

Self-reported noise exposure as a risk factor for long-term sickness absence

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INTRODUCTION

Little is known about the social consequences of occupational noise exposure, such as sickness absence. A number of studies show that noise exposure appears to have an impact on the well-being of the individual, which again can be construed as a precursor for long-term sickness absence i.e. ill physical or mental health. For example, evidence suggests that noise exposure is associated with physiological stress reactions (Evans & Johnson 2000; Waye et al. 2002) and self-reported stress (Morrison et al. 2003). In a study of noise effects in blue-collar workers Melamed and coworkers (Melamed et al. 1992) observed significant associations between noise levels and sickness absence in both men and women. In a study of the association of noise and sickness absence amongst white-collar employees exposed to relatively low noise levels (average 63 dBA) Fried and his colleagues (Fried et al. 2002) found a joint moderating effect of job complexity and gender on the relation between noise and sickness absence. These studies point to an association between occupational noise exposure and increased sickness absence. The purpose of the present article is therefore to investigate the relation between self-reported noise exposure and long-term sickness absence in the Danish working population aged 18 to 69.

METHODS

Population

This study is part of the project DWECS/DREAM, which is based on a merge between the Danish Work Environment Cohort Study (DWECS) and a national register, DREAM, on social transfer payments (Lund et al. 2005; Hjollund et al. 2007). DWECS features a random sample of 11,437 people living in Denmark, of which 8,583 (75 %) participated in interviews. Of these 5,357 were aged 18-69 and had worked as employees for at least two months prior to the baseline interview. This interview was conducted in 2000, and assessed exposure to noise and other work environment exposures, age, gender, education, family status, chronic disease, and health behavior. The cohort was followed up in the DREAM register from January 1st 2001 to June 30th 2002. DREAM contains weekly information on granted sickness absence compensation for all citizens in Denmark. Sickness absence compensation is given to the employer, who can apply for a refund from the State for employees after two weeks of sickness absence. However, the DREAM register contains no information on the health reasons on which sickness absence compensation is granted.

A total of 5,186 persons (96.8 %) without missing values on baseline risk factor variables were included in the study: 2,529 (48.8 %) women and 2,657 men (51.2 %). They were followed in DREAM for 78 weeks. People who died, emigrated or retired

were censored at the time of death, immigration or retirement, but were considered to be at risk until that time. Information about death, immigration and retirement was obtained from the DREAM register. Furthermore, as we analyze risk factors for the onset of long-term sickness absence, people were censored at first sickness absence spell.

Sickness absence

The outcome variable, sickness absence, was defined as two or more consecutive weeks of sickness absence in the follow-up period from January 1st 2001 to June 30th 2002.

Noise

Noise was assessed with the question “Are you exposed to noise so loud, that you have to raise your voice in order to talk with other people?” (response options: “Almost all the time”, “ $\frac{3}{4}$ of the time”, “ $\frac{1}{2}$ of the time”, “ $\frac{1}{4}$ of the time”, “rarely/very little” or “never”). The population is divided into four groups: “ $\frac{3}{4}$ to almost all the time”, “ $\frac{1}{4}$ to $\frac{1}{2}$ of the time”, “rarely/very little” and “never”.

Demographics, occupation, physical workload and health behavior

Employees provided information on age, gender, education (no high school degree and less than 3 years of vocational education; high school or 3–4 years of vocational education; university degree or > 4 years of vocational education), cohabitation (living alone/living with a partner), and children living at home (none, one child, two children, three or more children). The Body Mass Index (BMI) was calculated from self-reported information on weight and height ($BMI = kg/m^2$) and then categorized into underweight ($BMI < 18.5$), normal ($18.5–24.9$), overweight ($25–29.9$) and obesity ($BMI \geq 30$). Alcohol consumption was measured with a question regarding the number of units of alcohol per week and then categorized into (1) no consumption of alcohol, (2) moderate consumption (> 14 and 21 units of alcohol per week for women and men, respectively), and (3) heavy consumption (> 14/21 units of alcohol per week) in line with the guidelines of the Danish National Board of Health. Smoking status was assessed with a single item. The response options were current smoker, ex-smoker, and non-smoker. Leisure time physical activity was measured with a single item. The response options were: 0–2 h per week, 2–4 h per week, > 4 h per week or strenuous, > 4 h per week and strenuous. The occupational physical workload was measured with 5 indices covering lifting, pushing and pulling, and working with awkward body, arm or hand positions (Lund et al. 2006).

Analyses

In order to examine the relationship between self-reported noise at baseline and the onset of sickness absence during follow-up, the data were analyzed using the Cox proportional hazards model. Hazard ratios (HR) and 95 % confidence intervals (95 % CI) were calculated. Analyses were stratified by gender, and adjusted for age, education, cohabitation, children living at home, BMI, alcohol consumption and smoking status, and self-reported physical workload. Data were analyzed using SAS 9.

RESULTS

Table 1 shows hazard ratios and 95 % confidence intervals for onset of long-term sickness absence for women, and Table 2 shows the same results for men. The hazard ratios are adjusted for age, education, cohabitation, children living at home, BMI,

alcohol consumption, and smoking status (Model 1) and additionally adjusted for self-reported physical work environment (Model 2).

Table 1: Hazard ratios (HR) and 95 % confidence intervals (95 % CI) for the onset of long-term sickness absence in women during the 18 months of follow-up

Self-reported noise exposure	Total risk time	Events	Model 1		Model 2	
			HR*	95 % CI	HR*	95 % CI
More than 75 % of the time	358.81	67	1.38	 1.04-1.82 	1.04	0.77-1.40
Between 25 % and 75 % of the time	566.27	83	1.15	0.89-1.49	1.01	0.78-1.32
Rarely	742.15	94	1.03	0.80-1.32	0.99	0.77-1.27
Never	1643.73	196	1.00	-	1.00	-

* Hazard ratios in Model 1 are adjusted for age, education, cohabitation, children living at home, BMI, alcohol consumption, smoking status, and in Model 2 also for self-reported physical work environment exposure.

Women exposed to noise for more than three quarters of their working time had a 38 % (95 % CI: 4-82 %) increased risk of long-term sickness absence when adjusting for demographics and health behavior (Model 1). However, this association disappeared when further adjusting with self-reported physical workload (Model 2). In men those exposed to noise for more than three quarters of the working time had a 53 % (95 % CI: 11-110 %) increased risk of long-term sickness absence, when compared to the group who reported no noise exposure at their workplace. Increased risk was also seen for men who responded that they were rarely exposed to noise at work (61 %, 95 % CI: 26-105 %) or were exposed to noise between one quarter and three quarters of their time at work (107 %, 95 % CI: 62-163 %). As was the case for the results for women, further adjusting for physical workload reduced the risk estimates, but in contrast to women a significant association between noise exposure and sickness absence remained in the group that was rarely exposed (increased risk: 37 %, CI: 7-76 %) and the group exposed to noise between one quarter and three quarters of their time at work (increased risk: 43 %, CI: 10-85 %).

Table 2: Hazard ratios (HR) and 95 % confidence intervals (95 % CI) for the onset of long-term sickness absence in men during the 18 months of follow-up

Self-reported noise exposure	Total risk time	Events	Model 1		Model 2	
			HR*	95 % CI	HR*	95 % CI
More than 75 % of the time	344.65	55	1.53	 1.11-2.10 	0.87	0.61-1.23
Between 25 % and 75 % of the time	690.23	141	2.07	 1.41-2.32 	1.43	 1.10-1.85
Rarely	917.21	136	1.61	 1.16-1.89 	1.37	 1.07-1.76
Never	1508.15	128	1.00	-	1.00	-

* Hazard ratios in Model 1 are adjusted for age, education, cohabitation, children living at home, BMI, alcohol consumption, smoking status, and in Model 2 also for self-reported physical work environment exposure.

One explanation for the lack of increased risk in the group reporting the highest noise exposure may be a healthy worker effect. A second explanation may be that the use of hearing protection had confounded the association at the highest self-reported noise exposures, but not at lower levels.

The findings in the present study should be compared to those of Melamed et al. (1992) who identified a significant main effect of noise on sickness absence for both men and women. There are several possible explanations why our results differ in that we only find a significant effect for men: Firstly, the study of Melamed et al. (1992) focused on blue-collar workers while our study population contains both blue- and white-collar workers. Compared to men, women are more frequently employed in white-collar jobs, and less frequently in blue-collar jobs. In addition, our noise exposure metric is based on self-reporting of "loud noise" which may be perceived differently depending on the type of job you hold. These factors in combination may result in different observed associations between (self-reported) noise exposure and sickness absence. A second possible explanation pertains to differences in controlling confounders. We adjusted for various factors associated with lifestyle and health as well as physical workload. The results by Melamed et al. were not controlled for these potential confounders. Thirdly, the outcome measure in the study by Melamed et al. included both short-term and long-term sickness absence, while our analysis is based on sickness absence for at least 2 weeks. Short-term and long-term sickness absences probably have different etiologies, and short-term sickness absence could reflect coping behavior to a higher degree than long-term sickness absence.

CONCLUSIONS

This study demonstrated an association between self-reported noise exposure and long-term sickness absence for men but not for women, after controlling for individual demographic and occupational characteristics and characteristics related to individual health behavior. Given the fact that the analysis is prospective and that the outcome stems from another data source the study provides some evidence in support of a causal relationship, but confounding stemming from personality traits and psychosocial work environment factors cannot be completely ruled out. The results support the hypothesis of an association between noise exposure and sickness absence.

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