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The psychosocial work environment, musculoskeletal disorders and their functional consequences among pediatric healthcare providers

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Abstract

Objective: The goal of this study was to examine the association between aspects of the psychosocial work environment and prevalence of musculoskeletal disorders (MSDs) and associated functional consequences among pediatric healthcare providers.

Background: The psychosocial work demands make pediatric care providers susceptible to MSDs and subsequent functional consequences, but research on this at-risk group is lacking.

Methods: Randomly selected pediatric registered nurses, behavioral health specialists, and patient care assistants (N = 569) completed a survey assessing psychosocial factors, MSDs, and functional consequences (e.g., missing work). Logistic regression was used to assess associations between psychosocial factors and outcomes.

Results: The analysis yielded moderate-to-strong, significant associations between psychosocial environment factors and MSDs and their functional consequences. The odds of MSDs increased nearly three-fold in the highest quartile of the psychosocial summary score vs. the lowest (OR: 2.7, 95% CI: 1.6–4.5). The highest quartiles of the psychosocial environment measures were significantly associated with functional consequences of MSDs.

Conclusion: Results confirm knowledge about the association between the psychosocial environment and MSDs and demonstrates the association also exists among pediatric providers. Our study highlights the importance of studying the functional consequences of MSDs, which characterize the impact of MSD burden at work and elsewhere.

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Author contribution

All of the authors contributed significantly to the development and revision of this manuscript and have read and approve of the manuscript content. Francesca Macaluso formalized the research question, designed and carried out the present analysis, participated in the interpretation of the results and composed and edited the manuscript. Nancy Daraiseh served as the principal investigator of the study that provided data for this analysis and oversaw study design, data collection, and composition and editing of the manuscript. Maurizio Macaluso provided guidance on data analysis, interpreted results, and assisted with editing the manuscript. The authors declare no conflict of interest and have read and understood this journal's copyright guidelines.

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The authors declare no conflicts of interest.

Institution and Ethics approval and informed consent

The human subjects research protocol and informed consent for this project was reviewed and approved by the CCHMC institutional review board.

Keywords

Healthcare; Occupational injury; Environment; Functional consequences; Epidemiology; Pediatrics

Introduction

The hospital environment is hazardous and stressful. In 2001, the incidence of injury and illness per 100 full-time nursing staff was 7.5 times the national average [1]. In 2016, the United States Bureau of Labor Statistics reported that healthcare workers have one of the highest rates of occupational injury/illness with an incidence rate of 113.6 cases/10,000 full-time workers, compared to retail at 105.3 and manufacturing at 99.0 [2]. These statistics pertain to a large population of at-risk workers with more than eight million in the United States alone [3], as nurses and allied health clinicians comprise over one-quarter of the hospital workforce. Research has determined the distribution and type of injuries among healthcare providers. Although recent studies have examined injuries among pediatric healthcare workers [4-9], none have examined the impact of the work environment on occupational injuries. The dearth of research conducted on workplace injuries in pediatric hospitals fuels the inaccurate perception that pediatric healthcare workers are not exposed to the risks present in adult-care environments. However, research has shown that injuries among pediatric healthcare workers are not just comparable to adult rates, they are often higher [4,7,10,11], emphasizing the need for attention to the risk factors prevalent in this work environment.

The psychosocial environment

The psychosocial work environment can significantly impact worker health. Risks are particularly evident among nurses due to increasing emotional demands, decreasing commitment to the workplace, and low job satisfaction [12,13]. In one meta-analysis of 24 articles, researchers found significant associations between high psychosocial demands and prevalent low back, shoulder, and knee pain [14]. However, positive aspects of the psychosocial environment, such as management attention to worker safety, good communication among coworkers, and high job satisfaction are associated with lower injury rates and decreased stress levels [1,15].

We note that the research on this topic has previously been limited to nurses in adult care. Pediatric care providers deal with issues not always present in adult care that may impact the psychosocial environment. Increased (or absence) of family involvement, lack of consensus regarding pain management, and higher demand for assisting patients with eating, dressing, and using the bathroom, make pediatric care challenging in different ways than adult care [6,16]. Environments involving children are more stressful [13,17] and the emotional labor may have significant impact on the type and intensity of exposure to psychosocial aspects of the work environment. Thus, investigating the relationship between the pediatric psychosocial environment and MSDs is important and necessary.

Musculoskeletal disorders in healthcare

Physical work demands, combined with psychosocial work stressors, make healthcare providers especially susceptible to musculoskeletal disorders (MSDs) [14,18-21]. MSDs include both inflammatory and degenerative disorders that may affect tendons, joints, muscles, and nerves [22] and are strongly associated with worker absenteeism, one of the many costly functional consequences of workplace injury [14,23]. MSDs are also associated with presenteeism - referring to employees who are ill or injured but continue to go to work [24-27]. Interventions have focused on the biomechanical risk factors for MSDs. Strategies such as training programs, lifting teams, and lifting devices have reduced injury rates in some hospitals [28]. However, the etiology of MSDs is multifactorial and is not limited to physical risk factors [19,21].

Functional consequences

MSDs have immediate and long-term physical consequences but can often have an impact on other aspects of health and well-being. Functional consequences refer to the impact of work-related MSDs on lifestyle and habits [29,30]. Some functional consequences are readily recognizable, such as the use of pain medication to cope with symptoms or seeking a healthcare provider, while others impact the quality of life at work and elsewhere. Studies have found that individuals who experienced work-related MSDs are more likely to report reduced or modified work duties and diminished recreation [30,31].

Given the risks presented by MSDs to worker well-being, patient care, and the potential impact on quality of life at work and at home, we focused on the functional consequences of MSDs and their association with the psychosocial environment in the unique pediatric environment.

Methods

The study group consisted of randomly selected registered nurses (RNs), behavioral health specialists (BHSs), and patient care assistants (PCAs), working in a 700-bed, quaternary pediatric hospital. Participants were involved in a larger study examining the incidence of workplace injuries and near-misses [4]. All study activities were approved by the Institutional Review Board. All participants provided informed consent and received incentives for participation.

Participants completed the Nurses' Work Life Health Survey (NWHS) [32] modified to include BHSs and PCAs. Questions covered demographics (e.g. age, race, sex, education); job characteristics (e.g. shift type, length, role); MSDs; and 16 items assessing the psychosocial environment.

Assessing the psychosocial environment

The NWHS used the modified Job Content Questionnaire (JCQ), developed by Karasek and Theorell (1990) [33], the JCQ's supervision and peer-support domain [34], and items from the Nursing Work Index-Revised (NWI-R) [35] to assess the psychosocial work environment [36]. The NWHS was developed specifically for nurses and used extensively to

document their environment and its impact on their health and safety [30,37-39]. Although studies using the NWHS included nurses working in pediatric environments, they did not present analyses specific to pediatric healthcare workers. We used the General Nordic Questionnaire for Psychological and Social Factors (QPS Nordic) [40] framework for the psychosocial environment questions in the NWHS and categorized questions as 'task' level, 'social-organizational' level, or 'individual' level (Table 1). We chose the QPS Nordic model as a framework as it focused solely on the psychosocial work environment. Responses were on a 4-point Likert scale (strongly disagree=1, disagree=2, agree=3, or strongly agree=4). Higher values indicated a higher level of psychosocial environment demand.

We calculated Cronbach's alpha to validate the categories (task level α=0.7, social-organizational level α=0.9, individual level α=0.6), and to verify survey cohesion (overall α=0.8). Summary scores for the individual, task, and social-organizational level items were calculated for each participant, and we used the score quartiles to classify exposure as high demand-Q4, medium demand-Q3, low demand-Q2, with the lowest quartile Q1 the reference group.

MSDs and functional consequences

We calculated MSD prevalence using responses from the NWHS. Participants were asked about the frequency of neck, shoulder, and lower back problems experienced in the past 12 months: daily, 3-4 times/week, once/week, once/month, every 2-3 months, every 6 months, and never, and if MSDs resulted in any functional consequences. We defined an MSD as neck, shoulder, and lower-back pain experienced with a frequency equal to or greater than once/month (includes responses of daily, 3-4 times/week, and once/week). A functional consequence of an MSD was defined as an outcome that resulted in seeing a doctor, missing work, reducing work activity, reducing other non-work activity (e.g., housework), or reducing recreation (e.g. exercising).

To describe the sample, we employed simple univariate statistics and frequency distributions of demographic variables (age, sex, race/ethnicity, education, marital status, number of dependents, tobacco smoking status, and body mass index - BMI) and employment characteristics (years in current position, years at current institution, vacation days/year, hours worked/day, hours worked/week, number of breaks/work day, sick days/year, and work unit). We calculated means and 95% confidence intervals (CI) for the overall psychosocial environment score and for each subscale (task, social-organizational, and individual). We used one-way ANOVA models to examine variation in the mean scores by demographic and employment characteristics after confirming that the scores did not deviate from the normal distribution.

Odds ratios and their 95%CI were the main measures of association between psychosocial environment scales and outcome measures. The analysis of MSDs compared the odds of experiencing pain at least once/month with the odds of experiencing no pain or an MSD frequency of less than once/month, in each of the upper three quartiles of the psychosocial measures. Odds in the lowest quartile were considered the reference.

The analysis of functional consequences evaluated the frequency of any functional outcome (0, 1+) and of specific functional consequences. We compared the odds of experiencing a functional outcome in each of the upper three psychosocial demand quartiles (Q2-4) with the odds in the lowest reference quartile (Q1). We used logistic regression to estimate odds ratios and their 95%CI. Logistic regression models specified the dependent variable as a binary MSD or functional outcome and included the quartile of the score as the independent variable, either as a categorical variable to estimate category-specific odds ratios or as a continuous variable to assess the significance of the association in a linear trend test. Unadjusted models included only the score as the sole independent variable. Adjusted models included age, sex, race/ethnicity, and job group (RNs, BHSs, or PCAs) as covariates.

Results

The majority of participants (N = 569) were RNs (71.6%), followed by BHSs (13.9%), and PCAs (14.5%) (see Supplemental Tables A and B). About 75% were less than 35 years old and worked in their current position for 1-4 years (52.9%). Participants were primarily female (87.4%), White and non-Hispanic (83.4%), with at least a college education (79.9%). Over half had never been married (53.4%), with no dependents (60.6%), never smokers (81.5%), and a BMI of under 25 (50.5%). The majority worked 9-12 hours/day (58.5%) and at least 36 hours/week (57.3%).

Demographic and employment characteristics were significantly associated with psychosocial environment scores (see Supplemental Tables A and B). The mean overall score was highest among the 30-34 age group, among individuals with dependents, in their current position 5-9 years, and worked over 12 hours/day. Job type was not associated with mean overall psychosocial environment score, but mean task level score was highest among RNs.

The frequency of any MSDs differed significantly by job type ($p<0.0001$) while the frequency of functional consequences as a result of MSDs did not ($p>0.05$). Overall, over 56% of all participants reported experiencing MSDs at least once/month within the past 12 months. MSDs were most frequent among RNs (39.1%) and PCAs (32.9%). Overall, and by job type, the most prevalent functional consequence was reducing recreation (38.8%), and the least prevalent was missing work (5.4%). Nearly a quarter of participants reported seeing a doctor as a result of MSDs (24.4%).

The psychosocial environment, MSDs, and functional consequences

The overall, task, and social-organizational level scores were significantly associated with having any MSD at least once/month (Table 2). The odds of experiencing any type of MSD at least once/month were over 3 times greater among those in the highest quartile of overall psychosocial environment scores as compared to the lowest (AOR 3.3, 95%CI [1.8-5.8]); and were over 2 times greater (2.1, 1.2-3.7) among those in the highest quartile of task level (e.g., very little freedom to decide how I do my work) and social- organizational (2.1, 1.2-3.8) (e.g., my supervisor is concerned about the welfare of those on staff) compared to the lowest.

There was a statistically significant increasing trend in the odds of experiencing any type of MSD at least once/month across quartiles of individual level scores (e.g., my job security is good), but not significantly greater among the highest quartile of individual-level scores compared to the lowest.

Table 3 shows that overall psychosocial environment scores were significantly associated with reducing non-work activities and reducing recreation - over 2.5 times greater (2.7, 1.5-4.9) and over 3 times greater (3.1, 1.8-5.5) respectively in the highest quartile compared to the lowest. High quartile task level scores were significantly associated with each functional consequence: seeing a doctor (2.1, 1.1-4.0), missing work (3.6, 1.1-12.4), reducing work activities (3.3, 1.4-7.9), reducing non-work activities (3.2, 1.6-6.2), and reducing recreation (3.0, 1.7-5.4). Individual level scores were significantly associated reducing non-work activities at 3 times greater (3, 1.3-6.6) and over 2.5 times greater (2.6, 1.3-5.6) in the highest quartile compared to the lowest.

Discussion

Increased understanding of the relationship between risks and health consequences in a healthcare environment is necessary to improve the safety and well-being of healthcare providers that can significantly impact performance and patient care. However, assessing injury risk due to work-related factors does not go far enough. A broader examination of the impact of injury on workers' daily lives is needed. Our goal was to characterize the burden of MSDs in pediatric healthcare workers, a previously underrepresented population in occupational injury research. Additionally, we sought to examine the association between elements of the psychosocial environment and the prevalence of MSDs, and whether MSDs resulted in functional consequences such as missing work, reducing/modifying work duties, and reducing recreation. To our knowledge, this is the first study that documents these relationships among pediatric healthcare workers.

We found that a large proportion of pediatric healthcare workers experienced MSDs at least once/month that resulted in functional consequences impacting performance and well-being in and out of the workplace. Our results indicate that the odds of experiencing MSDs and their functional consequences were greater among those exposed to higher overall psychosocial environment work demands and its subscales of task, social-organizational, and individual demands. The uppermost levels revealed the highest odds of experiencing functional consequences.

These findings support the theory that there is an association between the psychosocial work environment and MSDs [18,23,41,42]. In a meta-analysis on the association between MSDs and the psychosocial environment, a few studies found statistically significant associations with specific injury types and psychosocial environment factors as found in this study [31]. In the past, it was thought that an individual's unique medical history and physical vulnerability could dictate which part of the body is affected by the physical and social demands from work [31]. Our analyses indicate that these associations hold independently from confounders of age, sex, and race/ethnicity.

Functional consequences such as worker absenteeism have been found to be significantly associated with back and upper-limb MSDs among adult-care nurses [30,43]. About 55% of our cohort experienced some type of functional consequence as a result of an MSD. However, individual functional consequences varied in frequency. Although over 56% of participants reported experiencing some kind of MSD at least once/month, only 5.4% reported missing work. In contrast, 24.4% of participants reported seeing a doctor, and 38.8% reported reducing recreational activities as a result of MSDs. Our findings suggest that while workers are experiencing symptoms frequent and severe enough to seek medical attention or modify aspects of their lives (reducing work and non-work activities and recreation), they are not missing work; instead, they come to work injured, indicating presenteeism [27]. This may be the result of the cultural aspects of healthcare [44] and more likely to occur in poorer psychosocial environments [45]. Injured workers may be more prone to errors and more likely to become re-injured at work [46-48].

The potential for functional consequences to impact quality of work and life/activities outside of work is worth further examination. Recent studies indicated a potential association between functional consequences and worker attrition [29]. Antonopoulou et al. [49] found that individuals with MSDs limiting physical activity reported lower quality of life. Given healthcare's continued struggle with understaffing and worker absenteeism, strategies for retaining nurses are important [30].

Several associations between psychosocial environment demands and work characteristics are worth noting (see Supplemental Tables A and B). Mean overall and task level scores were higher among individuals who worked 12 or more hours/day compared to those who worked 9-12 hours/day (12+/day = 2.15, 2.08-2.23; 9-12/day = 2.05, 2.02-2.07). There was a statistically significant increasing trend in social-organizational psychosocial environment score based on hours worked/week and vacation days taken/year - all potentially modifiable work characteristics that may lead to a reduction in MSDs.

In our initial analysis, the same percentile cut-off points in the Nordic QPS were used. However, the actual distribution of psychosocial environment scores in the data was much lower overall, making the QPS cut-off points inappropriate. Thus, we used score distribution quartiles to compare prevalence of pain and functional consequences in higher and lower psychosocial environment score categories. The generally lower mean psychosocial environment scores may be the result of a lower environment demand at this particular hospital. It could also be due to the relatively small number of questions (N = 16) used to assess psychosocial environment. However, the NWHS has been used extensively to document the health and safety environment of nurses [30,32] and results of factor analysis provide evidence of the scale's validity to estimate psychosocial environment demand. Additionally, our Cronbach's alpha for the overall psychosocial environment score was well within the acceptable range (α= 0.8), as well as for each sub-domain. As compared to the lowest quartile of scores, there were significant associations amongst the intermediate and the highest quartiles. These findings are important because they show that even in a hospital where the majority of participants reported relatively low overall psychosocial demands, the relationship we suspected holds true: there are greater odds of having MSDs among the highest demand group than the lowest.

We conducted this study in one hospital and therefore results may not be generalizable to other pediatric healthcare institutions. Furthermore, the institutional focus on safety and the high quality of patient care suggest that other pediatric hospitals may present more challenging environments for their providers. However, our large sample size (N = 569) and the variety of job types (RNs, PCAs, and BHSs) highlights the diversity of perceived psychosocial environment demands that could be expected within this type of study and supports the generalizability of the findings.

Conclusions

Given healthcare's constant struggle with understaffing and worker absenteeism, examining the psychosocial environment in the workplace can shed light on factors that may interfere with personnel retention, productivity, and quality of care and point to possible avenues for mitigation. The majority of participants reported comparatively low psychosocial demands, but the relationship we suspected holds: the likelihood of having MSDs is greatest for healthcare workers with the highest psychosocial demand. The results of our study further support the association between the psychosocial environment of a workplace and MSDs. Furthermore, not only is this the first study that observes this relationship in pediatric healthcare workers, but also the first to examine functional consequences in pediatric healthcare workers. Overall, the findings indicate that several modifiable characteristics of the work environment influence MSDs and their functional consequences, suggesting practical interventions for mitigation (e.g. increasing freedom on how work is completed, decreasing interruptions, improving supervisor support). With the burden of high prevalence of MSDs in the general population, understanding the resulting functional consequences associated with MSD pain may be more informative to the overall impact of the condition than merely the presence of pain.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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List of abbreviations

ANOVA	Analysis of Variance
AOR	Adjusted Odds Ratio
BHS	Behavioral Health Specialist
BMI	Body Mass Index
CI	Confidence Interval
MSDs	Musculoskeletal Disorders

NWHS	Nurses' Work Life Health Survey
OR	Odds Ratio
PCA	Patient Care Assistant
Q	Quartile
QPS Nordic	General Nordic Questionnaire for Psychological and Social Factors
RN	Registered Nurse

References

[1]. Stone PW, Gershon RR. Nurse work environments and occupational safety in intensive care units. Policy Politics Nurs Pract2006;7(4):240–7.

[2]. US Department of Labor. Bureau of Labor Statistics. News release: Lost-worktime injuries and illnesses: characteristics and resulting days ways from work, 2015. 2016; Available at: https://www.bls.gov/news.release/pdf/osh2.pdf.Accessed April 19, 2017.

[3]. Administration HRS. The US Health Workforce Chartbook—in Brief. The national center for workforce analysis; 2018.

[4]. Macaluso M, Summerville LA, Tabangin ME, Daraiseh NM. Enhancing the detection of injuries and near-misses among patient care staff in a large pediatric hospital. Scand J Work Environ Health2018;44(4):377–84. [PubMed: 29777614]

[5]. Ernst ME, Messmer PR, Franco M, Gonzalez JL. Nurses' job satisfaction, stress, and recognition in a pediatric setting. Pediatr Nurs2004;30(3):219–27. [PubMed: 15311648]

[6]. King PM, Gratz R, Scheuer G, Claffey A. The ergonomics of child care: conducting worksite analyses. Work1996;6(1):25–32. [PubMed: 24441427]

[7]. Haglund K, Kyle J, Finkelstein M. Pediatric safe patient handling. J Pediatr Nurs2010;25(2):98–107. [PubMed: 20185060]

[8]. Gillespie GL, Gates DM, Miller M, Howard PK. Violence against healthcare workers in a pediatric emergency department. Adv Emerg Nurs J2010;32(1):68–82.

[9]. Daraiseh NM, Summerville LA, Lin L, Tucker D, Hill AK, Salisbury K, et al.Selection of employee personal protective equipment based on aggressive behaviour in paediatric neuropsychiatry. Dev Neurorehab2016;21(1):32–9.

[10]. Boden LI, Sembajwe G, Tveito TH, Hashimoto D, Hopcia K, Kenwood C, et al.Occupational injuries among nurses and aides in a hospital setting. Am J Ind Med2012;55(2):117–26. [PubMed: 22025077]

[11]. Rodriguez-Acosta RL, Richardson DB, Lipscomb HJ, Chen JC, Dement JM, Myers DJ, et al.Occupational injuries among aides and nurses in acute care. Am J Ind Med2009;52(12):953–64. [PubMed: 19852018]

[12]. Li J, Fu H, Hu Y, Shang L, Wu Y, Kristensen TS, et al.Psychosocial work environment and intention to leave the nursing profession: results from the longitudinal Chinese NEXT study. Scand J Public Health2010;38(3_suppl):69–80. [PubMed: 21172773]

[13]. Ghaffari M, Alinaghizadeh H, Ghalichi L, Pournik O, Vingård E. Assessment of the psychosocial work environment among health care workers and its association with work and socioeconomic status. Arch Neurosci2017;3:1–13.

[14]. Bernal D, Campos-Serna J, Tobias A, Vargas-Prada S, Benavides FG, Serra C. Work-related psychosocial risk factors and musculoskeletal disorders in hospital nurses and nursing aides: a systematic review and meta-analysis. Int J Nurs Stud2015;52(2):635–48. [PubMed: 25480459]

[15]. Yassi A, Hancock T. Patient safety–worker safety: building a culture of safety to improve healthcare worker and patient well-being. Healthc Q20058Spec No:32–38.

[16]. Manworren RC. Pediatric nurses' knowledge and attitudes survey regarding pain. Pediatr Nurs2000;26(6):610–14. [PubMed: 12026363]

[17]. Czaja AS, Moss M, Mealer M. Symptoms of posttraumatic stress disorder among pediatric acute care nurses. J Pediatr Nurs2012;27(4):357–65. [PubMed: 22703683]

[18]. Gillen M, Yen IH, Trupin L, Swig L, Rugulies R, Mullen K, et al.The association of socioeconomic status and psychosocial and physical workplace factors with musculoskeletal injury in hospital workers. Am J Ind Med2007;50(4):245–60. [PubMed: 17311255]

[19]. Daraiseh N, Genaidy AM, Karwowski W, Davis LS, Stambough J, Huston RL. Musculoskeletal outcomes in multiple body regions and work effects among nurses: the effects of stressful and stimulating working conditions. Ergonomics2003;46(12):1178–99. [PubMed: 12933079]

[20]. Daraiseh NM, Cronin SN, Davis LS, Shell RL, Karwowski W. Low back symptoms among hospital nurses, associations to individual factors and pain in multiple body regions. Int J Ind Ergonom2010;40(1):19–24.

[21]. Harcombe H, Herbison GP, McBride D, Derrett S. Musculoskeletal disorders among nurses compared with two other occupational groups. Occup Med2014;64(8):601–7.

[22]. Punnett L, Wegman DH. Work-related musculoskeletal disorders: the epidemiologic evidence and the debate. J Electromyogr Kinesiol2004;14(1):13–23. [PubMed: 14759746]

[23]. Mehrdad R, Dennerlein JT, Haghighat M, Aminian O. Association between psychosocial factors and musculoskeletal symptoms among Iranian nurses. Am J Ind Med2010;53(10):1032–9. [PubMed: 20568267]

[24]. Russo A, Murphy C, Lessoway V, Berkowitz J. The prevalence of musculoskeletal symptoms among British Columbia sonographers. Appl Ergon2002;33(5):385–93. [PubMed: 12236647]

[25]. Queiroz-Lima ME, Serranheira F. Absenteeism and presenteeism costs from occupational accidents with WRMSDs in a Portuguese hospital. Dyna2016;83(196):27–30.

[26]. Campo M, Darragh AR, Work-related musculoskeletal disorders are associated with impaired presenteeism in allied health care professionals. J Occup Environ Med2012;54(1):64–70. [PubMed: 22157700]

[27]. Howard KJ, Howard JT, Smyth AF. The problem of absenteeism and presenteeism in the workplace. In: Handbook of occupational health and wellness. Springer; 2012. p. 151–79.

[28]. Trinkoff AM, Brady B, Nielsen K. Workplace prevention and musculoskeletal injuries in nurses. J Nurs Adm2003;33(3):153–8. [PubMed: 12629302]

[29]. Long MH, Johnston V, Bogossian F. Work-related upper quadrant musculoskeletal disorders in midwives, nurses and physicians: a systematic review of risk factors and functional consequences. Appl Ergon2012;43(3):455–67. [PubMed: 21851925]

[30]. Trinkoff AM, Lipscomb JA, Geiger-Brown J, Brady B. Musculoskeletal problems of the neck, shoulder, and back and functional consequences in nurses. Am J Ind Med2002;41(3):170–8. [PubMed: 11920961]

[31]. Hauke A, Flintrop J, Brun E, Rugulies R. The impact of work-related psychosocial stressors on the onset of musculoskeletal disorders in specific body regions: a review and meta-analysis of 54 longitudinal studies. Work Stress2011;25(3):243–56.

[32]. Brown JG, Trinkoff A, Rempher K, et al.Nurses' inclination to report work-related injuries: organizational, work-group, and individual factors associated with reporting. Am Assoc Occup Health Nurs J2005;53(5):213–17.

[33]. Karasek R, Tœ Theorell. Healthy work: stress, productivity, and the reconstruction of working life. New York: Basic Books; 1989.

[34]. Karasek R, Brisson C, Kawakami N, Houtman I, Bongers P, Amick B. The Job Content Questionnaire (JCQ): an instrument for internationally comparative assessments of psychosocial job characteristics. J Occup Health Psychol1998;3(4):322–55. [PubMed: 9805280]

[35]. Lake ET. Development of the practice environment scale of the Nursing Work Index. Res Nurs Health2002;25(3):176–88. [PubMed: 12015780]

[36]. Storr CL, Trinkoff AM, Anthony JC. Job strain and non-medical drug use. Drug Alcohol Dependence1999;55(1-2):45–51. [PubMed: 10402148]

[37]. Trinkoff AM, Zhou Q, Storr CL, Soeken KL. Workplace access, negative proscriptions, job strain, and substance use in registered nurses. Nurs Res2000;49(2):83–90. [PubMed: 10768584]

[38]. Trinkoff A, Geiger-Brown J, Brady B, Lipscomb J, Muntaner C. How long and how much are nurses now working?Am J Nurs2006;106(4):60–71 quiz 72.

[39]. Trinkoff AM, Le R, Geiger-Brown J, Lipscomb J, Lang G. Longitudinal relationship of work hours, mandatory overtime, and on-call to musculoskeletal problems in nurses. Am J Ind Med2006;49(11):964–71. [PubMed: 16691609]

[40]. Ørhede E, Hottinen V, Skogstad A, et al.User's guide for the QPSNordic: General Nordic Questionnaire for psychological and social factors at work. Nordic Council of Ministers; 2000.

[41]. Choobineh A, Movahed M, Tabatabaie SH, Kumashiro M. Perceived demands and musculoskeletal disorders in operating room nurses of Shiraz city hospitals. Ind Health2010;48(1):74–84. [PubMed: 20160411]

[42]. Deeney C, O'Sullivan L. Work related psychosocial risks and musculoskeletal disorders: potential risk factors, causation and evaluation methods. Work2009;34(2):239–48. [PubMed: 20037236]

[43]. Bartys S, Burton K, Main C. A prospective study of psychosocial risk factors and absence due to musculoskeletal disorders–implications for occupational screening. Occup Med (Lond)2005;55(5):375–9. [PubMed: 15827077]

[44]. Baldonedo-Mosteiro M, Sánchez-Zaballos M, Rodríguez-Díaz FJ, Herrero J, Mosteiro-Díaz MdP. Adaptation and validation of the Stanford Presenteeism Scale-6 in healthcare professionals. Int Nurs Rev2019.

[45]. Whysall Z, Bowden J, Hewitt M. Sickness presenteeism: measurement and management challenges. Ergonomics2018;61(3):341–54. [PubMed: 28791918]

[46]. Smedley J, Egger P, Cooper C, Coggon D. Prospective cohort study of predictors of incident low back pain in nurses. Br Med J1997;314(7089):1225. [PubMed: 9154024]

[47]. Smedley J, Inskip H, Trevelyan F, Buckle P, Cooper C, Coggon D. Risk factors for incident neck and shoulder pain in hospital nurses. Occup Environ Med2003;60(11):864–9. [PubMed: 14573717]

[48]. Luime JJ, Kuiper JI, Koes BW, Verhaar JA, Miedema HS, Burdorf A. Work-related risk factors for the incidence and recurrence of shoulder and neck complaints among nursing-home and elderly-care workers. Scand J Work Environ Health2004:279–86. [PubMed: 15458010]

[49]. Antonopoulou MD, Alegakis AK, Hadjipavlou AG, Lionis CD. Studying the association between musculoskeletal disorders, quality of life and mental health. A primary care pilot study in rural Crete, Greece. BMC Musculoskelet Disord2009;10:143. [PubMed: 19930570]

Table 1

NWHS Questions Assessing the Psychosocial Environment.

Task-Level	**In my job I have…** very little freedom to decide how I do my work a lot of say about what happens on my job tasks that are often interrupted before they can be completed enough time to get the job done to wait on work from other people or departments which often slows me down **In my job, I am…** not asked to do an excessive amount of work **My job…** requires working very hard requires working very fast
Social-Organizational Level	**My supervisor…** is concerned about the welfare of those on staff pays attention to what I am saying is helpful in getting the job done on the unit is successful in getting people to work together **My coworkers…** are competent in doing their job are friendly are helpful in getting the job done on the unit are good team members
Individual-Level	**In my job, I have…** a variety of different things to do an opportunity to develop my own special abilities **My job…** is very satisfying to me requires me to be creative security is good

Table 2

Association (Odds Ratios [OR] and 95% CI) Between Psychosocial Score Quartiles and MSDs.

Psychosocial Environment Scores	Odds of Experiencing Any MSD at Least Once/Month‡	
	FrequencyN (%)	Adjusted OR (95% CI)*
Overall†		†
Ref (Q1)	84 (50.0)	1.0
Low (Q2)	92 (55.8)	1.3 (0.8, 2.1)
Medium (Q3)	67 (51.9)	1.1 (0.7, 1.8)
High (Q4)	78 (72.9)	**3.3 (1.8, 5.8)**
Task Level†		†
Ref	67 (52.3)	1.0
Low	30 (37.5)	0.5 (0.3, 1.0)
Medium	137 (57.1)	1.1 (0.7, 1.7)
High	87 (71.9)	**2.1 (l.2, 3.7)**
Social-Organizational†		ns.
Ref	61 (50.0)	1.0
Low	93 (60.4)	1.5 (0.9, 2.6)
Medium	103 (53.7)	1.2 (0.7, 1.9)
High	64 (63.4)	**2.1 (1.2, 3.8)**
Individual†		†
Ref	159 (54.5)	1.0
Low	92 (55.1)	1.2 (0.8, 1.8)
Medium	46 (66.7)	1.8 (1.0, 3.2)
High	24 (58.5)	1.8 (0.8, 3.7)

ns, not significant.

*Adjusted by sex, race/ethnicity, age, and job type, some participants (N = 6) excluded due to missing demographic data.

†Test of null hypothesis of no association between scores and consequences (linear trend test); $P < .05$.

‡Includes: daily, 3–4 times/week, once/week frequencies.

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Table 3

Measures of Association (Adjusted and Unadjusted OR and 95% CI) Between Psychosocial Environment Score Quartiles and Functional Consequences.

Psychosocial Environment Scores[†]	Seeing a Doctor		Missing Work		Reducing Work Activities		Reducing Nonwork Activities		Reducing Recreation	
	Frequency N (%)	Adjusted OR (95% CI)[*]	Frequency N (%)	Adjusted OR (95% CI)[*]	Frequency N (%)	Adjusted OR (95% CI)[*]	Frequency N (%)	Adjusted OR (95% CI)[*]	Frequency N (%)	Adjusted OR (95% CI)[*]
Overall		ns		ns		ns		†		†
Ref	38 (22.6)	1.0	7 (4.2)	1.0	16 (9.5)	1.0	26 (15.5)	1.0	37 (22.0)	1.0
Low	35 (21.2)	0.9 (0.5, 1.6)	10 (6.1)	1.3 (0.5, 3.7)	20 (12.1)	1.3 (0.7, 2.7)	22 (13.3)	0.9 (0.5, 1.6)	38 (23.0)	1.1 (0.7, 1.9)
Medium	17 (l3.2)	0.5 (0.3, 1.0)	3 (2.3)	0.5 (0.1, 2.2)	12 (9.3)	1.0 (0.5, 2.3)	18 (14.0)	0.9 (0.4, 1.7)	32 (24.8)	1.3 (0.8, 2.3)
High	29 (26.9)	1.2 (0.6, 2.1)	10 (9.3)	1.9 (0.7, 5.4)	18 (16.7)	1.8 (0.9, 3.8)	35 (32.4)	**2.7 (1.5, 4.9)**	46 (42.6)	**3.1 (1.8, 5.5)**
Task		†		†		†		†		†
Ref	19 (14.8)	1.0	4 (3.1)	1.0	8 (6.3)	1.0	16 (12.5)	1.0	27 (21.1)	1.0
Low	17 (21.3)	1.5 (0.7, 3.2)	3 (3.8)	1.1 (0.2, 5.3)	7 (8.8)	1.5 (0.5, 4.2)	8 (10.0)	0.8 (0.3, 1.9)	12 (15.0)	0.7 (0.3, 1.4)
Medium	48 (20.0)	1.4 (0.8, 2.5)	11 (4.6)	1.9 (0.6, 6.5)	28 (11.7)	2.0 (0.9, 4.6)	35 (14.6)	1.1 (0.6, 2.1)	60 (25.0)	1.3 (0.7, 2.1)
High	35 (28.7)	**2.1 (1.1, 4.0)**	12 (9.8)	**3.6 (l.1, 12.4)**	23 (18.9)	**3.3 (1.4, 7.9)**	42 (34.4)	**3.2 (1.6, 6.3)**	54 (44.3)	**3.0 (1.7, 5.4)**
Social-Organizational		ns		ns		ns		ns		ns
Ref	25 (20.5)	1.0	3 (2.5)	1.0	14 (11.5)	1.0	23 (19.0)	1.0	31 (25.4)	1.0
Low	40 (26.0)	1.3 (0.7, 2.4)	10 (6.5)	2.7 (0.7, 10.5)	21 (13.6)	1.2 (0.6, 2.4)	27 (17.5)	0.9 (0.5, 1.7)	42 (27.3)	1.1 (0.6, 1.9)
Medium	34 (17.7)	0.8 (0.4, 1.5)	12 (6.3)	2.5 (0.7, 9.3)	18 (9.4)	0.8 (0.4, 1.7)	35 (18.2)	0.9 (0.5, 1.7)	46 (24.0)	1.0 (0.6, 1.7)
High	20 (19.8)	0.9 (0.5, 1.8)	5 (5.0)	1.6 (0.4, 7.1)	13 (12.9)	1.1 (0.5, 2.6)	16 (15.8)	0.8 (0.4, 1.7)	34 (33.7)	1.7 (0.9, 3.1)
Individual		ns		ns		ns		†		†
Ref	64 (21.9)	1.0	15 (5.1)	1.0	32 (11.0)	1.0	48 (16.4)	1.0	70 (24.0)	1.0
Low	26 (15.6)	0.7 (0.4, 1.1)	6 (3.6)	0.6 (0.2, 1.6)	19 (11.4)	1.1 (0.6, 2.0)	23 (13.8)	0.9 (0.5, 1.6)	40 (24.0)	1.2 (0.7, 1.8)
Medium	21 (30.0)	1.3 (0.7, 2.5)	3 (4.3)	0.7 (0.2, 2.6)	10 (14.3)	1.3 (0.6, 2.9)	17 (24.3)	1.7 (0.9, 3.2)	27 (38.6)	2.2 (1.2, 3.9)
High	8 (19.5)	0.8 (0.3, 2.0)	6 (14.6)	2.1 (0.7, 6.7)	5 (12.2)	1.0 (0.3, 3.0)	13 (31.7)	**3.0 (1.3, 6.6)**	16 (39.0)	**2.6 (1.3, 5.6)**

ns, not significant.

[*] Estimates adjusted by sex, race/ethnicity, age and job type, some participants (N = 6) excluded due to missing demographic data.

[†] Test of the null hypothesis of no association between the score and the outcome (linear trend test), P < .05.