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Original article

Demographic, Lifestyle, and Physical Health Predictors of Sickness Absenteeism in Nursing: A Meta-Analysis

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ABSTRACT

Background: Sickness absenteeism is an area of concern in nursing and is more concerning given the recent impacts of the COVID-19 pandemic on healthcare. This study is one of two meta-analyses that examined sickness absenteeism in nursing. In this study, we examined demographic, lifestyle, and physical health predictors.

Methods: We reviewed five databases (CINAHL, ProQuest Allied, ProQuest database theses, PsycINFO, and PubMed) for our search. We registered the systematic review (CRD de-identified) and followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses. Additionally, we used the Population/Intervention/Comparison/Outcome Tool to improve our searches. Results: Following quality testing, 17 articles were used for quantitative synthesis. Female employees were at higher risks of sickness absenteeism than their male counterparts (OR = 1.73; 95% CI: 1.33–2.25). Nursing staff who rated their health as poor had a greater likelihood of experiencing sickness absence (OR = 1.38; 95% CI: 1.19-1.60). Also, previous sick leave predicted future leaves (OR = 3.35; 95% CI: 1.37–8.19). Moreover, experiencing musculoskeletal pain (OR = 2.41 95% CI: 1.77–3.27) increased the likelihood of sickness absence with greater odds when it is a back pain (OR = 3.05; 95% CI: 1.66–5.62). Increased age, physical activity, and sleep were not associated with sick leave.

Conclusion: Several variables were statistically associated with the occurrence of sickness absenteeism. One primary concern is the limited research in this area despite alarming rates of sick leave in healthcare. More research is required to identify predictors of sickness absence, and thereby, implement preventative measures.

1. Introduction

With increased demands on the healthcare sector, its employees' well-being remains an area of great challenge [1]. Unsurprisingly, sickness absenteeism is an area of utmost concern in healthcare, especially in the nursing population. Sickness absence is of particular importance, given the recent impacts of the COVID-19 pandemic on healthcare and has several negative implications on both the employee and the employer.

Concerning the employee, several observational studies revealed that prolonged sick leaves were strongly associated with future sick leaves [2,3]. A recent qualitative study supported this notion while adding a caveat that the cause of sick leave may change with time [4]. As an example, sick leave due to a physical injury could lead to a future sick leave due to a psychological disorder. From an organizational perspective, sickness absence is a costly issue that impacts service provision, leading to staff shortages and more sick leaves due to increased working demands [1]. This revolving issue may be exacerbated by new challenges such as COVID-19, where nursing staff, particularly those working in a hospital or long-term care settings, are at significant risk of

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exposure [5]. To this end, identifying the antecedents of sickness absenteeism among nursing personnel is critical.

While several studies examined sickness absence in the nursing population, conflicting findings were found between studies and may not help employers or policymakers. Furthermore, from our search, studies that synthesized the literature within this population did not apply statistical methods to quantify the magnitude of the identified antecedent concerning sickness absenteeism as the outcome. Through a quantitative synthesis of the extant literature, employers and policymakers would identify correlates of sickness absenteeism [6].

This undertaking serves as one study of a larger project that examined sickness absence using a biopsychosocial lens. Given this project's breadth, we focused on the demographic, lifestyle, and physical health factors related to sickness absenteeism in nursing in this study. In another study, we examined organizational and psychosocial predictors [7].

2. Methods

This systematic review is registered with the International Prospective Register of Systematic Reviews (PROSPERO; CRD42017071040). Databases were selected based on relevance to the nursing and healthcare population and graduate-level dissertations. To this end, we used CINAHL, ProQuest Allied, ProQuest database theses, PsycINFO, and PubMed as the databases for our search. Keyword searches were used for this review (Appendix A). A snowball strategy was used such that the references of the studies cited in the identified papers were examined. Furthermore, to support, structure, and enhance the search strategy, we used the Population/Intervention/Comparison/Outcome (PICO) tool [8]. The study followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to map and identify records [9].

We screened titles and abstracts of articles. Eligible studies had to be observational studies that examined predictors of sickness absenteeism among nursing staff, presented in English and were published between January 1990 and December 2019. Additionally, we examined unpublished papers to reduce the risk of publication bias. Articles that included other occupations with nursing staff were omitted unless the sample sizes and effect sizes of sickness absence were presented separately by occupation type. Despite their exclusion, we screened these studies to enhance our search further.

We included studies that statistically examined the antecedents of sickness absence among nursing personnel. In addition, we followed up with corresponding authors who published studies that fit our review criteria but did not offer sufficient statistical data. Studies were precluded when we did not receive a response. Two reviewers further examined studies that met initial screening criteria for quality review using two quality measures. First, we used the National Institutes of Health's Quality Assessment Tool for

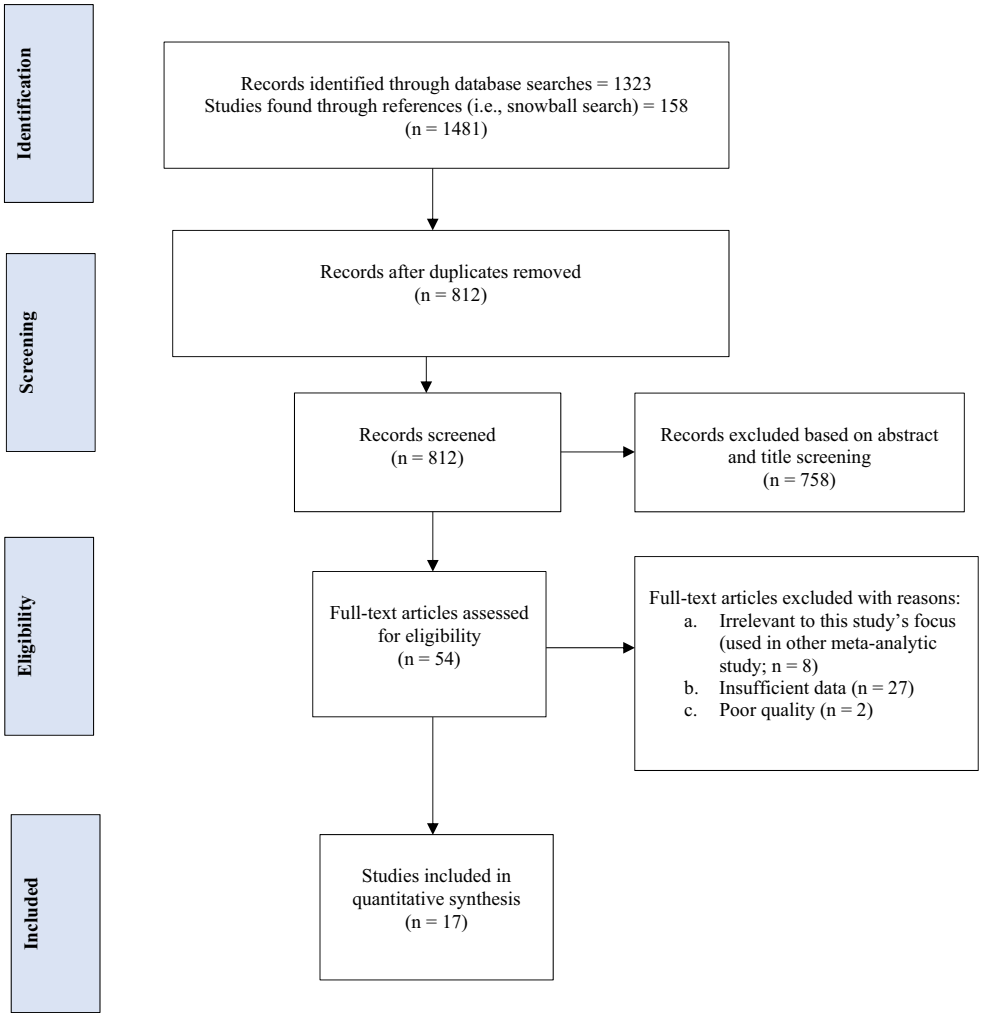

Fig. 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram of the inclusion process [9].

Observational Cohort and Cross-Sectional Studies [10]. An inter-rater reliability score of 83% was obtained by calculating the percentage consistency between the two raters. Inconsistencies were discussed in detail until a consensus was reached. The Strengthening the Reporting of Observational Studies in Epidemiology [11], a qualitative checklist, was also used to assist the reviewers with their quality assessment. Both tools evaluated risk bias and were rated as low risk by both reviewers for each study.

Adjusted odds ratios (ORs) and confidence intervals (CIs) were combined for three or more studies that reported statistical data on a predictive factor to sickness absence, and relative weights were calculated accordingly. Extracted data were imported to the software, Comprehensive Meta-analysis version 3.0 and were analyzed using a random-effects model [12,13]. We conducted follow-up heterogeneity testing using Cochrane Q and I^2 [14]. We used Cochrane Q to examine heterogeneity while the ratio of true heterogeneity to total observed variation was examined using I^2 percentages (low $\leq$25; moderate = 26–74; high $\geq$75) [12,13]. The Alpha level was set at 0.05 for all analyses.

3. Results

The initial search produced 1,323 studies with 158 additional studies from the snowballing method (n = 1481). Following the omission of duplicates, irrelevant studies, and studies with low quality, 17 studies were included for the quantitative synthesis. Please see the PRISMA figure for details (Fig. 1). Of those studies, 12 were cohort, and five were cross-sectional (Table 1). Over 80% of the studies were based out of Europe, 79% originated from Nordic countries. Other European studies included Greece, Netherlands, Spain, and England (21%). Two studies from the United States of America and one Brazilian-based study were also included. Participants were either nurses or nursing aides. The studies were carried out in various healthcare settings, including hospitals, community-based, and outpatient settings.

Statistical data were obtained for various variables that pertained to demographic information (i.e., age and sex), lifestyle information (i.e., sleep and physical activity), and physical health information (i.e., perceived general health, history of sick leave, and musculoskeletal pain). Among the 17 studies, 13 were classified as personal or lifestyle (Table 2, Figure 2). Five studies were pooled for the analysis of age. Notably, studies grouped age ranges differently. However, most studies' overall trend suggests that increased age predicts a higher risk of sickness absence. Most studies used the youngest age groups as points of reference (i.e., OR = 1). Of the five studies, one had 45+ as the oldest range; three had ages 50+ as the oldest range, while one study had 59+ as the oldest. Being 51+ years of age or older was not a significant predictor of sickness absence (OR = 1.03; 95% CI: 0.56–1.88). Female staff had a greater likelihood of sickness absence than male staff (OR = 1.73; 95% CI: 1.33–2.25). All pooled studies shared the same effect direction, with female nursing staff having higher odds of sickness absence. However, only two were statistically significant, and 1 neared statistical significance.

Table 1
Individual description of studies included in meta-analysis (N = 17)

First author, year	Study design	Origin	Participants & setting	Predictor(s)	Measure(s)	Risk bias
Alexopolous, 2011 [15]	Cross-sectional	Greece	N = 251 nurses; hospital	Age, perceived health	Survey	Low
Carneiro, 2008 [16]	Cross-sectional	Denmark	N = 3,121 nursing aides; elderly care settings	Sleep problems	National Survey	Low
Elstad, 2008 [17]	Cross-sectional	Nordic	N = 2,447 nursing aides; various setting	Age	Survey	Low
Eriksen, 2004(a) [18]	Cohort; three-month follow-up	Norway	N = 4,931 nursing aides; various settings	Age, perceived health, musculoskeletal pain	Survey	Low
Eriksen, 2002 [19]	Cohort; 15-month follow-up	Norway	N = 4,744 nursing aides; various settings	Physical activity	Survey	Low
Eriksen, 2003 [20]	Cohort; three-month follow-up	Norway	N = 4,931 nursing aides; various settings	Physical activity, perceived health, musculoskeletal pain	Survey	Low
Eriksen, 2004 [21]	Cohort; 15-month follow-up	Norway	N = 3,808 nursing aides; various settings	Musculoskeletal pain	Survey	Low
Ferreira, 2012 [22]	Cross-sectional	Brazil	N = 1,509 nurses and nursing aides; hospital	Sex, physical activity, sleep problems, perceived health, musculoskeletal pain	Survey	Low
Horneij, 2004* [23]	Cohort; 18-month follow-up	Sweden	N_1 = 443, N_2 = 274 female nursing aides; home-care	Musculoskeletal pain	Survey	Low
Jensen, 2010 [24]	Cohort; 12-month follow-up	Denmark	N = 1,724 female nursing aides; various settings	Musculoskeletal pain	Survey	Low
Nilsson, 2010 [25]	Cohort; three-year follow-up	Sweden	N = 196 nurses; hospital	Sleep problems, perceived health,	Survey	Low
Pompeii, 2010 [2]	Retrospective cohort: 13-year period	USA	N = 708 nurses and nursing aides; hospital/tertiary care	Physical activity, sleep problems, previous sick leave	Data	Low
Rauhala, 2006 [26]	Cohort; six-month follow-up	Finland	N = 877 nurses; hospital & wards	Age, sex	Survey	Low
Reis, 2003 [27]	Cross-sectional	Spain	N = 965 nurses and nursing aides; hospital	Sex	Database	Low
Rodriguez-Acosta, 2009 [28]	Retrospective cohort; seven-year period	USA	N = 6,771 nurses and nursing aides; hospital	Sex	Survey	Low
Roelen, 2013 [29]	Cohort; one-year follow-up	Norway	N = 1,582 nurses; hospital, nursing homes and ambulant care	Perceived health	Survey/SF-12	Low
Smedley, 1997 [30]	Cohort; ~19-month follow-up	England	N = 838 nurses; hospital	Age, musculoskeletal pain	Survey	Low

* Study Included Two Separate Samples.

Table 2
Demographic and lifestyle factors, and sickness absence

Demographic and lifestyle predictors					
Study	Odds ratio	Lower limit	Upper limit	*P*-value	Relative weight
Increased Age					
Alexopolous, 2011	1.84	1.09	3.11	0.02	19.76
Elstad, 2008	0.42	0.28	0.62	0.00	21.12
Eriksen 2004	1.68	1.00	2.82	0.05	19.86
Rauhala, 2006	1.41	1.04	1.93	0.03	21.87
Smedley, 1997	0.60	0.29	1.24	0.17	17.39
Overall Effect	**1.03**	**0.56**	**1.88**	**0.93**	
Female Employees					
Ferreira, 2012	1.85	1.15	2.97	0.01	30.97
Rauhala, 2006	1.60	0.67	3.84	0.29	9.12
Reis, 2003	1.59	1.09	2.31	0.02	49.42
Rodriguez-Acosta, 2009	2.20	0.97	4.97	0.06	10.50
Overall Effect	**1.73**	**1.32**	**2.25**	**0.00**	
Physical Activity					
Eriksen, 2002	0.83	0.73	0.95	0.01	41.22
Eriksen, 2003	0.57	0.40	0.82	0.00	24.56
Ferreira, 2012	1.31	0.77	2.23	0.32	15.68
Pompeii, 2010	0.86	0.54	1.37	0.53	18.55
Overall Effect	**0.82**	**0.63**	**1.06**	**0.13**	
Sleep Difficulty					
Carneiro, 2009	3.71	2.86	4.81	0.00	25.25
Ferreira, 2012	1.59	1.17	2.16	0.00	24.88
Nilsson, 2010	1.00	0.99	1.01	1.00	26.26
Pompeii, 2010	1.10	0.71	1.70	0.67	23.60
Overall Effect	**1.60**	**0.82**	**3.11**	**0.17**	

Table 3
Physical health variables and sickness absence

Physical health predictors					
Study	Odds ratio	Lower limit	Upper limit	*P*-value	Relative weight
Perceived Health					
Alexopolous, 2011	2.90	1.35	6.22	0.01	3.26
Eriksen, 2003	1.59	1.19	2.13	0.00	13.70
Eriksen, 2004	1.39	1.00	1.93	0.05	29.35
Ferreira, 2012	3.41	2.47	4.71	0.00	12.13
Nilsson, 2010	1.04	1.01	1.07	0.01	29.65
Roelen, 2013	1.08	1.04	1.12	0.00	29.65
Overall Effect	**1.38**	**1.19**	**1.59**	**0.00**	
Previous Sick Leave					
Horneij, 2004	6.40	3.97	10.31	0.00	35.56
Horneij, 2004(b)	3.30	1.33	8.18	0.01	28.10
Pompeii, 2010	1.80	1.18	2.75	0.01	36.34
Overall Effect	**3.35**	**1.37**	**8.19**	**0.01**	
Musculoskeletal Pain					
Eriksen, 2003	1.62	1.25	2.09	0.00	8.71
Eriksen, 2004	1.62	1.21	2.16	0.00	15.63
Eriksen, 2004	2.08	1.32	3.28	0.00	12.64
Ferreira, 2012	4.77	3.28	6.93	0.00	13.92
Horneij, 2004	1.89	1.21	2.97	0.01	12.67
Horneij, 2004(b)	4.45	1.26	15.68	0.02	4.40
Jensen, 2010	1.81	1.56	2.11	0.00	16.85
Smedley, 1997	7.30	3.50	15.21	0.00	8.71
Overall Effect **2.41**		**1.77**	**3.26**	**0.00**	
Musculoskeletal Pain (Back Only)					
Horneij, 2004	1.89	1.21	2.97	0.01	30.76
Horneij, 2004(b)	4.45	1.26	15.68	0.02	14.39
Eriksen, 2004	2.08	1.32	3.28	0.00	30.72
Smedley, 1997	7.30	3.50	15.21	0.00	24.13
Overall Effect **3.05**		**1.66**	**5.62**	**0.00**	

For physical activity and sleeping problems, data were obtained through surveys completed by the participants. Physical activity levels were examined in four different studies; however, they examined physical activity slightly differently. Three studies looked at the frequency of physical activity per week versus no physical activity. The fourth study looked at types of physical activity with "no physical activity." There was no evidence that physical activity influenced sickness absenteeism (OR = 0.82; 95% CI: 0.63–1.06). Similarly, there was no statistical correlation between sickness absence and sleep problems, described as either insomnia or difficulty sleeping at night (OR = 1.60; 95% CI: 0.82–3.11).

Overall, 11 studies were included in the examination of physical health factors as predictors. They include perceived health, history of sickness absence, and musculoskeletal pain. One study examined and analyzed two samples individually. Thus, 12 samples were pooled for meta-analytic computations. All physical factors presented were statistically predictive of sickness absence (Table 3, Figure 3). Nursing staff who rated their health as poor had a greater likelihood of experiencing sickness absence (OR = 1.38; 95% CI: 1.19–1.60). This finding was consistent across all pooled studies. Although only two studies were examined, one of which had two separate samples, these were pooled to examine how previous sick leave influenced future sickness absence. Results revealed a strong positive association between these variables. Specifically, overall effects suggest that the odds of experiencing sickness absence are up to 3.35 likely, in the event of previous certified sick leave (OR = 3.35; 95% CI: 1.37–8.19). Experiencing musculoskeletal pain was examined by pooling seven studies (8 samples). Overall effect results underlined that having musculoskeletal pain increased the likelihood of sickness absence by a factor of 2.41 (95% CI: 1.77–3.27). All studies in this analysis showed a significant association. Further analysis specific to back pain (n = 4), revealed greater odds of sickness absence (OR = 3.05; 95% CI: 1.66–5.62). Please see Figure 4 for overall effects.

It should be noted that the variable, poor health was highly heterogeneous ($Q = 9.02$). The percentage of the variability between studies due to heterogeneity was also high ($I^2 = 83\%$). Also, experiencing musculoskeletal pain was shown to have moderate levels of variability among studies ($I^2 = 35\%$) but not statistically heterogeneous ($Q = 10.77$). The remaining variables were not statistically heterogeneous (Table 4).

4. Discussion

This meta-analysis is one of two studies that statistically examined predictors of sickness absenteeism in nursing staff. This study focused on demographic, lifestyle, and physical health variables, and the other study focused on psychosocial and organizational variables. There was no evidence that older age influenced sickness absence. Increased age and injurious risks are somewhat inconclusive as per the literature [31]. With the physical demand of the profession, increased age may increase the risk of an injury; however, the experience is also gained, reducing injury risk. Thus, the noted inconsistencies among studies might not be simply due to age but due to the interaction between age and experience. However, work experience was markedly absent from the studies we examined.

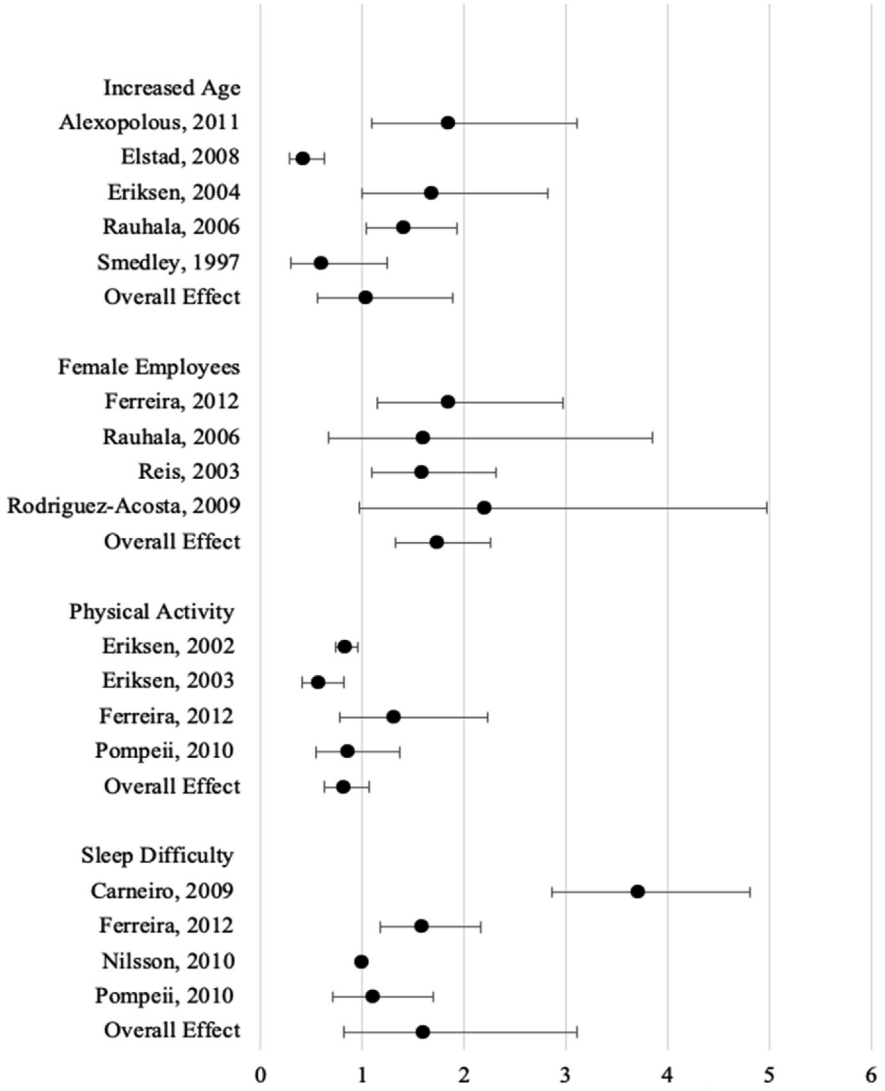

Fig. 2. Forest Plot Depicting Demographic and Lifestyle Variables and Sickness Absence.

Female nurses had greater odds of sickness absence than their male counterparts, which is a reasonably consistent predictor with other research [32]. One explanation that might explain this relationship could be tied to work-family conflicts [33]. Another explanation was attributed to the likelihood of reporting sickness absence. A Finnish study revealed that female staff had higher reports of poor physical functioning, diagnosed diseases, physical work demands, and fatigue than male staff [34]. However, the authors stated that this was not because female employees are at greater risk, but rather, they were more likely to report health concerns than men.

Contrary to our hypothesis, physical activity did not statistically influence sickness absence despite some studies in the pooled analysis revealed a relationship. However, some factors should be considered as we believe that physical activity may still play an indirect role in the health of nursing staff. In context, researchers found that increased physical self-care, which included physical activity and leisure time, did not reduce sickness absence but instead reduced the risk of occupational injuries [35]. Consequently, if injurious risks decrease, the likelihood of sickness absence may also decrease. Additionally, other factors related to physical activity, such as obesity, could contribute to high stress levels, musculoskeletal disorders, and ultimately, sickness absence [36]. Furthermore, the studies pooled in the analysis measured activity levels through self-reports, and therefore, there is the possibility of reporting biases. This bias is particularly common when reporting fitness and physical activity levels, where participants tend to either overreport or under-report their fitness levels.

Like physical activity, the impact of sleep on sickness absence was not statistically evident, which did not support our hypothesis. However, it should be noted that difficulty sleeping is only one of many issues related to sleep (e.g., too much sleep, difficulty staying awake). Like physical activity, “sleep issues” could be one of numerous interrelated elements that might lead to sickness absence. For instance, shiftwork is an unavoidable part of the nursing profession, which has been found to increase the likelihood of sickness absence [7]. In addition, other lifestyle choices such as self-medicating, including drinking alcohol and smoking, could be interrelated. For instance, a recent meta-analysis revealed that shiftwork, particularly working at night, is associated with binge drinking disorders [37]. The authors noted that this behaviour could be a form of self-medication or a method to deal with stress, which is associated with sickness absence among nursing staff [7,37]. Similarly, in an Australian cross-sectional study, results

revealed high-risk alcohol consumption and smoking were related to poor sleep [38].

Self-rated perceptions of general health were significant predictors of sickness absence. All studies that examined general health perception in this analysis indicated that the odds of sickness absence increased as self-rated health decreased. Although this finding might seem like a foregone conclusion, it confirms that nurses and nursing aides have a reasonably accurate rating of their health. However, given the level of heterogeneity in this variable, interpretations should be made with caution. The detected variability between studies could be due to how health perception was measured. Specifically, how the authors collected or defined poor health could have influenced the variability. Nevertheless, it is a variable worth consideration in the workplace, given its simplicity and applicability.

Equally robust in terms of predictive potential is a history of sick leave. The idea of the past predicting the future has found considerable support in other meta-analytic research, including other disciplines. Irrespective of the profession, similar trends have also been demonstrated [3,39]. For instance, a European study that sought to examine sickness absence among hospital staff discovered that sickness absence episodes in the past year predicted approximately 25% of future prolonged sickness absences and 30% within 2 years [3]. Thus, employers should monitor data on sick leave to better support their staff. By closely monitoring sickness absence spells, better detection of antecedents of sick leave, or perhaps, appropriate interventions could be implemented to reduce the risk of future sick leaves.

Fig. 4. Forest plot depicting the overall effect and confidence intervals per predictor.

Perhaps one of the more studied areas in the occupational health field is musculoskeletal pain. Unsurprisingly, suffering musculoskeletal disorders or recurrent pain statistically predicted sickness absence. This likelihood increases if the pain is located in the back region. With musculoskeletal disorders being well-studied in the nursing profession, researchers have been able to isolate

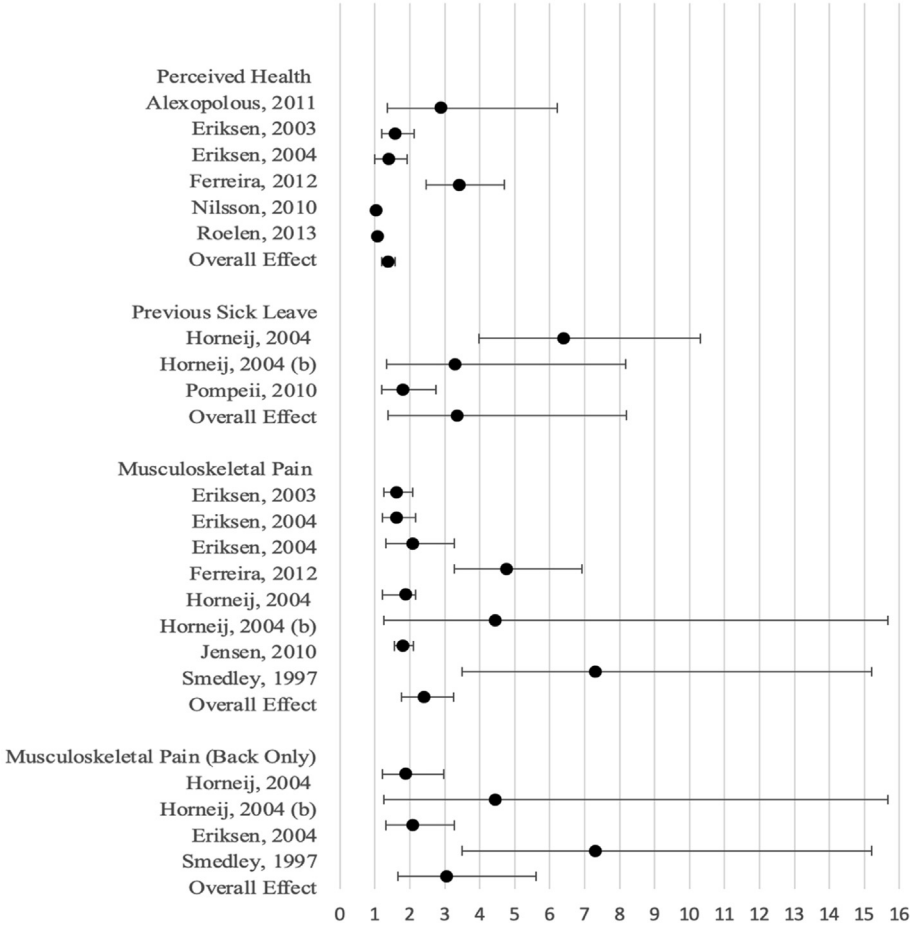

Fig. 3. Forest Plot Depicting Physical Health Variables and Sickness Absence.

Table 4
Analysis of heterogeneity using Cochrane Q and I^2

Variable	OR	CI lower limit	CI upper limit	P	Q df	Q	P	I^2
Age	1.03	0.56	1.88	0.93	4	3.77	0.44	0%
Female Employees	1.73	1.32	2.25	<.01	3	0.64	0.88	0%
Physical Activity	0.82	0.63	1.06	0.13	3	3.8	0.72	21.48%
Sleep Difficulty	1.60	0.82	3.11	0.17	3	2.34	0.31	0%
Poor Health Rating	1.38	1.19	1.59	<.01	5	29.02	<.01	82.77%
Previous Sick Leave	3.35	1.37	8.19	.01	2	1.39	0.50	0%
Musculoskeletal Pain	2.41	1.77	3.26	<.01	8	10.77	0.22	35.03%
Back Pain	3.05	1.66	5.62	<.01	3	3.29	0.35	8.82%

further the movements that could lead to further sickness absence among those with previous injuries. For instance, nurses and nursing aides who had a history of back pain and had trouble reaching overhead and bending at the waist were likely to experience time loss that amounted to eight days or longer [40].

With the increase in ergonomic research and technological advances, there have been improvements in how nursing personnel undertakes their daily duties that were once physically exerting. For instance, experimental studies within the nursing field demonstrated the effectiveness of using lifts during patient handling with promising results to reduce the risk of musculoskeletal pain and sickness absence [41]. However, some aspects of the nursing profession are unpredictable, especially with patient handling, which might lead the nursing staff to suddenly move or lift from awkward positions, leading to injury [42].

There are some limitations that should be addressed in this study. First, a common threat in knowledge synthesis is publication and search biases. To reduce these biases this risk, we used wide-ranging searches while also investigating unpublished research. Second, while the random-effects model was appropriate for this analysis, it is subject to a greater error with limited studies pooled into the analysis [13]. To mitigate this problem, we analyzed data based on a minimum of three pooled studies. Finally, our review's primary concern is the scarcity in recent studies that examined predictors of sickness absenteeism. Accordingly, more research in this area is required because of the significant health and fiscal implications of sickness absenteeism in healthcare. Additional research in this area is important considering that the labor laws and work duties are ever-changing in the healthcare sector. Next, it is understood that each organization operationalizes sickness absence and its duration differently. Therefore, unifying the definition and duration for research purposes could have favorable implications. Last, while examining studies collectively to quantify the likelihood of sickness absence was possible and informative, qualitative efforts need to address some of the extant literature gaps.

We believe that the results of this study are important to consider as the nursing population has been facing high rates of injuries, burnout, sick leaves, and intention to leave the profession. While these factors are not new to this sector, it is likely to have worsened globally amid the COVID-19 pandemic [43–45]. Unlike other sectors, disruptions to the healthcare system could affect service provision and further increase the costs associated with sickness absence and job turnover.

In conclusion, nurses and nursing aides are integral members of the healthcare system. Their work exposes them to physical and psychosocial risks, which can result in lost time from work. Female staff had higher odds of sickness absence than men; however, this could be due to reporting. Physical activity and sleep did not statistically impact the risk of sickness absence; however, employers and policymakers need to examine these factors, among other inter-related factors. Nursing staff who (1) describe their health as poor; (2) had previous sickness leaves; and/or (3) experienced musculoskeletal pain, especially back pain, are likely to experience sickness absence had greater odds of sick leave. Communicating with employers, nursing staff about their experiences could deepen our understanding of the risks they face and mediating factors that could interconnect and produce unfavorable outcomes. Furthermore, closely monitoring the well-being of those returning to the workplace could help reduce future absences.

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Conflicts of interest

None to declare.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.shaw.2021.07.006.

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