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Workplace social capital and risk of long-term sickness absence. Are associations modified by occupational grade?

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Background: Workplace social capital (WSC) is an emerging topic among both work environment professionals and researchers. We examined (i) whether high WSC protected against risk of long-term sickness absence (LTSA) in a random sample of the Danish workforce during a 1-year follow-up and (ii) whether the association of WSC with sickness absence was modified by occupational grade. **Methods:** We measured WSC by self-report in a cohort of 3075 employees and linked responses to a national register of sickness absence. We calculated hazard ratios (HRs) and 95% confidence intervals (CIs) of onset of LTSA (≥21 days), adjusted for covariates. We stratified analyses by occupational grade and examined if there was an interaction effect of WSC and occupational grade. **Results:** A one standard deviation higher WSC score predicted a reduced risk of sickness absence after adjustment for sociodemographic variables, prevalent health problems and health behaviours (HR = 0.85, 95% CI = 0.74–0.99). The HR was attenuated and lost statistical significance after further adjustment for occupational grade (HR = 0.90, 95% CI = 0.78–1.04). When stratified by occupational grade, high WSC predicted a decreased risk of sickness absence among higher grade workers (HR = 0.61, 95% CI = 0.44–0.84) but not among lower grade workers (HR = 0.98, 95% CI = 0.83–1.15). The interaction effect of WSC and occupational grade was statistically significant (HR = 0.97, 95% CI = 0.95–0.99). **Conclusion:** High WSC might reduce risk of LTSA. However, the protective effect appears to be limited to workers of higher occupational grade.

Introduction

The term 'social capital' originated from debates in sociology and political science, in particular from the work by Bourdieu, Coleman and Putnam.[1–4] It entered the public health debate in the 1990s, when Wilkinson, Kawachi and others proposed that societies or groups with high social capital have better health than those with low social capital[5,6]. In this research, social capital is usually defined as a characteristic of social structures that encompasses high levels of trust, reciprocity and cohesion.[6]

Whether social capital is 'a good investment strategy for public health'[7] has been controversially discussed.[5–18] Proponents have argued that the marked differences in morbidity and mortality between high-income countries, between the 50 US-American states or between neighbourhoods might partly be explained by differences in social capital.[5,6,18] Opponents have questioned the empirical evidence,[8] doubted the theoretical concept[7,9,11] and raised suspicion about the political motives behind the rise of the concept in the scientific debate.[14]

Recently, 'workplace social capital' (WSC) has become a matter of interest in occupational health research, in particular in Finland and Denmark.[19–26] In 2011, The Danish Working Environment Council, which encompasses both employer and employee organisations and acts as an advisor to the government, published a guide defining WSC as the combination of mutual trust, justice and collaboration at work.[27] Based on scale validation analyses,[28] the council recommended the use of a 12-item questionnaire to be scored as a global scale for overall WSC and suggested that improving WSC would enhance employees' well-being, increase quality and productivity at work and decrease sickness absence.[27]

To our knowledge, no prospective Danish epidemiological study has yet been published in the peer-reviewed literature, examining whether high WSC indeed gives such results. Prospective epidemiological evidence on WSC is almost exclusively based on one study, the Finnish Public Sector study that found low WSC predicting risk of depression,[19] decline in self-rated health,[20] hypertension[21] and all-cause mortality.[22] Recently, a study on the prospective association of low WSC with increased risk of psychological distress among Japanese employees had been added to the literature.[29]

It has been argued that long-term sickness absence (LTSA) is a global measure of health,[30] although other factors than health may also contribute to LTSA.[31] We previously examined the prospective association of 18 psychosocial workplace factors with risk of LTSA in a random sample of the Danish workforce, the Copenhagen Psychosocial Questionnaire, version II study (COPSOQ-II study).[32] After adjustment for multiple testing, only two factors, emotional demands and role conflicts, predicted LTSA. We further found indications that the association between psychosocial workplace factors and LTSA differed by occupational grade. Although the dataset included measures of WSC, we did not examine the construct, because we felt that this new theoretical construct deserved a separate investigation.[32] To our knowledge, within the peer-reviewed literature, no prospective study has yet examined whether WSC is related to risk of LTSA.

The aim of this article is to re-visit the COPSOQ-II study and to test the hypothesis that high global WSC predicts a decreased risk of

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LTSA. Further, we examine whether the association of WSC with LTSA is different in workers of different occupational grades.

Methods

Study design and population

This is a prospective analysis linking survey data on WSC and covariates with register data on LTSA.

The survey data were collected in the COPSOQ-II study that is described in detail elsewhere.[32,33] Briefly, 8000 Danish residents, aged 20–60 years, were randomly selected from the Danish Centralized Civil Register, of which 7834 were eligible and received the questionnaire in autumn and winter 2004/2005. Of these, 4732 (60.4%) provided valid responses. Among the respondents, 3517 were employees and were selected for the data analyses. We excluded 225 participants with missing values on key variables and 193 participants with a LTSA spell in the 3 months preceding the completion of the questionnaire. Finally, we excluded 24 participants with onset of LTSA during the first 2 weeks of follow-up, as these participants might have been already ill when they filled in the questionnaire, yielding a final cohort of 3075 employees.

Measurement of WSC

The COPSOQ-II study included seven of the 12 WSC-items recommended by the Danish Working Environment Council,[27] including all of the three trust and of the three justice items, and one of the six collaboration items (see Supplementary Appendix). The responses were summed up and divided by the number of items, yielding a WSC score ranging from 0 to 100, with higher scores indicating higher WSC. Participants were included, if they responded to at least four of the seven items. The Cronbach's alpha of the WSC scale was 0.89, and a factor analysis showed one global factor with an eigenvalue of 3.97.

Measurement of LTSA

We defined LTSA as a sickness absence period of 3 weeks or more. Until 2012, Danish employers were obliged to finance sickness absence benefits for the first 21 days of absence (now 30 days). After this period, the municipality is responsible for managing and evaluating the sickness absence process. For this reason, we regarded 21 days as a meaningful cut-off point for defining LTSA in a Danish context for studies conducted before 2012.

We retrieved information on LTSA from the Danish Registry of the Evaluation of Marginalisation (DREAM). DREAM contains weekly updated information on all social transfer payments in Denmark, including granted sickness absence benefits since 1996. The validity of DREAM for research purposes has been demonstrated in several studies.[34,35]

Measurement of covariates

As covariates, we recorded sex, age, living together with a partner, prevalent health problem at baseline, health behaviours, occupational grade, emotional demands and role conflicts at work.

We measured prevalent health problems with a 17-item checklist including both severe chronic physical diseases, such as cancer, diabetes or cardiovascular disease, and more unspecific disorders, such as musculoskeletal disorders, psychological disorders or stomach-ache. Participants who had at least one of these diseases or disorders were scored with a prevalent health problem.

Health behaviours included current smoking, heavy alcohol consumption [more than three (men) or two (women) drinks per day respectively], and leisure time physical activity, measured with a single item with response categories indicating, no, low, moderate and intense physical activity.

We measured occupational grade by asking the participants to categorize themselves as executive/manager, other non-manual worker, skilled manual worker and semi-/unskilled manual worker. We further differentiated the 'other non-manual worker' category by taking length of post-high school education into account, resulting in a final occupational grade variable with five categories: I, high-grade non-manual (executives/managers); II, intermediate-grade non-manual (advanced post-high school education); III, low-grade non-manual (no advanced post-high school education); IV, skilled manual and V, semi-/unskilled manual.

Emotional demands and role conflicts were measured with two scales, each containing four items, derived from the COPSOQ-II.[33]

Statistical analysis

We examined the univariate association of participants' characteristics with WSC scores with one-way analyses of variance. Differences between the categories were estimated with Scheffé multiple comparison test. Using a proportional hazards model, we calculated crude and adjusted hazard ratios (HRs) and 95% confidence intervals (CIs) for the prospective association of a one standard deviation (SD) increment of the WSC score at baseline with time to onset of LTSA during the 12-month follow-up. Participants were followed-up until onset of LTSA, censoring due to emigration or death or end of follow-up, whichever came first. We incrementally adjusted the HR for baseline covariates: model 1 was adjusted for sex and age; model 2 was further adjusted for prevalent health problems and health behaviours and model 3 was further adjusted for occupational grade. Next, we examined the association of WSC with risk of LTSA separately for the five occupational grades. We examined whether the association of WSC with LTSA was modified by occupational grade by calculating three interaction terms: (i) the product of the continuous WSC variable (higher scores = higher WSC) with the five categories of the occupational grade variable (higher scores = higher grade); (ii) the product of the continuous WSC variable and a dichotomized occupational grade variable (0 = low occupational grade (grades III, IV and V), 1 = high occupational grade (grades I and II)) and (iii) the product of the dichotomized WSC variable (0 = low WSC, 1 = high WSC, based on median split) with the dichotomized occupational grade variable. All interaction analyses were adjusted for the covariates from model 3.

We conducted a supplementary analysis that included emotional demands and role conflicts at baseline as covariates, the two variables that had predicted LTSA in a previously analysis in this cohort.[32] We adjusted for emotional demands and role conflicts in the supplementary analysis but not in the main analysis, because it is unclear whether these two variables are potential confounders for the association of WSC with LTSA or if they are mediators, i.e. potential intermediate steps in a causal pathway. We also performed a supplementary analysis that used post-high school education instead of occupational grade as the effect modifier.

All analyses were conducted with the Stata/SE 12.1 statistical software (StataCorp LP, College Station, TX). Possible violations of the proportional hazard assumption were examined by Schoenfeld residuals.

Results

Study sample characteristic and distribution of WSC

Table 1 lists the characteristics of the study sample. Of the 3075 participants, 1587 (51.6%) were women. Mean age was 42 years (SD: 10).

The mean WSC score of the total cohort was 62.5 (SD: 16.4). The WSC scores did not differ by sex, age, living with a partner, smoking or alcohol consumption. The WSC scores were statistically

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significantly lower among participants with a prevalent health problem compared to those without a prevalent health problem and among participants with no leisure time physical activity compared to each of the three other physical activity groups (Table 1). High-grade non-manual workers showed a statistically significantly higher WSC score compared to each of the other four occupational grades. In addition, intermediate-grade non-manual workers showed a statistically significantly higher WSC score than low-grade non-manual workers.

Table 1 Study participants' characteristics at baseline and their association with WSC

	Participants		WSC score		F	P
Characteristic	**n**	**%**	**Mean**	**SD**		
Sex						
Women	1587	51.6	62.3	(16.6)		
Men	1488	48.4	62.7	(16.2)	0.48	0.49
Age (years)						
20–29	399	13.0	63.7	(17.1)		
30–39	823	26.8	62.8	(16.8)		
40–49	956	31.1	62.0	(16.4)		
50–60	897	29.2	62.1	(15.5)	1.23	0.30
Living together with a partner						
No	627	20.4	61.6	(16.6)		
Yes	2448	79.6	62.7	(16.3)	2.18	0.14
Prevalent health problems						
No	1835	59.7	63.6	(16.3)		
Yes	1240	40.3	60.7	(16.3)	23.59	<0.001
Current smoking						
No	2130	69.3	62.5	(15.9)		
Yes	945	30.7	62.4	(17.3)	0.03	0.85
Heavy alcohol consumption						
No	2774	90.2	62.6	(16.4)		
Yes	301	9.8	61.4	(16.3)	1.39	0.24
Leisure time physical activity						
None	302	9.8	58.6	(19.2)		
Low	1166	37.9	62.4	(15.4)		
Moderate	1340	43.6	63.2	(16.4)		
Intense	267	8.7	63.1	(16.2)	6.81	<0.001
Occupational grade						
I: High-grade non-manual	405	13.2	67.6	(15.7)		
II: Intermediate-grade non-manual	824	26.8	63.2	(15.4)		
III: Low-grade non-manual	815	26.5	60.7	(16.4)		
IV: Skilled manual	535	17.4	61.4	(16.8)		
V: Semi-/unskilled manual	496	16.1	60.9	(17.1)	14.47	<0.001

Univariate associations between participants' characteristics and WSC score were estimated with analyses of variance.

WSC and onset of LTSA

During the 12-month follow-up period, 177 (5.8%) of the 3075 participants had an episode of LTSA, 30 (1.0%) were censored due to emigration or death and 2868 (93.3%) completed the follow-up period without event or censoring. Mean time to onset of LTSA was 26 weeks (SD = 15) with a median of 24 weeks.

Table 2 lists the crude and adjusted HR for the prospective association between WSC at baseline and onset of LTSA. A 1 SD higher WSC score predicted a decreased risk of LTSA both in the crude analyses and after adjustment for sex, age, living together with a partner, prevalent health problems and health behaviours (HR = 0.85, 95% CI = 0.74–0.99, model 2). Further adjustment for occupational grade attenuated the HR to 0.90, resulting in the loss of statistical significance (model 3). Occupational grade showed a strong dose-response association with risk of LTSA.

WSC and onset of LTSA, effect modification by occupational grade

Table 3 lists the prospective association of WSC with onset of LTSA, stratified by occupational grade. A 1 SD increment in WSC predicted a reduced risk of LTSA among workers of grade I (HR = 0.47, 95% CI = 0.23–0.96) and grade II (HR = 0.68, 95% CI = 0.47–1.00) but not among workers of grades III, IV and V. The interaction WSC (continuous scale) times occupational grade (five categories) approached statistical significance.

Table 3 also lists the results, when we collapsed the two higher grades (grades I and II) and the three lower grades (grades III–V). We found that a 1 SD increment on the WSC scale predicted a reduced risk of LTSA among higher grade workers (HR = 0.61, 95% CI = 0.44–0.84), whereas there was no association between WSC and risk of LTSA among lower grade workers. The interaction WSC (continuous scale) times occupational grade (dichotomized) was statistically significant (HR = 0.97, 95% CI = 0.95–0.99).

Figure 1 depicts the interaction between WSC and occupational grade, when both WSC and occupational grade were dichotomized. Among participants of higher occupational grade, a high WSC predicted a reduced risk of LTSA (HR = 0.33, 95% CI = 0.16–0.70).

Table 2 WSC at baseline and onset of LTSA during 1-year follow-up

	Crude		Model 1		Model 2		Model 3	
Predictor	**HR**	**(95% CI)**	**HR**	**(95% CI)**	**HR**	**(95% CI)**	**HR**	**(95% CI)**
WSC[a]	0.83	(0.72–0.96)	0.84	(0.73–0.97)	0.85	(0.74–0.99)	0.90	(0.78–1.04)
Male sex			0.89	(0.67–1.20)	0.90	(0.66–1.21)	0.85	(0.62–1.16)
Age[b]			1.14	(1.06–1.23)	1.13	(1.04–1.22)	1.15	(1.07–1.24)
Living together with a partner			0.65	(0.46–0.91)	0.68	(0.49–0.96)	0.71	(0.50–0.99)
Prevalent health problems					1.41	(1.05–1.90)	1.39	(1.04–1.88)
Current smoker					1.49	(1.09–2.02)	1.28	(0.94–1.75)
Heavy alcohol consumption					1.09	(0.69–1.72)	1.22	(0.77–1.93)
Leisure time physical activity[c]					1.00	(0.83–1.22)	1.03	(0.85–1.26)
Occupational grade								
I: High-grade non-manual							1	(Reference)
II: Intermediate-grade non-manual							1.88	(0.81–4.34)
III: Low-grade non-manual							3.46	(1.56–7.70)
IV: Skilled manual							5.06	(2.27–11.28)
V: Semi-/unskilled manual							5.49	(2.46–12.25)

Cox proportional hazard analysis.
a: 1 SD increment.
b: 5-year increment.
c: 1 unit increment.

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Table 3 One SD higher WSC scale at baseline and risk of LTSA during 1-year follow-up, stratified by occupational grade

Occupational grade categorization	n	HR	(95% CI)
Occupational grade in five groups			
I: High-grade non-manual	405	0.47	(0.23–0.96)
II: Intermediate-grade non-manual	824	0.68	(0.47–1.00)
III: Low-grade non-manual	815	1.17	(0.88–1.55)
IV: Skilled manual	535	0.77	(0.58–1.02)
V: Semi-/unskilled manual	496	1.05	(0.79–1.39)
Interaction: WSC (continuous scale) X occupational grade (five groups): HR = 0.99 (95% CI = 0.99–1.00)			
Occupational grade, dichotomized			
High-grade workers (grade I and grade II)	1229	0.61	(0.44–0.84)
Low-grade workers (grades III, IV and V)	1846	0.98	(0.83–1.15)
Interaction: WSC (continuous scale) X occupational grade (dichotomized): HR = 0.97 (95% CI = 0.95–0.99)			

Cox proportional hazard analysis adjusted for sex, age, living together with a partner, prevalent health problems, smoking, heavy alcohol consumption and leisure time physical activity.

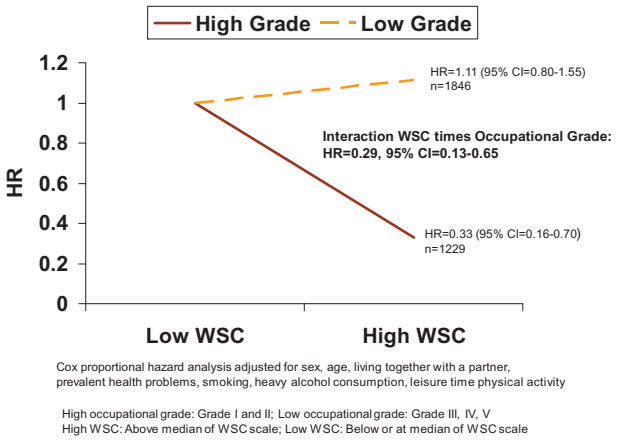


Figure 1 Interaction of WSC (dichotomized) and occupational grade (dichotomized) on risk of LTSA during 1-year follow-up

Among participants of lower occupational grade, a high WSC did not predict risk of LTSA (HR = 1.11, 95% CI = 0.80–1.55). The interaction term WSC times occupational grade was statistically significant (HR = 0.29, 95% CI = 0.13–0.65).

When we repeated the analyses for figure 1, while adjusting for emotional demands and role conflicts, results remained similar. A high WSC score predicted a reduced risk of LTSA among workers of higher occupational grade (HR = 0.38, 95% CI = 0.17–0.82) but not among workers of lower occupational grade (HR = 1.32, 95% CI = 0.93–1.86), with a statistical significant interaction between WSC and occupational grade (HR = 0.28, 95% CI = 0.13–0.63). When we used post-high school education instead of occupational grade as the effect modifier, results were similar, albeit not statistically significant (data available on request).

Post-estimation tests showed that the proportional hazard assumption was fulfilled in the analyses.

Discussion

In this study, high WSC predicted a decreased risk of LTSA after adjustment for sex, age, prevalent health problems and health behaviours but not after additional adjustment for occupational grade. There was a statistical significant interaction effect of WSC and the dichotomized occupational grade measure on risk of LTSA, indicating that occupational grade was an effect modifier rather than a confounder. Among participants of higher occupational grade, WSC predicted a reduced risk of LTSA. Among participants of lower occupational grade, WSC did not predict risk of LTSA.

To our knowledge, this is the first study that prospectively examined the association between WSC and LTSA. However, assuming that LTSA is strongly related to health,[30] our results might be compared with previous findings showing that high WSC predicted a decreased risk of poor self-rated health,[20] depression,[19] hypertension[21] and all-cause mortality.[22]

The role of occupational grade

To our knowledge, no other study has demonstrated yet that the effect of WSC on a health outcome might be modified by occupational grade. Kouvonen et al.[36] reported earlier that high WSC predicted smoking cessation in higher-grade but not lower-grade workers; however, the interaction effect was not statistically significant.

It is possible that trust, justice and collaboration are more relevant for workers who have to deal with complex work tasks, decision making and coordination—aspects of working life that probably are more prevalent among higher grade workers.[37] Moreover, lower grade workers may, compared to higher grade workers, more often be exposed to other occupational health hazards that may render protective effects of WSC on LTSA negligible.[38] Workers of lower occupational grade had lower WSC scores than workers of higher occupational grade, a pattern that was also found in the Finnish Public Sector Study.[20,22] Thus, it is possible that lower grade workers often did not experience the amount of WSC that is necessary to protect health.

We would like, though, to caution against any firm conclusions on the role of occupational grade yet, as the results might be specific to our operationalisation of WSC, the type of analyses we conducted or the chosen outcome. Clearly, more research on occupational grade as a potential modifier of the association of psychosocial working conditions and health is needed. Policy makers and health professionals should be aware, though, that a protective effect of high WSC with regard to LTSA may be confined to workers of higher occupational grade.

Strengths and weaknesses of the study

A strength of the study is the use of a random sample of the Danish workforce, including a broad range of occupations from both the private and the public sector. Previous prospective studies on WSC and health endpoints were confined to employees from the public sector[19–22] and to one study among Japanese employees from selected workplaces.[29] We assessed LTSA in a Danish national register, which is well-validated for research purposes,[34,35] ensuring follow-up with virtually no attrition. By including analyses on effect modification, we demonstrated that the effect of WSC on LTSA might depend on occupational grade, something that has not been shown before.

A weakness of the study is the exclusive use of individual-level WSC. Social capital is conceptualized not as a characteristic of individuals or individuals' social relations, but as a characteristic of social entities, such as neighbourhoods, societies or workplaces.[6,23] Workplace means of WSC scores may therefore be better measures than individual-level WSC scores. In company-based samples, aggregation of individual-level data to the workplace-level and multilevel analysis is possible, but aggregation was not possible in this random sample of the workforce. Thus, for a strength of the study, the inclusion of a wide range of occupational groups in a random sample of the workforce, we paid for with a weakness, the lack of workplace-aggregated WSC-data.

The study had a moderate response rate of 60.4%. Earlier analysis showed that response rates were lower among men than women and among younger employees than older employees.[39] Thus, we cannot

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claim that the data were representative for the whole Danish workforce. As neither sex nor age were associated with WSC it seems unlikely, though, that selective non-response had biased our results.

WSC was measured only once. Repeated measures of WSC would have yielded a more precise assessment and would have allowed analysing whether change in WSC was related to risk of LTSA.

We assessed WSC with 7 of the 12 items of the global Danish WSC scale. All items from the 'trust' and 'justice' components were included but only one of the six 'collaboration' items. An earlier scale validation indicated that the 7-item and the 12-item versions were strongly correlated, rendering systematic bias in the 7-item version unlikely.[28] However, different measures of WSC might have yielded different results. In 2014, an alternative measure of WSC was developed by a Danish research group, focusing on linking, bridging and bonding WSC.[40] This may have captured different aspects of WSC than our measure, including aspects related to vertical and horizontal WSC.

Conclusion

High WSC might reduce risk of LTSA among workers of higher occupational grade but not among workers of lower occupational grade. To further examine the relation of WSC, occupational grade and health endpoints, we recommend the use of the complete global WSC scale and analyses of both individual-level and workplace-level measures of WSC.

Supplementary data

Supplementary data are available at *EURPUB* online.

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Conflicts of interest: None declared.

Key points

- Workplace social capital (WSC) is increasingly discussed as a potential resource for workers' health; however, prospective studies are scarce.
- In this prospective study, high WSC predicted a lower risk of long-term sickness absence among workers of higher occupational grade but not among those of lower grade.
- Policy makers and health professionals should be aware of that a possible protective effect of high WSC with regard to sickness absence might be confined to workers of higher occupational grade.

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