 60 meta-analyses that included published and unpublished studies it was found that unpublished studies were less likely to conceal intervention allocation adequately and to blind outcome assessments [94]. Hence, by only including peer-reviewed studies, the scientific quality of the included studies should be ensured at a minimum level at the same time being representative for the published literature on workplace bullying and sleep.

Conclusions and implications

While this systematic synthesis shows that exposure to bullying at the workplace relates to sleep problems, both cross-sectionally and over time, we have identified several knowledge gaps in the existing research literature as the nature, directionality, mechanisms, and conditions of the association are poorly understood. Future research should therefore provide a more in-depth examination of the "how" and "under which conditions" bullying relates to sleep, preferably using longitudinal research designs (e.g., diary studies) and objective measures of sleep quantity and quality.

The findings of the present review have important implications. The impact of bullying on subsequent increase in sleep problems indicates that preventions and measures against bullying could contribute to reduce the prevalence of sleep problems as well as costs related to impaired sleep and other health problems. However, as no studies have identified effective measures that can reduce the negative consequences of bullying on sleep or any other health outcome [95,96], additional investigations into broad-reaching interventions that can reduce both bullying and its detrimental outcomes are needed.

Practice points

1. Workplace bullying is a potential risk factor for developing and maintaining sleep problems.
2. The risk of sleep problems in relation to bullying is equal among genders.
3. General practitioners and occupational physicians should be aware of the role of workplace bullying in the development of sleep problems.
4. Measures and interventions against bullying at the workplace are needed.

Research agenda

1. Research on the association between bullying and sleep is limited.
2. Further studies are needed to establish the nature, directionality, mechanisms, and conditions of the association.
3. There is a need for a comprehensive theory that can explain the impact of bullying on sleep.
4. Studies should apply objective indicators of sleep, such as actigraphs and polysomnography, to determine the impact of workplace bullying.
5. To advance our knowledge on the association between bullying and sleep future studies should apply prospective designs, quantitative diary studies, or experimental designs.

Funding

This paper is a part of a project supported by the Norwegian Research Council – NFR (grant numbers 250127).

Conflicts of interest

The authors do not have any conflicts of interest to disclose.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.smrv.2020.101289>.

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