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Reference:

Mutambudzi Miriam, Theorell Toeres, Li Jian.- Job strain and long-term sickness absence from work : a ten-year prospective study in German working population
Journal of occupational and environmental medicine - ISSN 1076-2752 - 61:4(2019), p. 278-284
Full text (Publisher's DOI): <https://doi.org/10.1097/JOM.0000000000001525>
To cite this reference: <https://hdl.handle.net/10067/1619520151162165141>

Job strain and long-term sickness absence from work - a ten-year prospective study in German working population

Running Title: Job strain and sickness absence in German workers

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Conflict of Interest: Authors have no conflict of interests to report.

Funding: None

ABSTRACT

Objective: To examine the prospective associations between baseline job strain and ten-year cumulative incidence of long term sickness absence (LTSA) in the German workforce.

Methods: This study used longitudinal data from the 2001-2010 waves of The German Socio-Economic Panel (SOEP) (n = 9794). Kaplan-Meier survival curves and Cox proportional hazard regression models were used to examine the prospective association between job strain and incidence of LTSA.

Results: High strain (HR=1.28, 95%CI=1.12-1.46) and passive jobs (HR= 1.14, 95%CI=1.01-1.30) were significantly associated with LTSA after full adjustment for covariates, with greater risk in the older participants (>45) in passive (HR=1.33, 95%CI= 1.08-1.63) and high strain (HR=1.56, 95%CI=1.24-1.92) jobs.

Conclusions: Jobs with low control over work were associated with LTSA in German workers. More studies using longitudinal employment data, and more detailed job strain measures is warranted.

Key Words: Job strain, job control, long-term sickness absence, German workforce

INTRODUCTION

Long-term sickness absence (LTSA) is a major public health problem with detrimental direct and indirect health, and economic effects. It is often used as a measure of ill health and health services use among adults participating in the workforce.^{1,2} Previous studies have reported that adverse psychosocial work factors predict sickness absence.^{3–17} Several models have been used to assess the relationship between psychosocial work factors and LTSA^{3,4,10–16} including Karasek and Theorell's validated and widely used job strain model.^{18,19} The job strain hypothesis, is derived from the operational dimensions of psychological work demands and control over work.¹⁹ High strain jobs, which are characterized by high psychological demands and low control, are associated with adverse physiological and psychological health outcomes.^{14,19–24} Low strain jobs (low demands and high control) are often found to be protective of health, passive jobs (low demands and low control) are associated with various negative health outcomes,^{21,25} and active jobs (high demands and high control) are associated with reduced mortality, however they have also been found to increase the risk of sickness absence.^{6,26}

Evidence for the association between high job strain and LTSA in Europe and elsewhere has been inconsistent. Some studies have reported significant associations between job strain and sickness absence^{4,8,14,17,27} while other studies did not report similar findings.¹ A Finnish study found an association in participants of high socioeconomic status (SES) only.¹¹ In a multi-cohort study of working adults from France, Finland and the UK, high job strain was associated with sickness absence in women only.¹⁵ In a separate study, active jobs were significantly associated with LTSA in women only.⁶ Some studies however, have reported that high emotional demands and passive work are associated with sickness absence among men only.^{5,28,29}

Overall, the determinants of sickness absence differ between men and women.^{11,15,29–}

³³ Several studies have found higher levels of sickness absence in women for some mental and physical health conditions, and occupational factors,^{2,15,34–36} and others have not found gender variations.³¹ A Belgian study reported that the gender differences noted in the association between psychosocial factors and sickness absence were in part due to mediating factors.³⁷ One study found that the incidence of sickness absence due to common mental disorders was higher in women than in men, however the recurrence rate was similar. While gender differences in incidence and recurrence of sickness absence have been reported to persist even among college educated adults,^{38,39} one study did not show gender differences neither in attitudes towards sickness absence nor in sickness absence norms.⁴⁰

Gotz and colleagues, in a study using the German socio-economic panel data to examine the association between work stress using the Effort Reward Imbalance model (ERI) and sickness days assessed the following year found that high imbalance increased risk of sickness absence in women but not men. Further the associations remained after accounting for social position using variables that included education.⁴¹ Education has been reported to have a strong and independent association with sickness absence. Individuals with low education have been reported to have a greater risk of sickness absence.^{42,43} Some scholars have postulated that higher education may offer greater access to knowledge of positive health behaviors, career and opportunities, and better quality of health care.^{44,45} These factors may provide a health advantage that is protective of sickness absence.

Gotz et al also reported higher sick leave rates among older workers.⁴¹ Age differences in risk of sickness absence have been reported in other studies.^{17,44} As individuals grow older, they are at an increased risk of adverse health conditions, which may impact their work.¹⁷ An approximately 20% decline in work capacity reportedly occurs between the ages of 40-60 years, and may be accompanied with adverse occupational risk factors that have

accumulated over the working life, with resulting increased risk of illness and injury,^{44,46} resulting in sickness absence.

A study of sickness absence prevalence in 15 EU countries reported that Germany had one of the highest rates of sickness absence (18%), and ranked 13th out of the 15 countries observed.⁴⁷ There are however, limited findings describing the association between psychosocial work factors and LTSA in the German working population. Differences in labor force participation within EU countries^{48,49} and elsewhere,^{50,51} different national social security schemes and sick leave documenting systems,^{47,52} make it difficult to generalize research from other countries to Germany. Further, variations in regulations and LTSA case definition within the EU⁴⁷ raises concerns of generalizing research on LTSA from one EU country to another. An examination of the effects of job stress on LTSA in Germany is of great importance, as it will provide an understanding of the burden of the problem, and potentially indicate areas where workplace interventions, or policy, may be needed to effectively enhance public health efforts, working conditions, and reduce lost productivity for employers.⁴⁷

Given the inconclusive findings and the knowledge gaps that require attention in Germany, the objective of the current study was to examine the prospective associations between baseline job strain and ten-year cumulative incidence of LTSA, using a nationally representative sample of adults participating in the German workforce. We were also interested in examining age, gender, and education effect modification in this association. Research has indicated that effects of work psychological factors on sickness absence could be modified by these sociodemographic factors,^{14,27,41,53,54} which may be fundamental in describing the relationship between self-reported job strain and LTSA.

METHODS

Study sample: The German Socio-Economic Panel (SOEP) is a longitudinal panel dataset of the population in Germany. Initiated in 1984, this well-established longitudinal study of randomly selected household adults aged 18 years and over, follows participants annually.^{55,56} We used data from the release version of the SOEP for years 1984-2011, version 28 (DOI: 10.5684/soep.v28). The total SOEP sample size in 2001 was 22351 with a 92% response rate. Participants gave their informed consent prior to data collection. Compliant with national laws as well as evaluated and approved by the German Council of Science and Humanities (Wissenschaftsrat), the SOEP is ethically sound and explicitly intended for epidemiological analyses. All procedures contributing to this work adhered to the Declaration of Helsinki.

Inclusion and exclusion criteria: Participants were included in the study if they were 1) working at baseline in 2001 with complete data, and 2) followed up at least once over the next 10 years. There were 12566 participants employed in 2011. Of these, 11125 had complete baseline data on job strain, LTSA and relevant covariates, and a total of 10276 were followed up at least once over the study period (overall follow-up rate was 92%). To identify bias due to loss of participants during follow-up, we compared baseline characteristics of study participants who were followed up (N=10276) with those who were not (N=11125–10276=849). Relative to study participants, non-participants during follow-up were younger, less educated, more often male and single. Importantly, however, there were no systematic differences with regard to other characteristics including prevalence of job strain and LTSA in 2001. In order to minimize reverse causation, we excluded 482 participants with LTSA at baseline in 2001, leaving a final analytic sample of 9794 employees.

Approximately 11% of participants had incomplete data. These participants were more likely to be younger, less educated, single female, and in high strain jobs. We

conducted sensitivity analysis in which we included these participants after multiple imputation of the data. The magnitude, direction and strength of the association did not vary greatly before and after including participants with missing data. We therefore made the decision to focus on data from those with complete data.

Variables of Interest: Job strain in 2001 was our predictor variable of interest, and was defined using a modified version of job strain model. A quadrant job strain variable (low strain [reference category], active, passive, and high strain) was generated based on median cut-off points of psychological work demands and low work control. Participants were asked to rate on a 3-point Likert scale (applies completely, applies partly, applies not at all) questions about their current jobs psychological demands and control. Psychological demands were measured by two questions: 1) "Are your work hours unevenly distributed according to the workload?" 2) "Does your work involve a high level of psychological tension?" Job control was measured by five questions 1) "Is your work varied?" 2) "Do you often learn something new on the job, something which is relevant for your career?" 3) "Do you decide yourself how to complete the tasks involved in your work?" 4) "Is your work performance strictly monitored?" 5) "Do you have an influence in determining whether employees receive more pay or a promotion?"

LTSA was the outcome of interest which was assessed using 2001-2011 responses to the question: "Were you sick from work for more than six weeks at one time last year (yes/no)?" Though based on self-report, some reports have indicated good memory retention regarding LTSA in Germany, because of the significant decrease of sick pay after six weeks which is provided through the health insurance and not employer (see details below).⁵⁷

It is important to note that there is no single universally accepted definition of LTSA, however in Germany, it is defined as absence from work for more than six weeks with respect to specific sick pay schemes in this country. Short-term sickness absence (up to six

weeks) does not equate to income loss for employees in Germany, due to the fact that continuation of wage payments by employers for short-term sickness absence is mandatory by law.⁵⁷ After six weeks, the statutory long-term sick pay is switched to the Statutory Health Insurance where sick employees could receive 70% of foregone gross wages.⁵⁷

Additional baseline covariates of interest included age-group (based on tertile distribution), sex, marital status, education, smoking, sport (exercise), and self-rated health.

Statistical analyses: Descriptive statistics were conducted on baseline data. The incidence of LTSA over the study period was displayed using Kaplan-Meier survival curves. Failure was defined as the onset of self-reported LTSA between the 2001 and 2011 study waves. Participants were censored if they were lost to follow-up, reported LTSA, or if they were followed up through the 2011 wave without reporting LTSA. Cox proportional hazards regression analysis, which produced an estimate of the hazard ratio (HR) and 95% confidence interval (CI), was used to determine whether high job strain predicted LTSA, with adjustment for age, sex, marital status, and education at baseline as confounders, and with adjustment for potential mediators on the job strain – LTSA pathway, such as smoking, sport, and self-rated health at baseline. To examine potential effect modification by age, gender, and education in the survival analysis, we included an interaction term between job strain and these variables respectively in the fully adjusted Cox proportional hazards regression model. All analyses were conducted using SAS 9.2 (SAS Institute, Cary, NC, USA).

RESULTS

At baseline in 2001, the mean age was 39.4 years, 55% of the population was male, and average education length was 12.2 years. Prevalence of high strain jobs was 22.9%, compared to 19.2% low strain, 26.6% passive, and 31.9% active jobs. Table 1 presents the baseline study characteristics stratified by the job strain quadrants. Participants with high

strain jobs were more likely to be younger, women, single, less educated, and current smokers. In addition, those who rated their own health as poor, and those who participated in sports activities less than once a week were more likely to have high strain jobs.

Within the 10-year follow-up period (66208 person-years), 2175 new cases of LTSA were reported. The (crude) absolute incidence rates of LTSA per 1000 person-years were much higher among employees with high strain and passive jobs (39.57 and 36.02, respectively) than those with active and low strain jobs (28.12 and 29.37, respectively). Kaplan-Meier curves also indicated that high strain and passive jobs, both of which have low levels control, were the least favorable for LTSA (Figure 1). Overall there were significant differences in LTSA survival curves between the job strain quadrants ($\chi^2=43.59, p<0.001$).

Table 2 presents the prospective associations between job strain at baseline (2001 wave) and LTSA over a 10-year period. No association between active jobs and LTSA was observed. Passive jobs showed a significant association with LTSA in all models. After adjustment for demographic factors in model II, a 25% (95%CI=1.10-1.42) increased risk of LTSA with passive jobs was evident, however the association was attenuated after inclusion of education, smoking, sports activities and self-reported health. In the fully adjusted model, there was a 14% (95%CI=1.01-1.30) increased risk of LTSA with passive jobs. High strain jobs were significantly associated with LTSA incidence over a ten-year period. After full adjustment for all covariates, there was a 28% (95%CI=1.12-1.46) increased risk of LTSA in employees reporting high job strain.

To examine potential effect modification in the fully adjusted analyses, interactions between job strain, and the demographic factors age, gender, and education were tested. The interaction between job strain and age was the only significant finding ($p=0.02$), therefore we modeled age stratified cox proportional models, which are presented in Table 3. Among workers 35 years and younger, there was no significant association between job strain and

LTSA. Participants aged 36-45 with passive jobs, showed a 31% (95%CI=1.04-1.65) increased risk of LTSA in the crude model, however this was attenuated after adjustment for all covariates. Among those older than 45, an increase risk of LTSA with passive (HR=1.33, 95%CI= 1.08-1.63) and high strain (HR=1.56, 95%CI=1.24-1.92) jobs was observed.

DISCUSSION

Our study sought to assess the temporal relationship between baseline job strain and LTSA over 10-year follow-up period, and examine potential effect modification of demographic factors in this association, in the German workforce. Our findings corroborate several European reports that have found an association between job strain and LTSA.^{13-15,17,58} Specifically, and similar to previous findings, we found that high strain and passive jobs, both of which have low levels of control, were associated with an increased risk of LTSA.^{13,25,58}

Adverse health outcomes in jobs with low control, have been previously reported in assessments of varied health outcomes,^{21,59} and draws attention to the importance of the dimensions of control over work. Some scholars have noted that control may be a more important factor than psychological demands in the workplace.⁶⁰ Further, a systematic review of organizational interventions reported evidence of health benefits with increased employee control improved, while demands decreased resulted in improved health outcomes less consistently.⁶¹ Employees with greater job autonomy may view demands differently relative to those with low levels of control.⁶¹ Research has also indicated that increasing employee autonomy in a specific control dimension, particularly in employees with overall low work control may reduce level of stress.^{3,19,62,63} One study reported that more autonomy over work schedule alone mediated the relationship between job strain and sickness absence.³ Our

findings when taken in conjunction with current research suggest that a focus on aspects of job control may reduce LTSA and potentially increase organizational productivity.

It could be argued that the outcome long term sick leave may be particularly relevant for job strain since the symbolic trap associated with the combination of high demands and low decision latitude makes it particularly difficult to return to work. The concept *adjustment latitude* has been introduced corresponding to difficulties to change conditions that contribute to illness⁶⁴ and cause increased rates of sick leave.

Contrary to previous studies^{5,6,11,15,28} we did not find notable gender or SES differences. Results from our age stratified analysis however, indicated that older participants were at greater risk of LTSA with high strain and passive jobs. Two previous studies have reported similar results.^{41,65} As individuals age, they are at greater risk of adverse health outcomes, which are reported to increase sickness absence. One study examining 32 mental and chronic health conditions reported that almost all the conditions they assessed were associated with LTSA.⁶⁶ Conditions with the greatest association included cancer, stroke, and heart disease, the risk of which is known to increase with age.^{67,68}

Our study builds upon previous studies of psychosocial work factors and sickness absences,⁴¹ and fills an important knowledge gap through the use of longitudinal methodology approaches and examination of prolonged absences of 6 weeks or greater. To our knowledge, ours is the first study in Germany examining the prospective association between job strain and LTSA. Given the high rates of sickness absence, and high prevalence of job strain in some occupations,^{47,69} more research in German workers is warranted to better address this phenomenon.

Our findings should be considered in light of several limitations. Firstly, we used self-reported sickness absence data in lieu of registry data which is described as providing a more objective measure of LTSA.⁴⁷ Obtaining registry data from each respondent's workplace,

however would present bureaucratic obstacles and take a considerable amount of time. Challenges in obtaining complete sickness absence data has been previously reported.^{15,70} Moreover, the LTSA in our current report refers to all-cause LTSA. Cause-specific LTSA which has been reported in other studies is not available in the German SOEP study.⁵⁷ Secondly, the strength of the associations observed in our study is probably underestimated since potential mediators were controlled for in the analysis. Finally, we measured job strain at baseline only, and were therefore unable to assess effects of cumulative exposure to work related stress, or changes in working conditions. This would have enabled us to distinguish whether the results we observed were due to acute or chronic (cumulative disadvantage) stress over the occupational life-course.

Our study used a short modified version of the JDC model. Researchers have previously raised concerns about the predictive validity of shorter scales.⁷¹ It is possible that this may have impacted the robustness of our results, in particular when examining effect modification by gender. The literature reports gender differentials in the types of work demands men and women are susceptible to. Men are reportedly affected more by “quantitative demands” such as time pressure while women are more vulnerable to “qualitative demands” which may include emotionally demanding work.⁷² The constructs in our abridged scale, may not have been sufficiently comprehensive to capture these differences. Our overall study findings however were consistent with the literature, which supported evidence of adverse outcomes in participants with low control.

Despite these limitations, this study provides the first scientifically valid findings of the prospective association between job strain and LTSA in Germany. Our findings are strengthened by the use of a national, representative, longitudinal dataset with a large sample size, and low attrition. Prospective cohort studies assessing the relationship between job strain and LTSA in the German population are scarce, and our study partially addressed this

gap in the literature. Additional investigation with longitudinal employment data, and use of more detailed job strain measures for increased predictive validity is warranted.

ACCEPTED

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Figure legend

Table 1: Characteristics of study subjects at baseline, N (%)

Variables		Low strain	Active	Passive	High strain	p
		(N = 1881)	(N = 3130)	(N = 2600)	(N = 2183)	
Age	18-35 years	646 (18.16)	1018 (28.61)	1045 (29.37)	849 (23.86)	< 0.0001
	36-45 years	584 (18.75)	1082 (34.75)	756 (24.28)	692 (22.22)	
	>= 46 years	651 (20.85)	1030 (32.99)	799 (25.59)	642 (20.57)	
Sex	Men	909 (22.02)	2013 (25.31)	1217 (31.33)	1241 (21.34)	< 0.0001
	Women	972 (16.90)	1117 (37.42)	1383 (22.62)	942 (23.06)	
Marital status	Married	1262 (19.16)	2173 (32.99)	1705 (25.88)	1447 (21.97)	0.0001
	Single	484 (18.85)	734 (28.59)	732 (28.52)	617 (24.04)	
	Separated, divorced, widowed	135 (21.09)	223 (34.85)	163 (25.47)	119 (18.59)	
Education (years)	< 12 years of schooling	1055 (18.51)	1327 (23.28)	1915 (33.60)	1403 (24.61)	< 0.0001
	>= 12 years of schooling	826 (20.18)	1803 (40.04)	685 (16.73)	780 (19.05)	
Smoking	Non smoker	853 (19.70)	1341 (30.97)	1216 (28.08)	920 (21.25)	< 0.0001
	Former smoker	371 (19.28)	724 (37.63)	418 (21.73)	411 (21.36)	
	Current smoker	657 (18.56)	1065 (30.08)	966 (27.29)	852 (24.07)	
Regular sport	Never	717 (18.52)	1004 (25.93)	1268 (32.75)	883 (22.80)	< 0.0001
	Yes, less than once a week	472 (16.32)	1032 (35.68)	665 (22.99)	723 (25.01)	
	Yes, once a week or more	692 (22.84)	1094 (36.11)	667 (22.01)	577 (19.04)	
Self-rated health	Good	1766 (19.50)	2911 (32.14)	2409 (26.60)	1971 (21.76)	< 0.0001
	Poor	115 (15.60)	219 (29.72)	191 (25.92)	212 (28.76)	

Differences were determined by χ^2 test

Table 2: Prospective associations of job strain at baseline (2001 wave) with LTSA during subsequent 10 years (2002-2011 waves)

		Absolute incidence rate of LTSA (per 1000 person-years)	Model I	Model II	Model III	Model IV	Model V
			HR (95% CI)	HR (95% CI)	HR (95% CI)	HR (95% CI)	HR (95% CI)
Job strain	Low strain	29.37	1	1	1	1	1
	Active	28.12	0.96 (0.84, 1.09)	0.97 (0.85, 1.10)	1.01 (0.89, 1.15)	1.02 (0.90, 1.16)	1.01 (0.89, 1.15)
	Passive	36.02	1.22 (1.07, 1.38) **	1.25 (1.10, 1.42) ***	1.18 (1.04, 1.35) *	1.16 (1.02, 1.32) *	1.14 (1.01, 1.30) *
	High strain	39.57	1.34 (1.17, 1.52) ***	1.39 (1.22, 1.58) ***	1.35 (1.18, 1.54) ***	1.33 (1.17, 1.52) ***	1.28 (1.12, 1.46) ***

Cox regression, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Model I: non-adjustment

Model II: Model I + additional adjustment for age, sex and marital status at baseline

Model III: Model II + additional adjustment for education at baseline

Model IV: Model III + additional adjustment for smoking and sport at baseline

Model V: Model IV + additional adjustment for self-rated health at baseline

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Table 3: Prospective associations of job strain at baseline (2001 wave) with LTSA during subsequent 10 years (2002-2011 waves), stratified by age

				Crude HR (95% CI)	Adjusted HR (95% CI) #
Age	18-35 years	Job strain	Low strain	1	1
			Active	0.88 (0.69, 1.12)	0.92 (0.72, 1.17)
			Passive	0.95 (0.75, 1.20)	0.92 (0.72, 1.17)
			High strain	1.14 (0.90, 1.44)	1.09 (0.86, 1.38)
Age	36-45 years	Job strain	Low strain	1	1
			Active	0.95 (0.76, 1.19)	1.01 (0.80, 1.27)
			Passive	1.31 (1.04, 1.65) *	1.19 (0.94, 1.50)
			High strain	1.22 (0.96, 1.55)	1.15 (0.90, 1.46)
Age	>= 46 years	Job strain	Low strain	1	1
			Active	1.03 (0.84, 1.27) 1.46 (1.20, 1.79)	1.08 (0.88, 1.32)
			Passive	*** 1.71 (1.40, 2.10)	1.33 (1.08, 1.63) ** 1.56 (1.27, 1.92)
			High strain	***	***

Cox regression, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Adjustment for sex, marital status, education, smoking, sport, and self-rated health at baseline