

# Multilevel Analysis of Individual and Contextual Factors as Predictors of Return to Work

Merete Labriola, MPH

Thomas Lund, PhD

Karl B. Christensen, PhD

Tage S. Kristensen, DrMedSci

**Objective:** The objective of this study was to examine if individual and contextual levels of work environment factors predict return to work (RTW). **Methods:** Baseline data from 52 workplaces was linked to a national absence register. Four hundred twenty-eight persons with more than 2 weeks of sickness absence during a 2-year period were identified. Follow up was 1 year to examine three RTW outcomes. Multilevel logistic and Poisson regression models were used. **Results:** At the individual level, significant associations were found between one psychosocial and four physical factors and RTW within 4 weeks. Two physical factors predicted RTW within 1 year. Two psychosocial and two physical factors significantly prolonged duration of sickness absence. No significant contextual level risk factors were found. **Conclusion:** At the individual level, both the psychosocial and physical work environment factors are important independent predictors of RTW. (J Occup Environ Med. 2006;48:1181–1188)

Return to work during recovery after sickness absence benefits most workers.<sup>1</sup> Furthermore, the longer a worker is off work due to illness or injury, the less likely that person is to return to work (RTW).<sup>2–4</sup> Furthermore, work disability and RTW are not uniquely biomedical outcomes but are processes in a variety of social, psychologic, and economic factors not necessarily specific to the underlying or precipitating injury or illness.<sup>5–7</sup> The multifaceted nature of the RTW process is also reflected by the broad array of related determinants representing behavioral, sociodemographic, health-related, work environmental, and employment-related dimensions.<sup>5</sup> Concerning occupational factors, most studies conceptualize and measure working conditions as individual exposures, whereas only a few relatively recent studies have identified contextual exposures in terms of organizational-level risk factors affecting duration of sickness absence.<sup>8–11</sup> In the study by Galizzi and Boden of time to first RTW among 188,965 employees, a company size smaller than 50 employees versus more than 1000 was related to length of disability in a disability phase-specific way: for employees with periods of disability less than 30 days, time to first RTW was shorter if the company is small. The opposite applied if the disability period exceeded 30 days: large company size shortened time to first RTW. Amick et al found that duration of absence was shortened in companies comprising a workplace culture promoting an interpersonal and value-focused envi-

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From the National Institute of Occupational Health; Research Unit on Absence and Early Retirement, Copenhagen, Denmark.

Address correspondence to: Merete Labriola, MPH, National Institute of Occupational Health, Lerso Parkall, 105, DK-2100 Copenhagen, Denmark; E-mail: mla@ami.dk.

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DOI: 10.1097/01.jom.0000243359.52562.a5

ronment.<sup>9</sup> In the study by Lund et al, the risk of transition from employment to a combined measure of long-term sickness absence and disability pension was relatively smaller for employees in organizations scoring high on indices of “employee development” and “use of supplementary training.”<sup>12</sup> From a study on challenges for future RTW research, a conclusion was predictors of RTW originated from several levels from the “individual level” to “society level.”<sup>13</sup> These levels interact with each other in many ways and models of disability eventually need to describe these interactions qualitatively and quantitatively. Analytic methods to approach such complex relationships include, for example, path analyses and structural equation modeling for multistep processes as well as hierarchical regression modeling for multilevel analyses.<sup>5,13–15</sup>

This study aims to: 1) estimate the effects of physical and psychosocial work-environment risk factors on three RTW outcomes and 2) study the interaction between individual and contextual level risk factors on RTW. Furthermore, the potential effect of workplace size and employee attitude to sickness absence is studied.

## Materials and Methods

### Population

In this cohort study, national register data (DREAM) was used to identify the population of this study, a cohort of employees ( $n = 428$ ) who experienced sickness absence periods exceeding 2 weeks during 2 years of follow up. The persons were followed additionally 1 year after the onset of sickness absence to examine three RTW outcomes.

Baseline information was collected during Intervention Project on Absence and Well-being (IPAW). IPAW is a controlled intervention study with 5 years of follow up (intervention effects are not analyzed here). At baseline, 2716 employees at 52 workplaces received the questionnaire. A total of 2052 completed

the questionnaire (response rate 75.6%). A total of 442 (21.5%) respondents were found to have missing values on important baseline data and were excluded from this study. The remaining 1993 participants were clustered in 52 workplaces allowing analyses on individual and contextual level. A more detailed description on the rationale, design, study population, and measurements of IPAW can be found elsewhere.<sup>16,17</sup>

Baseline data were linked to the register database DREAM. DREAM is based on data from the Danish Ministry of Employment, the Ministry of Social Affairs, and the Ministry of Education. The register contains information on persons who have received any type of social transfer payment from the middle of 1991 and onward. Sick leave compensation is included from 1996 and is given to the employer, who can apply for a refund from the state for employees after 2 weeks of sickness absence. This implies that a person receiving sick leave compensation for a period of, eg, 2 weeks in DREAM will have experienced a period of (employer paid) sickness absence of 2 weeks before the record in DREAM.

Baseline data was gathered during the period from April 14, 1997, to April 14, 1999. These people were followed additionally 1 year after the onset of sickness absence to examine if they returned to work or not and to examine the duration of sickness absence.

### Variables

Three outcome variables were used in this study: 1) “RTW within four weeks of the onset of sickness absence,” 2) “RTW within one year of the onset of sickness absence,” and 3) “Duration of sickness absence.” People were taken to have returned to work on cessation of sickness absence benefit and receiving no other social transfer benefits for at least 1 week.

Additionally, employer attitude towards sickness absence was studied

as a potential determinant: four dichotomous items about work-related wrist pain, hangover, asthma, and the flu covered attitude to sickness absence. Response options were “go to work” or “have sickness absence.”

Workplace sizes were grouped in small (under 50 employees at baseline) and large (over 50 employees at baseline).

### Psychosocial Work Environment Risk Factors

Psychosocial workplace factors were measured by the Danish version<sup>18</sup> of the Whitehall II scales<sup>19</sup> on “psychologic demands,” “decision authority,” “skill discretion,” “co-worker social support,” and “supervisor social support.” To this battery were added two new scales on “meaning of work” and “predictability of work.” These two scales were developed and validated by Nielsen et al.<sup>16</sup> Also developed by Nielsen et al but not validated is a scale measuring “management quality.” The scale consists of five items with five response categories: “Is it reasonable to say that the closest management at your workplace,” “Values the employees and take individual considerations?,” “Makes sure that the individual employees have good development possibilities?,” “Gives high priority to planning of education and human resources?,” “Gives high priority to well-being at the workplace,” and “Puts efficiency higher than other considerations?” The five response categories were: “to a very high degree,” “to a high degree,” “partly,” “to a low degree,” and “to a very low degree.”

These factors were included as individual-level variables and were also aggregated to contextual-level variables by using mean scores on each variable for the employees at each workplace.

### Physical Work Environment Risk Factors

Physical work environment was measured by six questions on how

much of the daily working time one is exposed to “stooping work position,” “twisting the back,” “lifting more than 30 kg,” “pushing/pulling heavy burdens,” “full body vibration,” and “repeating the same job task many times per hour.” For each of these risk factors, the respondents were asked how often they occurred with six response categories ranking from “almost all the time” to “never.” Furthermore, the respondents were asked to rate the intensity of “physical activity at work” on a five-point scale ranging from “very light” to “very heavy.”

## Covariates

**Background Variables.** The study includes data on gender and baseline age of the individual employee. Data on family status were divided into the categories “single without children,” “couple without children,” “couple with children that all are seven years or older,” “couple with child below seven years (including those with older siblings),” and “single parent.”

The 52 workplaces are from three organizations: a major pharmaceutical company (production factories, packaging units, laboratories, can- teens, and cleaning departments), municipal workplaces in the care sector (nursing homes for the elderly and institutions for mentally handi- capped), and the technical services of the municipality (cemeteries, parks, workshops, sewage pumping sta- tions, road construction and repair, administrative offices), and were ei- ther assigned for later intervention, were control workplaces with low absence, or control workplaces with high absence.<sup>16</sup> The analyses are controlled for organization and inter- vention assignment.

**Health Behavior.** Smoking status was divided into three levels: current smokers, previous smokers, and never-smokers.

With regard to alcohol consump- tion, we asked the respondents to state the average number of drinks per week during the last year. Re-

spondents had the option to express this in number of 1) bottles of beer (33 cl), 2) glasses of wine, or 3) 2 cl amounts of strong liquor, and based on this information, we calculated number of units of alcohol per week.

Body mass index (BMI) from self- reported height and weight was calcu- lated by dividing weight in kilograms with squared height in meters.

**General Health.** The general health perceptions (GH) scale from SF-36 was used.<sup>20</sup>

## Analysis

RTW within 4 weeks of the onset of sickness absence and RTW within 1 year of the onset of sickness ab- sence are modeled using a multilevel logistic regression model:

$$\log\left(\frac{p_{ij}}{1 - p_{ij}}\right) = X_{ij1}\beta_1 + X_{ij2}\beta_2 + \dots + X_{ijk}\beta_k + u_j$$

$$u_j = Z_{j1}\delta_1 + X_{j2}\delta_2 + \dots + Z_{jp}\delta_p + \varepsilon_j$$

where the probability  $p_{ij}$  of RTW for individual  $i$  in workplace  $j$  depends on individual level covariates  $X_{ij1}, X_{ij2}, \dots, X_{ijk}$  (eg, gender and age) and of contextual level covariates  $Z_{j1}, Z_{j2}, \dots, Z_{jp}$  (eg, the mean level of influence at the workplace), and a random workplace effect  $\varepsilon_j$ , assumed to be normally distributed, is added.

Duration of sickness absence is modeled using a multilevel Poisson regression model:

$$\log(y_{ij}) = X_{ij1}\beta_1 + X_{ij2}\beta_2 + \dots + X_{ijk}\beta_k + u_j$$

$$u_j = Z_{j1}\delta_1 + X_{j2}\delta_2 + \dots + Z_{jp}\delta_p + \varepsilon_j$$

where the duration,  $n_{ij}$ , of long-term sickness absence for individual  $i$  in workplace  $j$  depends on individual- level covariates  $X_{ij1}, X_{ij2}, \dots, X_{ijk}$  and of contextual-level covariates  $Z_{j1}, Z_{j2}, \dots, Z_{jp}$  and a random work- place effect  $\varepsilon_j$ , assumed to be nor- mally distributed, is added.

These models take the clustered structure of the data into account and can be used to quantify the between workplace variation. Analyses are con-

trolled for background variables: age, family status, organization, and inter- vention assignment. Health behavior variables (smoking status, alcohol con- sumption, and BMI) and general health were included in independent steps be- cause they can be conceptualized as ei- ther confounders or mediators.

Analyses were not stratified by gen- der. All analyses were made using SAS V8.2. Multilevel regression mod- els were fitted using the GLIMMIX macro.<sup>21</sup>

All psychosocial scales are stan- dardized to have mean zero and standard deviation one in the study population. For the individual-level analysis, estimated odds ratios can thus be interpreted as the effect of an increase of one standard deviation, whereas for the contextual-level analysis, the effects can be inter- preted as the effect of an increase in the workplace mean of one standard deviation.

## Results

Of 428 employees who were sick- listed for more than 2 weeks, 367 (85.7%) returned to work within 1 year after the onset of sickness ab- sence. Of these, 186 (51%) returned within 4 weeks. The average dura- tion of sickness absence was 9.1 weeks (95% confidence interval = 7.9–10.3) and the median duration was 4 weeks. By examining partici- pation in later questionnaire rounds in the IPAW study and retirement dates from company registers of ab- sence, we determined that 315 (85.8%) of those returning returned to a job in the same organization.

### Outcome 1: ‘RTW within four weeks of the onset of sickness absence’

At the individual level, one psycho- social and four physical work environ- ment factors significantly decreased the chance of RTW after control for covariates, health behavior, and gen- eral health: low meaning of work, stooping or twisting the back, lifting

**TABLE 1**  
Predicting Return to Work Within 4 Wk: Individual Level

	Model I		Model II		Model III	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Psychosocial risk factors						
Low decision authority	1.02 (0.82–1.27)	0.86	1.05 (0.83–1.33)	0.68	1.09 (0.85–1.39)	0.50
Low skill discretion	0.81 (0.66–1.01)	0.06	0.80 (0.64–1.00)	0.06	0.83 (0.66–1.04)	0.10
High psychologic demands	0.96 (0.78–1.19)	0.74	0.96 (0.77–1.19)	0.69	0.93 (0.73–1.17)	0.53
Low coworker support	0.96 (0.77–1.18)	0.67	1.03 (0.82–1.29)	0.82	1.00 (0.79–1.26)	0.99
Low supervisor support	1.15 (0.93–1.43)	0.19	1.19 (0.95–1.50)	0.13	1.19 (0.94–1.51)	0.15
Low meaning of work	0.73 (0.59–0.91)	0.00	0.74 (0.58–0.93)	0.01	0.67 (0.52–0.86)	0.00
Low predictability	0.86 (0.69–1.07)	0.18	0.84 (0.66–1.06)	0.13	0.80 (0.63–1.02)	0.07
Low management quality	0.91 (0.73–1.13)	0.39	0.92 (0.73–1.17)	0.51	0.90 (0.70–1.16)	0.43
Physical risk factors						
Stooping work position	0.73 (0.59–0.91)	0.01	0.68 (0.54–0.87)	0.00	0.71 (0.55–0.92)	0.01
Twisting the back	0.81 (0.65–1.01)	0.06	0.78 (0.61–0.98)	0.04	0.75 (0.58–0.96)	0.03
Lifting more than 30 kg	0.79 (0.63–1.00)	0.06	0.76 (0.59–0.99)	0.05	0.78 (0.60–1.03)	0.08
Push/pull heavy burdens	0.84 (0.67–1.05)	0.13	0.80 (0.62–1.02)	0.07	0.84 (0.65–1.10)	0.21
Repetitive job tasks	0.74 (0.59–0.92)	0.01	0.73 (0.57–0.92)	0.01	0.74 (0.58–0.95)	0.02
Full body vibrations	0.98 (0.78–1.23)	0.89	1.06 (0.82–1.36)	0.67	1.07 (0.82–1.39)	0.63
Physical activity in work	1.02 (0.81–1.27)	0.89	0.98 (0.77–1.25)	0.86	0.96 (0.75–1.24)	0.76

Note: Model I is controlled for background variables. Model II is controlled for background variables and health behavior. Model III is controlled for background variables, health behavior, and general health.

OR indicates odds ratio; CI, confidence interval.

more than 30 kg, and reporting repetitive job tasks (Table 1).

One of the measures of attitude to sickness absence, “go to work with the flu,” showed a significant association with RTW within 4 weeks (odds ratio = 0.35; 95% confidence interval = 0.16–0.77;  $P = 0.01$ ) when controlled for covariates and health behavior (not shown).

### Outcome 2: ‘RTW one year after onset of sickness absence’

At the individual level, two physical work environment factors significantly decreased the chance of RTW after control for covariates, health behavior, and general health: being exposed to stooping work position and having repetitive job tasks (Table 2).

No significant associations between the four measures of attitude to sickness absence and RTW were found (not shown).

### Outcome 3: ‘Duration of sickness absence’

Individual levels of two psychosocial and two physical work environment factors significantly prolonged duration of sickness absence after

control for covariates, health behavior, and general health: low skill discretion, low meaning of work, lifting more than 30 kg, and pushing/pulling (Table 3).

No significant associations between the four measures of attitude to sickness absence and RTW were found.

There were no significant differences between small (<50) and large (>50) workplace size with respect to RTW or duration of sickness absence. At the contextual level, no significant risk factors were found to predict any of the three outcomes (not shown).

## Discussion

In this study based on questionnaire and register data, of 428 employees who were sick-listed for more than 2 weeks, 367 (85.7%) returned to work within 1 year after the onset of sickness absence. Of these, 315 (85.8%) returned to a job in the same organization. The mean duration of sickness absence was 9.1 weeks. The median duration was 4 weeks. At the individual level, one

psychosocial and four physical of the studied work environment factors decreased the chance of RTW within 4 weeks after onset of sickness absence. Also at the individual level, two of the studied physical work environment factors decreased the chance of RTW within 1 year after onset of sickness absence. Finally, at the individual level, both physical and psychosocial work environment factors significantly prolonged duration of sickness absence. When aggregated to contextual level, no significant risk factors were found.

No significant association between RTW and workplace size was found and no significant association was found between RTW and attitude to sickness absence on the individual level, except one item: “go to work with the flu” predicted RTW after 4 weeks. Finally, no significant associations were found between contextual level variables and any of the three RTW measures.

The longer time to first return to work the less work environment risk factors were associated with RTW.

**TABLE 2**  
Predicting Return to Work Within 1 Year: Individual Level

	Model I		Model II		Model III	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
<b>Psychosocial risk factors</b>						
Low decision authority	1.07 (0.79–1.44)	0.67	1.01 (0.74–1.36)	0.93	0.96 (0.69–1.34)	0.82
Low skill discretion	0.95 (0.70–1.29)	0.72	0.93 (0.67–1.28)	0.65	0.96 (0.69–1.34)	0.83
High psychologic demands	0.75 (0.55–1.02)	0.07	0.77 (0.56–1.07)	0.12	0.78 (0.55–1.09)	0.15
Low coworker support	0.98 (0.74–1.32)	0.91	0.97 (0.71–1.33)	0.86	0.96 (0.69–1.34)	0.81
Low supervisor support	1.10 (0.82–1.47)	0.53	1.06 (0.78–1.45)	0.70	1.07 (0.77–1.48)	0.69
Low meaning of work	0.99 (0.73–1.32)	0.92	0.96 (0.71–1.32)	0.82	0.95 (0.69–1.32)	0.78
Low predictability	1.02 (0.75–1.38)	0.91	0.95 (0.69–1.31)	0.75	0.95 (0.67–1.33)	0.75
Low management quality	1.18 (0.87–1.62)	0.29	1.10 (0.79–1.53)	0.58	1.04 (0.73–1.49)	0.82
<b>Physical risk factors</b>						
Stooping work position	0.67 (0.50–0.91)	0.01	0.70 (0.51–0.97)	0.03	0.68 (0.48–0.95)	0.03
Twisting the back	0.80 (0.56–1.07)	0.14	0.83 (0.60–1.15)	0.26	0.78 (0.56–1.10)	0.16
Lifting more than 30 kg	0.98 (0.72–1.34)	0.86	0.98 (0.69–1.37)	0.86	0.92 (0.64–1.31)	0.64
Push/pull heavy burdens	0.97 (0.72–1.32)	0.87	0.99 (0.71–1.39)	0.96	0.99 (0.69–1.42)	0.95
Repetitive job tasks	0.62 (0.46–0.85)	0.00	0.66 (0.47–0.91)	0.01	0.64 (0.45–0.91)	0.01
Full body vibrations	1.09 (0.78–1.53)	0.61	1.15 (0.77–1.70)	0.50	1.13 (0.75–1.70)	0.56
Physical activity in work	0.99 (0.71–1.36)	0.93	0.94 (0.67–1.33)	0.73	0.87 (0.61–1.25)	0.45

Note: Model I is controlled for background variables. Model II is controlled for background variables and health behavior. Model III is controlled for background variables, health behavior, and general health.  
OR indicates odds ratio; CI, confidence interval.

**TABLE 3**  
Predicting Duration of Sickness Absence—Individual Level

	Model I		Model II		Model III	
	OR (95% CI)	P	OR (95% CI)	P	RR (95% CI)	P
<b>Psychosocial risk factors</b>						
Low decision authority	0.93 (0.82–1.06)	0.30	0.92 (0.81–1.04)	0.19	0.92 (0.80–1.05)	0.22
Low skill discretion	1.13 (0.99–1.29)	0.07	1.15 (1.01–1.31)	0.04	1.15 (1.01–1.32)	0.04
High psychologic demands	0.98 (0.86–1.12)	0.81	1.02 (0.89–1.16)	0.79	1.03 (0.90–1.18)	0.68
Low coworker support	1.07 (0.94–1.22)	0.31	1.01 (0.88–1.16)	0.85	1.03 (0.89–1.19)	0.71
Low supervisor support	1.02 (0.89–1.16)	0.82	0.99 (0.87–1.13)	0.90	0.99 (0.86–1.13)	0.86
Low meaning of work	1.18 (1.03–1.35)	0.02	1.18 (1.04–1.35)	0.01	1.25 (1.09–1.44)	0.00
Low predictability	1.08 (0.95–1.24)	0.26	1.07 (0.94–1.23)	0.31	1.09 (0.95–1.26)	0.23
Low management quality	1.02 (0.88–1.17)	0.79	1.00 (0.87–1.15)	0.99	1.02 (0.88–1.18)	0.83
<b>Physical risk factors</b>						
Stooping work position	1.04 (0.92–1.19)	0.51	1.09 (0.96–1.25)	0.18	1.08 (0.94–1.25)	0.26
Twisting the back	1.09 (0.96–1.23)	0.19	1.10 (0.97–1.25)	0.14	1.12 (0.97–1.29)	0.12
Lifting more than 30 kg	1.24 (1.09–1.41)	0.00	1.29 (1.13–1.46)	0.00	1.29 (1.13–1.48)	0.00
Push/pull heavy burdens	1.15 (1.02–1.30)	0.02	1.20 (1.06–1.36)	0.01	1.18 (1.02–1.35)	0.02
Repetitive job tasks	1.08 (0.95–1.23)	0.24	1.11 (0.97–1.28)	0.14	1.09 (0.94–1.26)	0.26
Full body vibrations	1.03 (0.91–1.16)	0.67	1.03 (0.90–1.18)	0.62	1.02 (0.88–1.19)	0.78
Physical activity in work	1.05 (0.91–1.20)	0.51	1.09 (0.95–1.26)	0.22	1.08 (0.93–1.26)	0.31

Note: Model I is controlled for background variables. Model II is controlled for background variables and health behavior. Model III is controlled for background variables, health behavior, and general health.  
OR indicates odds ratio; CI, confidence interval; RR, relative risk.

**On Design**

Certain limitations of the study should be noticed. First, the information on exposure and outcome was collected at two points in time. This implies having no knowledge of processes and events taking place be-

tween baseline and follow up: important life events, changes in health or changes in work environment occurring after the baseline interviews are not taken into account, which could possibly dilute the results. Second, the exposure assessment is based on

point estimates: the duration of exposures was not measured.

The design also has several strengths: First, the study is based on a large cohort of employees in Denmark. Second, it is a prospective study over 3 years with a temporal

relationship between exposures and outcome allowing causal interpretation. Third, baseline was questionnaire-based, whereas outcome was established using register data; this eliminates possible common method variance and the related bias.<sup>22,23</sup> Finally, the study comprises information on both physical and psychosocial work environment exposures on individual and on the contextual level controlling for a variety of demographic and occupational variables as well as health behavior.

However, some residual confounding cannot be ruled out, because many workplace exposures were not measured.

Neither strength nor weakness is the fact that the cohort used in this study is not representative for the working population in Denmark but rather tend to represent occupational subgroups known to have an above average level of absence and also a lower RTW rate than the Danish population in general.<sup>24</sup> Therefore, the presented sickness absence incidence and RTW estimates are not representative for the population in general.

## On Measurements

Some researchers see RTW as a misleading indicator of the effectiveness of healthcare intervention, because RTW does not necessarily correlate with the health status of the worker.<sup>25</sup> However, it can be argued from an occupational healthcare perspective, that RTW should be considered an important primary outcome measure. The goal adopted in the area of RTW research is generally to achieve an early and safe RTW. In the case of this study, people were taken to have returned to work on cessation of sickness absence benefit and receiving no other social transfer benefits. In this study, 85.8% returned to a job in the same organization, but whether or not they returned safe to work without relapses is beyond the scope of this study.

## On Results of Individual-Level Risk Factors

In other studies, physical exposures are found to be predictors of sickness absence.<sup>12,26–30</sup> This study confirmed that some of the same exposures are also predictors for RTW within 4 weeks: stooping, twisting the back, lifting more than 30 kg, and repetitive job tasks. As could be expected, the work environment exposures lose their predictive abilities over time: the longer time to RTW, the fewer work environment exposures are significantly associated. Possible explanations for this could be the increasing importance of personal factors (health, financial – and family status, and so on), the longer the absence period. The study design does not allow insight in processes and events taking place between onset of sickness absence and RTW.

With regard to the effects of meaning of work, it is not possible to compare our results directly with other RTW studies. Meaning of work was found to be important in one qualitative study on return to work behaviors.<sup>31</sup> However, our study assessed whether the individual employee feels they perform an important job and are motivated and involved in their work, whereas Shaw et al addressed peoples perception and importance of work as a concept compared with other key personal and external factors.<sup>31</sup>

Skill discretion and RTW was studied in three studies; two studies based on populations with musculoskeletal diagnoses<sup>32,33</sup> and one representative cohort study.<sup>34</sup> The prospective study by van Duijn et al found that employees were more likely to return to modified work when they had a better mental health, had prolonged periods of standing in their regular job, and had less skill discretion. This study only includes participants with musculoskeletal complaints on sick leave for 2 to 6 weeks.<sup>32</sup> Another study on low back disability and RTW found that expectations of recovery and percep-

tion of health change was important. Also implicated, but to a lesser degree, were skill discretion at work.<sup>33</sup> Whereas this study measures skill discretion before onset of sickness absence, the studies by Duijn et al and Schultz et al measure skill discretion after onset of sickness absence: The employees' perception of their health can bias the assessments of working conditions. The representative cohort study by Janssen et al investigated work-related determinants of return to work and found that high skill discretion in combination with high job demands predicted return to working with adjustments in comparison with those not working.<sup>34</sup>

Physical exposures were found to prolong sickness absence to a higher extent than psychosocial exposures. One explanation can be lack of exposure contrast due to the relatively large proportion of blue collar workers in this study. This could influence the balance between effects of psychosocial and physical risk factors, because these are unequally distributed between jobs. Also, the present study features a relatively long follow-up period, which can water down the effects of certain psychosocial risk factors for cases occurring in the latter part of the 1-year follow-up period. Research has shown how specific variables are associated with certain time phases in the disability process and therefore also to certain phases in the absence process.<sup>35,36</sup>

## On Results of Contextual-Level Risk Factors

In the present study, no significant association was found between workplace size and any of the three outcomes. This is in contrast with the findings of Galizzi et al; time to first RTW was shorter if the company was small for employees with sick-time off shorter than 30 days, whereas the opposite was the case for sick-time off that exceeded 30 days: large company size shortened time to first RTW.<sup>11</sup> Importantly, the

present study only includes samples of workplaces with a maximum size of 280 employees, far smaller than in the study by Galizzi et al. For studies related to length of disability period in a disability phase-specific way, a larger difference between sizes of workplaces is preferable.

No significant effects between contextual-level variables and any of the RTW outcomes were found. The same contextual variables that have been found to predict onset of sickness absence thus does not predict RTW. Consequently, the interaction effects found in other studies between individual- and contextual-level variables and onset of long-term sickness absence<sup>37</sup> could not be found in relation to any of the three RTW measures in this study.

## Conclusion

Both the individual employees' exposures to psychosocial and physical work environment factors are important predictors of RTW, independently of sociodemographics, general health, and health behavior. The effects of work environment seem to be most pronounced in the early phase of sickness absence, suggesting that interventions aiming at promoting RTW in the later disability phases should take into account factors outside the work sphere.

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