International Archives of Occupational and Environmental Health (2018) 91:547–557
https://doi.org/10.1007/s00420-018-1302-y

ORIGINAL ARTICLE

Can a workplace leadership intervention reduce job insecurity and improve health? Results from a field study

Amira Barrech[1] · Christian Seubert[2] · Jürgen Glaser[2] · Harald Gündel[1]

Received: 15 June 2017 / Accepted: 4 March 2018 / Published online: 22 March 2018

Abstract

Purpose To examine the effectiveness of an intervention in the workplace designed to reduce job insecurity among employees affected by organizational change.

Methods Supervisors were randomly allocated to an intervention (IG) or waiting-list-control group (CG) and the intervention was administered over a period of 3 months, comprising six group sessions. $N = 103$ supervisors and their team members (mean age 41.80 ± 9.60 years, 60.19% male) provided data prior to (t0) and 3 months post-intervention (t1) by means of questionnaires and hair samples. Job insecurity (COPSOQ), mental health (HADS) and somatic health (GBB, hair cortisol concentration) were measured.

Results Job insecurity was reduced to a marginally significant degree in the IG compared to the CG at t1 ($B = -5.78$, $p = .06$, CI [−11.73, 0.17]). Differential effects for supervisors and team members were not found. No effects on health could be observed overall in the IG, but supervisors in the IG reported a significant decrease in exhaustion tendency ($B = -0.92$, $p = 0.01$, CI [−1.64, −0.20]) and a non-significant trend towards higher levels of anxiety ($B = 2.98$, $p = 0.10$, CI [−0.57, 6.54]) compared to team members.

Conclusions This is the first study to provide some evidence for the effectiveness of an intervention that aimed at reducing job insecurity during organizational change. Health-related effects were observed in supervisors but not in team members. Further intervention studies are needed to add to the current knowledge base.

Keywords Job insecurity · Workplace intervention · Occupational stress · Supervisor training · Occupational health

Introduction

Working environments around the world have been subjected to fundamental changes in the past decades. Constant change has become the rule, which is mirrored in increasing numbers of restructuring efforts in organizations: The fifth European Working Conditions Survey ($n = 43{,}816$), conducted in 2010, revealed that a quarter of all participants experienced both the introduction of new processes/technologies as well as restructuring/reorganisation within their working environment in the past 3 years (Eurofound 2015). While changes in the working environment can have certain positive aspects (e.g. job promotion, improvement of inefficient processes), restructuring has also been associated with job insecurity and adverse health effects in employees that remain in the company (Geuskens et al. 2012; Keim et al. 2014). Therefore, it is not surprising that in the past decades, developed countries have recorded a rise in job insecurity among the working population (OECD 1997; Eurofound 2015). Though there is still some debate as to the exact definition of job insecurity, it generally can be described as the subjectively experienced uncertainty with regard to the continuance of a present working situation (Sverke and Hellgren 2002). This uncertainty can either refer to the possibility of an involuntary job loss (quantitative job insecurity) and/or negative changes to valued job characteristics, e.g. career opportunities (qualitative job insecurity), and reflects an individual's

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s00420-018-1302-y) contains supplementary material, which is available to authorized users.

✉ Amira Barrech
amira.barrech@uni-ulm.de

[1] Department of Psychosomatic Medicine and Psychotherapy, University hospital Ulm, Albert-Einstein-Allee 23, 89081 Ulm, Germany

[2] Institute of Psychology, University of Innsbruck, Innsbruck, Austria

subjective appraisal of a given situation (Hellgren et al. 1999; Sverke et al. 2002). Given the same situation, two individuals can come to different conclusions. While objective job insecurity is associated to an objective risk of job loss (De Cuyper et al. 2009), perceived/subjective job security is deemed to be the result of the subjective appraisal of a given situation and can, therefore, also arise in the absence of an objective risk of job loss (De Witte 1999; Sverke et al. 2002; Sverke and Hellgren 2002). Low self-perceived chances on the labour market, younger age, low job control, low social support at work, low socio-economic status and organizational change have all been shown to facilitate job insecurity (Ferrie et al. 2005; Keim et al. 2014). There is increasing evidence that job insecurity may act as a work-related stressor and can, therefore, be detrimental to both the mental and somatic health of those affected (Sverke and Hellgren 2002). To date, job insecurity has been linked to a number of adverse health outcomes such as depression (Theorell et al. 2015), impaired subjective well-being (Schütte et al. 2014), coronary heart disease (Virtanen et al. 2013), hypertension (Kaur et al. 2014), emotional exhaustion (Geuskens et al. 2012) and lower self-rated health (László et al. 2010). The majority of studies has used self-reports to measure both stress and health-related outcomes and there is a lack of studies which employ both subjective as well as objective measures (Cheng and Chan 2008; De Witte et al. 2016; Näswall et al. 2012; Sverke et al. 2002), which would allow for a better understanding of the underlying physiological mechanisms. One objective measure of stress is the concentration of cortisol measured in hair (HCC). Chronic distress assessed by HCC levels was shown to prospectively predict adverse physical health outcomes such as acute myocardial infarction (Pereg et al. 2011).

An array of interventional studies in the workplace, aimed at reducing work-related stressors and improving health, have been shown to be effective (Richardson and Rothstein 2008). Furthermore, a number of studies have shown that a change in psychosocial working conditions leads to a change in health (Lohela et al. 2009; Strazdins et al. 2011). However, to the best of our knowledge, no study has evaluated an intervention in the workplace aimed at reducing job insecurity during organizational change. Drawing on the role of job insecurity as a work-related stressor and the role of resources in this context, it seems promising to enhance resources in the working environment of employees. Hobfoll's conservation of resources (COR) theory states that the more resources are available to an individual, the less vulnerable they are to stressors (Hobfoll 1989). In this context, the role of supervisors is of great importance, as they are considered a job resource in itself, and can exert influence on further job resources of employees (e.g. information) (Demerouti et al. 2001). Moreover, supervisors are considered to be an important source of social support when it comes to job insecurity and they can play a pivotal role in the development of job insecurity (Mohr 2000; Rigotti et al. 2014). Good communication practices by supervisors, particularly during organizational change, have been shown to reduce job insecurity, as they reduce the perceptions of lack of both predictability and control in an uncertain situation (Keim et al. 2014; Smet et al. 2016; Vander Elst et al. 2010). Furthermore, there is an array of research that links leadership behaviour to employee health (Rigotti et al. 2014) as well as work-related outcomes (e.g. employee stress) (Kelloway and Barling 2010). Based on these considerations, an intervention was designed for supervisors, addressing a number of factors that may facilitate employee-supportive leadership during times of change: (a) understanding their role as a resource for employees, (b) enhancing their ability to provide social support to employees, (c) communicate effectively, particularly during the times of change, and (d) improving their knowledge of work-related stress. The underlying assumption is that by enhancing supervisors' ability to counteract antecedents of job insecurity, they will be able to reduce job insecurity among their employees and thereby maintain employee health in the long run.

The aim of the present study was, therefore, to (1) evaluate the effectiveness of a custom-designed intervention in reducing job insecurity as the primary outcome. Mental (anxiety and depression) and somatic health (psychosomatic complaints) as well as a biological indicator of stress (hair cortisol concentration) were explored as secondary outcomes (2).

Methods

Study design and participants

This longitudinal study was conducted at a production site of a multinational healthcare provider in Switzerland in 2012, which was facing several organizational changes. The study was supported by the management of the plant and they were involved in the design of the study (Kristensen 2005; Nielsen et al. 2010b). Approximately, 12 months prior to the first data collection, management had announced a cost-cutting programme, followed by the announcement of a number of reorganizational projects 6 months later. While employees were ensured that there would be no lay-offs in their plant as a result of these developments, there were indeed lay-offs in other sections of the company. The impending organizational changes were, therefore, anticipated to induce both quantitative as well as qualitative job insecurity at the plant (Keim et al. 2014).

Drawing on the important role of supervisors in the context of job insecurity, the intervention was directed at supervisors to reduce job insecurity among their team

members and thereby indirectly maintain their health. A cluster-randomized intervention (IG) and waiting-list control group (CG) design was initially chosen, since treatment had to be offered to the control group as well for ethical reasons. The trainings were conducted between 2012 and 2013 over a period of 3 months, respectively. Study-related activities were performed during working hours. All supervisors ($n = 101$) working at the plant (and indirectly their respective team members; $n = 815$) were randomly allocated to either the IG ($n = 52$) or CG (n = 49) prior to study-begin. However, two supervisors from the CG had left their positions shortly after the randomization had been completed, leaving n = 47 supervisors in the CG (cluster randomization; Fig. 1). Prior to study recruitment, senior management invited all supervisors to an extensive informational session on the intervention, upon which supervisors could decide whether to participate or not. In a second step, senior management informed team members of the study in a staff meeting.

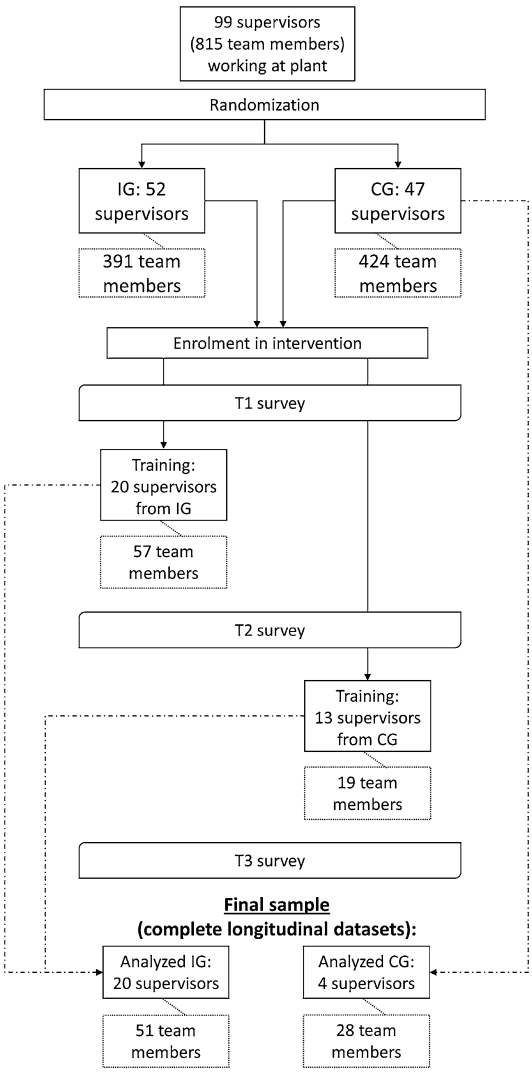

Fig. 1 Study sample

Supervisors who had been randomly allocated to the IG and who had enrolled for participation ($n = 52$) were trained in a first wave and those allocated to the CG ($n = 47$) were trained 4 months later in a second wave. Both supervisors and team members were asked to submit an anonymized questionnaire and a hair sample before the intervention began (T1), 3 months after the IG was trained (T2) and 3 months after the CG was trained (T3). All 914 employees of the plant received three questionnaires (T1, T2, T3). Supervisor and team member data were linked by a team-specific code printed on the questionnaire beforehand. All complete data sets were used for analyses, irrespective of the number of questionnaires returned by team members of a supervisor. To maximize statistical power, the original RCT design was slightly altered for analyses: all trained supervisors (and their respective team members) from both the initially randomized IG and CG were included in the IG (called the "analyzed IG" henceforth), while the CG consists of supervisors (and their respective team members) who had been cluster-randomized into the CG initially but had not participated in the intervention trainings (called the "analyzed CG" henceforth; Fig. 1). A baseline comparison between trained and untrained supervisors (and their respective team members) from the originally randomized CG revealed no significant differences in terms of any of the variables used in this study, apart from position: not surprisingly, the number of supervisors was significantly higher (32 vs. 16%) among those who had participated in the intervention ($X^2 = 5.16$, $df = 1$, $p = 0.023$).

A total of 471 (51%) employees returned a questionnaire and 126 (14%) provided a hair sample at one of the three data collection points. Out of these datasets, 368 cross-sectional questionnaires and 96 hair-samples were excluded, leaving a total of $n = 103$ complete longitudinal datasets and 28 longitudinal sets of hair samples. Drop-out analyses revealed no significant differences between one-time and multiple-time respondents for nearly all variables at baseline; merely, the final longitudinal sample included significantly more non-shift-workers (74 vs. 55%) than the cross-sectional drop-out sample at T1 ($X^2 = 10.65$, $df = 1$, $p = 0.001$). Descriptive information of non-participants was not available.

Due to low return rates and to increase statistical power of the analyses, participants' data from both T1–T2 and T2–T3 were merged into one comprehensive dataset, consisting of non-overlapping data of pre- and post-intervention measurements for IG and CG, henceforth denoted as t0 and t1 (with lowercase t).

The study was approved by the ethics committee of the University of Ulm (Germany). Participation in the study was

voluntary and all participants were required to give written consent.

Measures

Job insecurity was assessed using a four-item subscale of the German version of the Copenhagen Psychosocial Questionnaire (Nübling et al. 2005) (e.g. "Are you worried about losing your job?"). The scale encompasses both quantitative as well as qualitative aspects of job insecurity. Response format was a five-point Likert scale, ranging from 1 (very much) to 5 (not at all), which was recoded to values from 0 (no job insecurity) to 100 (highest possible job insecurity) based on the COPSOQ manual. Cronbach's alphas of 0.74 and 0.82 (t0/t1) were satisfactory.

Somatic health was assessed using a reduced version (12 items) of the Giessen Subjective Complaints List (GBB) (Brähler and Scheer 1995). The scale comprises four dimensions (three questions each): exhaustion tendency (e.g. "rapid exhaustibility"; Cronbach's alphas = 0.73/0.74), gastric symptoms (e.g. "nausea"; Cronbach's alphas = 0.70/0.64), limb pain (e.g. "neck- and shoulder"; Cronbach's alphas = 0.71/0.68), and heart complaints (e.g. "feeling of dizziness"; Cronbach's alphas = 0.78/0.59). Respondents were asked to indicate whether they suffered from a list of complaints on a five-point Likert scale ranging from 1 (not at all) to 5 (yes, strongly). The overall scale (global discomfort) provided good reliabilities (Cronbach's alphas = 0.86/0.83).

Mental health was assessed by the German version of the Hospital Anxiety and Depression Scale (Herrmann-Lingen et al. 2011) (HADS). Responses were given on a 4 point Likert scale, ranging from 0 (not at all) to 3 (mostly), and aggregated into a sum score with values from 0 to 21 according to the HADS manual. Both the anxiety scale (seven items; e.g. "I feel tense or wound up") as well as the depression scale (seven items; e.g. "I still enjoy the things I used to enjoy") provided sufficient reliabilities (Cronbach's alphas = 0.71/0.80 and 0.78/0.79).

Cortisol concentration in hair (HCC), as an objective measure of retrospective and cumulative cortisol secretion for up to 6 months (Stalder and Kirschbaum 2012), was assessed from 2 to 3 strands of hair of at least 3 cm length, which were taken very close to the participants' scalp (posterior vertex position). This sample allows for the calculation of a valid retrospective index of cortisol-secretion of the past 3 months (Kirschbaum et al. 2009). The method is described in detail by Stalder et al. (2012; Study II). To date, no reference value exists for the average HCC concentration within humans (Stalder and Kirschbaum 2012).

All multivariate analyses were adjusted for baseline levels of a set of variables that have previously been associated with either job insecurity and/or impaired health [age (Keim et al. 2014), sex (Hinz and Brähler 2011) and shift work (Saunders 2002)]. Negative affect (NA) at baseline was controlled for in all analyses, as was suggested for self-assessments of job insecurity and health (Näswall et al. 2005; Sverke and Hellgren 2002). Most studies on job insecurity fall short of doing so, thus potentially leading to an overestimation of effects (Sverke et al. 2002; Näswall et al. 2005). There is ample evidence to suggest that self-assessments are influenced by an individual's personality traits, such as negative affectivity (Sverke et al. 2002). NA was measured using the German short version (five items) of the Negative Affect Schedule from the Positive and Negative Affect Schedule (Krohne et al. 1996; Mackinnon et al. 1999). Respondents were asked to rate their general emotional state (e.g. "afraid") on a five-point Likert scale, ranging from 1 (not at all) to 5 (yes, strongly); Cronbach's alpha at baseline (t0) was 0.77. Due to the known association between depression and increased HCC (Stalder and Kirschbaum 2012), all analyses of HCC as outcome variable were additionally controlled for the baseline levels of depression.

Intervention

The intervention consisted of six training sessions (2–4 h each) during 3 months with groups of up to 10 supervisors. Three sessions were designed as seminars and each was followed by a peer-counselling session. The seminars were divided into two parts: first, the trainers provided theoretical input, which was then transferred into practice in the second part by means of group discussions and case studies. Each training session also related to the context of the organization at hand undergoing a phase of organizational change.

In the first seminar, participants were educated on biological fundamentals of chronic stress and its relationship with health as well on the important role of social support in this context (McEwen 1998; Kivimäki et al. 2006). Various forms of coping with stress as well as specific strategies to modify stressors were elaborated upon. The focus of the second seminar lay on determinants of healthy psychosocial working conditions in terms of learning demands (e.g. job complexity), work-related resources (e.g. work autonomy) and job stressors (e.g. job insecurity) (Glaser et al. 2015). Work-related predictors and health effects of work stress were illustrated and discussed with reference to the specific working environments of participants. The third seminar was directed towards the role of leadership in the context of employee health (Vander Elst et al. 2010; Keim et al. 2014; Smet et al. 2016). Important aspects of change-oriented leadership behaviour (e.g. trust, appreciation, role models) were discussed. Particularly, principles and methods of successful communication during change were emphasized in this context.

The peer-counselling sessions had two major aims: First, the topics of the seminars were to be discussed in more depth based on real-life examples from peers. Second, the peer-counselling setting was intended to increase participants' understanding and appreciation of social support by colleagues as a valuable resource. Discussing the practical implications of the theoretical input on multiple occasions as well as counselling peers supported the participants in implementing the learnings into their everyday managerial conduct.

Statistical analyses

Analysis of covariance (ANCOVA) was applied with post-treatment values as dependent variables and baseline values of the same variables as covariates. While recent research suggests that, for randomized studies, both ANCOVA and the gain scores approach (including its mathematical equivalent, repeated-measures analysis of variance), are equally unbiased, the former was found to yield higher statistical power (Van Breukelen 2006), an issue of vital importance in field studies. HCC was log-transformed prior to analysis. All continuous variables were standardized. Analyses were performed with the UNIANOVA procedure in SPSS 21. Parameter estimates are reported in terms of unstandardized regression coefficients B, their standard errors (SE), p values and 95% confidence intervals (CI).

In a first step (model 1), group-affiliation (IG/CG) and position (supervisor/team member) were entered into the model together with the control variables (age, negative affect, shift work, baseline value of outcome variable). In a second step, an interaction between analyzed IG/CG * position was added (model 2) to account for differences in intervention effects in subordinates and supervisors, respectively.

The level of statistical significance was set to $p < 0.05$. However, we also report results within the range of $p < 0.10$ as potentially meaningful tendencies. This is in accordance with the notion that for the detection of intervention effects in highly dynamic social systems, more humble aspirations should be considered (Semmer 2006). In addition, we respond to the call for a transition from dichotomous thinking (significant/non-significant) to estimation thinking (Coulson et al. 2010) by reporting 95% confidence intervals (CI) in addition to p values.

Results

Baseline results

Table 1 gives an overview of the descriptive statistics for all variables at baseline. The sample consisted of 41 women (40%) and 62 men (60%), 79 team members (77%) and 24 supervisors (23%), 76 non-shift (74%) and 27 shift workers (26%). Mean age was 41.80 years (SD = 9.60, ranging from 24 to 64 years). Average job insecurity at t0 ($M = 31.49$, SD = 18.50) ranged in the lower third of the scale (max: 100) and was slightly higher (though not significantly) than in the German reference group (Nübling et al. 2005) ($M = 29$; $N = 2'561$). Mean baseline levels of anxiety ($M = 6.07$, SD = 3.35) as well as depression ($M = 4.32$, SD = 3.36) were sub-clinical (Hinz and Brähler 2011). In terms of somatic health, global discomfort ($M = 21.67$, SD = 7.59) ranged in the lower third (max: 60) of the scale. Mean values of exhaustion tendency ($M = 1.83$, SD = 0.76), gastric

Table 1 Descriptive characteristics of the sample at baseline

Characteristic	Total sample ($n = 103$)	Intervention group ($n = 71$)	Control group ($n = 32$)	p
Age (years)	41.80 (±9.60)	41.37 (±9.23)	42.75 (±10.47)	0.523
Male sex	62 (60.19%)	48 (67.61%)	14 (43.75%)	0.022
Shift work	27 (26.21%)	15 (21.13%)	12 (37.50%)	0.080
Supervisors	24 (23.30%)	20 (28.17%)	4 (12.50%)	0.082
Negative affect	1.73 (±0.57)	1.67 (±0.52)	1.84 (±0.67)	0.209
Job insecurity	31.49 (±18.50)	27.99 (±15.56)	39.26 (±22.12)	0.012
Global discomfort	21.67 (±7.59)	20.85 (±6.80)	23.50 (±8.97)	0.142
Exhaustion tendency^{+}	1.83 (±0.76)	1.82 (±0.80)	1.86 (±0.67)	0.766
Gastric symptoms^{+}	1.59 (±0.76)	1.52 (±0.65)	1.74 (±0.94)	0.240
Limb pain^{+}	2.40 (±0.90)	2.32 (±0.80)	2.58 (±1.06)	0.221
Heart complaints^{+}	1.48 (±0.71)	1.39 (±0.54)	1.69 (±0.96)	0.105
Anxiety	6.07 (±3.35)	5.89 (±3.41)	6.47 (±3.23)	0.410
Depression	4.32 (±3.36)	4.49 (±3.56)	3.94 (±2.90)	0.405
HCC (log transf.)	0.02 (±0.36)	1.30 (±0.39)	1.05 (±0.26)	0.091

Values represent mean (±SD) or absolute numbers (%)

$^{+}n = 102$ (IG = 70, CG = 32); $^{\#}n = 28$ (IG = 17, CG = 11)

symptoms ($M = 1.59$, SD = 0.76), limb pain ($M = 2.40$, SD = 0.90) and cardiac complaints ($M = 1.48$, SD = 0.71) ranged in the lower half of the scale (max: 5).

The analyzed IG consisted of significantly more men (68% vs. 44%) and reported significantly lower levels of job insecurity (27.99 vs. 39.26).

Evaluation of the intervention

As shown in Table 2, job insecurity at t1 was reduced in the analyzed IG (vs. the CG) in model 1 to a marginally significant degree ($B = -5.78$, $p = 0.057$, CI [− 11.73, 0.17]). There was no significant interaction between analyzed IG/CG*position in model 2 ($B = 6.11$, $p = 0.439$, CI [− 9.50, 21.73]), suggesting no differential effects between supervisors and team members in the analyzed IG.

The effect of the intervention on somatic health rendered mixed results (see supplement 1 for complete table): while the intervention did not show any effect on global discomfort, gastric symptoms, limb pain or heart complaints, there was an effect on exhaustion tendency. The overall intervention effect (Table 3) in model 1 was not significant ($B = 0.029$, $p = 0.824$, CI [− 0.226, 0.283]). Adding the interaction between analyzed IG/CG*position (model 2) lead to a significant association between position and exhaustion tendency ($B = 0.837$, $p = 0.014$, CI [0.175, 1.500]) as well as a significant interaction between analyzed IG/CG*position ($B = -0.92$, $p = 0.013$, CI [− 1.64, − 0.20]). This indicates that supervisors in the analyzed IG had a reduced exhaustion tendency at t1 compared to team members in the analyzed IG (Supplement 2).

No significant intervention effects with regard to indicators of mental health were found (Table 3), apart from a marginally significant interaction between analyzed IG/CG*position (model 2) for anxiety, whereby supervisors in the analyzed IG had a tendency for higher anxiety levels at t1 when compared to their team members ($B = 2.98$, $p = 0.099$, CI [− 0.57, 6.54]). No intervention effect on HCC was found (Table 3).

Discussion

To the best of our knowledge, this is the first study to assess the effectiveness of an intervention aimed at reducing job insecurity. Job insecurity was reduced to a marginally significant degree post-intervention in the analyzed IG compared to the CG. Following the intervention, exhaustion tendency among supervisors in the IG was significantly reduced and there was a tendency towards higher anxiety after the intervention.

While we found that job insecurity was reduced overall in the analyzed IG, no statistically significant group differences were found between team members and supervisors. A potential reason could be the low number of supervisors ($n = 24$), which might have rendered statistical power too low to detect a possible interaction effect in model 2. Considering that the intervention took place during a period of restructuring efforts at the company unprecedented in extent, a rise in job insecurity was very likely, as organizational change has been shown to be an independent predictor of job insecurity (Keim et al. 2014). It is, therefore, all the more noteworthy that the study found indications of a reduction in job insecurity in the analyzed IG.

We did not find intervention effects on the health of team members. Given that the mean values for somatic and mental health at baseline reflected a rather healthy sample (Table 1), chances for further improvements might have been little. A recent longitudinal cohort study on the association between restructuring and employee health has found that only exposure to restructuring in the past 24 months was associated with a decline in general health (mediated by job insecurity), while restructuring in the past 12 months was not (Geuskens et al. 2012). Moreover, in their review on leadership development interventions, and in line with clinical experience, Kelloway and Barling (2010) point out that indirect effects on the health of team members may not develop in the short-term (e.g. three months). To this end, there is a lack of evidence-based knowledge on the right time lags between the end of an intervention and data collection to capture such indirect effects (Kelloway and Barling 2010). It is possible

Table 2 Effect of the intervention on job insecurity at t1 ($n = 103$)

Predictors	Model 1 adj. $R^2 = 0.559$					Model 2 adj. $R^2 = 0.557$				
	B	SE	*p*	95% CI		*B*	SE	*p*	95% CI	
				LCI	UCI				LCI	UCI
IG	− 5.78	3.00	0.057	− 11.73	3.17	− 6.70	3.23	0.041	− 13.11	− 0.29
Supervisor	0.69	3.18	0.829	− 5.62	7.00	− 4.29	7.15	0.550	− 18.48	9.90
Interaction[a]						6.11	7.86	0.439	− 9.50	21.73

Controlled for age, sex, shift work, negative affect and job insecurity at t0

[a]IG X supervisor

Table 3 Effect of the intervention on somatic (GBB, HCC) and mental (HADS) health ($n = 103$)

	Global discomfort (GBB)									
	Model 1 (adj. $R^2 = 0.578$)					Model 2 (adj. $R^2 = 0.574$)				
	B	SE	*p*	95% CI		*B*	SE	*p*	95% CI	
				LCI	UCI				LCI	UCI
Predictors										
IG	1.24	1.03	0.230	−0.80	3.28	1.12	1.12	0.320	−1.10	3.33
Supervisor	−0.96	1.10	0.384	−3.15	1.22	−1.63	2.51	0.517	−6.60	3.34
Interaction*						0.82	2.76	0.768	−4.66	6.29
	Exhaustion tendency (GBB)									
	Model 1 (adj. $R^2 = 0.419$)					Model 2 (adj. $R^2 = 0.452$)				
IG	0.03	0.13	0.824	−0.23	0.28	0.13	0.13	0.309	−0.13	0.40
Supervisor	0.06	0.14	0.655	−0.21	0.34	0.84	0.33	0.014	0.18	1.5
Interaction						−0.92	0.36	0.013	−1.64	−0.20
	HCC[a]									
	Model 1 (adj. $R^2 = 0.108$)					Model 2 (adj. $R^2 = 0.096$)				
IG	0.12	0.16	0.454	−0.21	0.45	0.02	0.20	0.926	−0.40	0.43
Supervisor	0.15	0.16	0.377	−0.19	0.48	−0.25	0.48	0.616	−1.26	0.77
Interaction						0.45	0.53	0.401	−0.65	1.56
	Anxiety (HADS)									
	Model 1 (adj. $R^2 = 0.320$)					Model 2 (adj. $R^2 = 0.333$)				
IG	0.65	0.68	0.336	−0.69	2.00	0.20	0.72	0.783	−1.24	1.64
Supervisor	0.92	0.73	0.207	−0.52	2.36	−1.51	1.63	0.355	−4.74	1.72
Interaction						2.98	1.79	0.099	−0.57	6.54
	Depression (HADS)									
	Model 1 (adj. $R^2 = 0.515$)					Model 2 (adj. $R^2 = 0.521$)				
IG	0.32	0.54	0.551	−0.75	1.39	0.01	0.57	0.988	−1.13	1.15
Supervisor	1.11	0.57	0.054	−0.02	2.24	−0.06	1.28	0.637	−3.14	1.93
Interaction						2.10	1.41	0.138	−0.69	4.90

All analyses controlled for age, sex, shift work, negative affect and dependent variable at t0

[a] $n = 28$, additionally controlled for depression at t0; *IG X supervisor

that the time lag of three months between the end of the intervention and the measurement point was not sufficient to capture potential effects on team member health. Our results, however, show first effects of the intervention on supervisor health and it is imaginable that effects on the health of their team members would consecutively surface after some time. This might also have played a role with regard to hair cortisol concentrations (HCC), as it was determined for a retrospective period of 3 months after the end of the intervention. This in turn might have been too short a time period for a reduction on cortisol levels post intervention. These results are also in line with a current meta-analyses that has no associations between HCC and self-reports of perceived stress (Stalder et al. 2017). However, the small number of longitudinal hair sample datasets call for cautious interpretation of the results.

A further explanation for the lack of an intervention effect on the health of team members might be the length of exposure to job insecurity in the present sample. In one of the few longitudinal studies on effects of changes to job insecurity over a 2.5 year period, Ferrie et al. (2002) have found that persistent job insecurity lead to a deterioration in health, with residual effects still observed even after job security was regained. For the present study, in which subjects had been exposed to job insecurity for about 12 months prior to the beginning of the intervention, this could imply that the data collection was too early to detect a positive effect on health, induced by a decrease in job insecurity.

With regard to the effect of the intervention on participating supervisors, the picture is somewhat different. Our analyses revealed that the intervention lead to a significant reduction in exhaustion tendency among supervisors from the IG, compared to team members. This underlines the effectivity of the intervention, considering the focus on stress-management techniques in the first training session: participants were instructed to reflect upon stressors in their working environment and coping measures (e.g. relaxation techniques) were discussed and practiced. Furthermore, the intervention might have helped supervisors in identifying potentials for improvements in their work organization and management style. Their implementation may in turn have had beneficial effects on supervisors' level of exhaustion.

Baseline levels of job insecurity in the present sample were slightly higher than in the German reference sample for the COPSOQ scale (31.49 vs. 29) (Nübling et al. 2005). The high standard deviations indicate that there was some heterogeneity in the experience of job insecurity within the sample. This might be a result of the mix between blue- and white-collar workers in this sample, as blue-collar workers are likelier to develop job insecurity (Keim et al. 2014). Indeed, shift-workers reported significantly higher baseline-levels of job insecurity than non-shift-workers in the present study (38.66 vs. 28.95, $p < 0.05$). This might also be the reason for the higher level of job insecurity in the CG compared to the IG (Table 1) at baseline, as the proportion of shift-workers in the CG (38%) is higher than in the IG (21%).

Strengths and limitations

The strengths of the study lie in its longitudinal, quasi-RCT design, and its setting in a company undergoing organizational changes. Moreover, controlling for baseline levels of both the dependent and independent variables additionally strengthens our findings. A further strength of the study is the control for negative affectivity in all analyses, as suggested by scholars (Sverke and Hellgren 2002; Näswall et al. 2005). The value of the study lies not only in the fact that it is the first to test the validity of an intervention to reduce job insecurity, but it is also the first to conduct the training in a "real-life" environment and hence provide valuable experience on the effective implementation of such interventions in other work-settings in the future.

Some limitations need to be considered, particularly in light of the fact that conducting a RCT in a dynamic industrial environment can entail complications (Kristensen 2005; Nielsen et al. 2010a; Schelvis et al. 2016). First, supervisors' voluntary decision whether or not to participate in the study may have been influenced by hidden variables, thus, for example, rendering participation bias a potential issue (e.g., higher likelihood of participation for highly motivated supervisors or supervisors of well-functioning teams). This problem could not be entirely circumvented, as, from an ethical point of view, it was not possible to make participation mandatory. Second, low return rates of employees resulted in a small sample size that made a restructuring of both the study design and the data necessary, effectively reducing three measurement occasions to pre-post-measurement data. As a consequence, the resulting composition of the IG used for the analyses (i.e., supervisors and their team members who were cluster-randomized into the IG or the waiting-list CG and participated in the training) has weakened the strength of the originally intended RCT design. Furthermore, this might have introduced a selection bias that might threaten the validity of our study design, in that overworked or sceptical supervisors were left in the CG (that consisted of supervisors and their team members who were cluster-randomized into the waiting-list CG and did not participate in the training). Indeed, the significant difference in baseline levels of job insecurity between IG and CG seems to imply that some supervisors of work groups whose members experienced comparably high job insecurity tended not to participate in the intervention. Albeit baseline differences in RCT studies are, by design, due to random error and such tests for baseline differences are in fact discouraged

(De Boer et al. 2015), our method of analysis nevertheless avoids a possible distorting effect by controlling for baseline values of the dependent variables. Furthermore, the drop-out analysis only found a difference in the number of supervisors, not in baseline levels of job insecurity. Third, since return rates were rather low, so were the sample sizes, which reduced the generalizability of our results. Furthermore, the match between supervisor and team member data was not satisfactory and might have led to an underestimation of effects. Not every supervisor that had participated in the intervention provided questionnaires at all measurements, and not every team member of a participating supervisor provided a complete set of questionnaires either. Only $n=24$ supervisors at the plant took part in the intervention and provided multiple response sets. This needs to be considered in the context of the realities of working environments: employee fluctuations, organizational changes at the plant and resulting higher workloads for middle management might have led to lower participation rates than expected. Indeed, a number of supervisors who had dropped out in the course of the intervention had reported too high workload as a primary reason for discontinuing. Furthermore, there might have been resistance to participate among employees for reasons that were not openly communicated (e.g. distrust towards management`s motives). It is, therefore, conceivable that the intervention did not reach out to those who might have profited most. Kelloway & Barling pointed out that a general challenge of interventional studies in the field lies in the small sample sizes due to low response rates, missing data, and the need to match supervisor-team member pre and post data (Kelloway and Barling 2010). On the other hand, Kristensen et al. point out that in prevention effectiveness studies, such as ours, large sample sizes are not as important a factor as for example the testing of the intervention in different settings (Kristensen 2005). The present sample consists of a mix of blue-& white-collar workers across different age groups and occupational settings. Fourth, the IG had significantly more male participants and lower levels of job insecurity than the CG, potentially compromising the randomization. However, both sex and baseline levels of job insecurity were controlled for in all inferential analyses. Fifth, the final longitudinal sample consisted of significantly less shift-workers than the cross-sectional sample, which suggests that shift-workers were less inclined to participate (e.g. due to language barriers or distrust in the motivation behind the study).

Conclusions

This intervention study, the first of its kind, indicates that it may indeed be a promising approach to train supervisors with regard to health-oriented and supportive leadership behaviour in the context of organizational change to reduce job insecurity among their team members. Employees in today's working environments constantly face a plethora of change projects and reorganizations. In light of its broader qualitative definition (i.e., involuntary changes to important job characteristics (Hellgren et al. 1999; Sverke and Hellgren 2002), job insecurity may become the rule. Early prevention of job insecurity is also likely to maintain employee health in the long run (Sverke et al. 2002; Geuskens et al. 2012). Future research with larger samples, additional objective and subjective markers of health and longer follow-up periods is warranted to further substantiate the findings presented in this paper.

Acknowledgements This research project was funded by the hosting company and the Swiss State Secretariat for Economic Affairs (SECO).

Author contributions A.B. wrote the manuscript. C.S. and A.B. prepared the data and performed the statistical analyses. A.B., C.S., J.G. and H.G. made substantial contributions to the interpretation of results and revised all versions of the manuscript until completion. A.B., C.S., J.G. and H.G. revised the manuscript critically for important intellectual content. J.G. and H.G. conceptualized and planned the study as well as the data collection methodology. A.B. assisted in the planning of the study as well as the implementation at the company.

Compliance with ethical standards

Conflict of interest The first author was an employee of the hosting company during this research project. The authors declare that they have no conflicts of interest.

Research involving human and animal participants All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

References

Brähler E, Scheer JW (1995) Der Gießener Beschwerdebogen. [The Giessen Subjective Complaints List], 2. überar. Huber, Bern

Cheng GH-L, Chan DK-S (2008) Who suffers more from job insecurity? A meta-analytic review. Appl Psychol 57:272–303. https://doi.org/10.1111/j.1464-0597.2007.00312.x

Coulson M, Healey M, Fidler F, Cumming G (2010) Confidence intervals permit, but do not guarantee, better inference than statistical significance testing. Quant Psychol Meas 1:26

De Witte H (1999) Job insecurity and psychological well-being: Review of the literature and exploration of some unresolved issues. Eur J Work Organ Psychol 8:155–177

De Cuyper N, De Witte H, Vander Elst T, Handaja Y (2009) Objective threat of unemployment and situational uncertainty during a restructuring: associations with perceived job insecurity and strain. J Bus Psychol 25:75–85. https://doi.org/10.1007/s10869-009-9128-y

De Witte H, Pienaar J, de Cuyper N (2016) Review of 30 years of longitudinal studies on the association between job insecurity

and health and well-being: is there causal evidence? Aust Psychol 51:18–31. https://doi.org/10.1111/ap.12176
Demerouti E, Bakker AB, Nachreiner F, Schaufeli WB (2001) The Job Demands-Resources Model of Burnout. J Appl Psychol 86:499–412
Eurofound (2015) First findings: sixth european working conditions survey. Luxembourg
Ferrie JE, Shipley MJ, Stansfeld SA, Marmot MG (2002) Effects of chronic job insecurity and change in job security on self reported health, minor psychiatric morbidity, physiological measures, and health related behaviours in British civil servants: the Whitehall II study. J Epidemiol Community Health 56:450–454
Ferrie JE, Shipley MJ, Newman K et al (2005) Self-reported job insecurity and health in the Whitehall II study: potential explanations of the relationship. Soc Sci Med 60:1593–1602. https://doi.org/10.1016/j.socscimed.2004.08.006
Mohr GB (2000) The changing significance of different stressors after the announcement of bankruptcy: a longitudinal investigation with special emphasis on job insecurity.J Organ Behav 21:337–359. doi: 10.1002/(SICI)1099-1379(200005)21:3<337::AID-JOB18>3.0.CO;2-G
Geuskens GA, Koppes LLJ, van den Bossche SNJ, Joling CI (2012) Enterprise restructuring and the health of employees: a cohort study. J Occup Environ Med 54:4–9. https://doi.org/10.1097/JOM.0b013e31823c766e
Glaser J, Seubert C, Hornung S, Herbig B (2015) The impact of learning demands, work-related resources, and job stressors on creative performance and health. J Pers Psychol 14:37–48. https://doi.org/10.1027/1866-5888/a000127
Hellgren J, Sverke M, Isaksson K (1999) A two-dimensional approach to job insecurity: consequences for employee attitudes and well-being. Eur J Work Organ Psychol 8:179–195. https://doi.org/10.1080/135943299398311
Herrmann-Lingen C, Buss U, Snaith R (2011) Hospital anxiety and depression scale—Deutsche Version (HADS-D) [Hospital Anxiety and Depression Scale—German version (HADS-D)], 3. aktual. Hans Huber, Bern
Hinz A, Brähler E (2011) Normative values for the hospital anxiety and depression scale (HADS) in the general German population. J Psychosom Res 71:74–84
Hobfoll SE (1989) Conservation of resources: a new attempt at conceptualizing stress. Am Psychol 44:513–524. https://doi.org/10.1037//0003-066X.44.3.513
Kaur H, Luckhaupt SE, Li J et al (2014) Workplace psychosocial factors associated With hypertension in the U. S. workforce: a cross-sectional study based on the 2010 National Health Interview Survey. Am J Ind Med 57:1011–1021. https://doi.org/10.1002/ajim.22345.Published
Keim A, Landis R, Pierce C, Earnest D (2014) Why do employees worry about their jobs? A meta-analytic review of predictors of job insecurity. J Occup Health Psychol 19:269–290
Kelloway EK, Barling J (2010) Leadership development as an intervention in occupational health psychology. Work Stress 24:260–279. https://doi.org/10.1080/02678373.2010.518441
Kirschbaum C, Tietze A, Skoluda N, Dettenborn L (2009) Hair as a retrospective calendar of cortisol production-increased cortisol incorporation into hair in the third trimester of pregnancy. Psychoneuroendocrinology 34:32–37
Kivimäki M, Virtanen M, Elovainio M et al (2006) Work stress in the etiology of coronary heart disease—a meta-analysis. Scand J Work Environ Health 32:431–442. https://doi.org/10.5271/sjweh.1049
Kristensen TS (2005) Intervention studies in occupational epidemiology. Occup Environ Med 62:205–210. https://doi.org/10.1136/oem.2004.016097
Krohne HW, Egloff B, Kohlmann CW, Tausch A (1996) Untersuchungen mit einer deutschen Version der" Positive and Negative Affect Schedule"(PANAS). [Investigations with a German version of the Positive and Negative Affect Schedule (PANAS)]. Diagnostica 42:139–156
László KD, Pikhart H, Kopp MS et al (2010) Job insecurity and health: a study of 16 European countries. Soc Sci Med 70:867–874. https://doi.org/10.1016/j.socscimed.2009.11.022
Lohela M, Björklund C, Vingård E et al (2009) Does a change in psychosocial work factors Lead to a change in employee health? J Occup Environ Med 51:195–193. https://doi.org/10.1097/JOM.0b013e318192bd2c
Mackinnon A, Jorm A, Christensen H et al (1999) A short form of the Positive and Negative Affect Schedule: Evaluation of factorial validity and invariance across demographic variables in a community sample. Pers Individ Dif 27:405–416
McEwen B (1998) Protective and damaging effects of stress mediators. N Engl J Med 338:171–179
Näswall K, Sverke M, Hellgren J (2005) The moderating role of personality characteristics on the relationship between job insecurity and strain. Work Stress 19:37–49. https://doi.org/10.1080/02678370500057850
Näswall K, Lindfors P, Sverke M (2012) Job insecurity as a predictor of physiological indicators of health in healthy working women: an extension of previous research. Stress Heal 28:255–263. https://doi.org/10.1002/smi.1430
Nielsen K, Randall R, Holten A-L, Gonzalez ER (2010a) Conducting organizational-level occupational health interventions. What works? Work Stress 24:234–259. https://doi.org/10.1080/02678373.2010.515393
Nielsen K, Taris TW, Cox T (2010b) The future of organizational interventions: Addressing the challenges of today's organizations. Work Stress 24:219–233. https://doi.org/10.1080/02678373.2010.519176
Nübling M, Stößel U, Hasselhorn H et al (2005) Methoden zur Erfassung psychischer Belastungen - Erprobung eines Messinstrumentes (COPSOQ) [Assessment methods for mental strain - Testing a measurement instrument (COPSOQ)]. Berlin Dresden
OECD (1997) OECD Employment Outlook: Is Job Insecurity on the increase in OECD countries? In: OECD Employment Outlook. Paris
Pereg D, Gow R, Mosseri M et al (2011) Hair cortisol and the risk for acute myocardial infarction in adult men. Stress 14:73–82
Richardson KM, Rothstein HR (2008) Effects of occupational stress management intervention programs: a meta-analysis. J Occup Health Psychol 13:69–93. https://doi.org/10.1037/1076-8998.13.1.69
Rigotti T, Holstad T, Mohr GB et al (2014) Rewarding and sustainable health- promoting leadership. Dortmund
Saunders R (2002) Shift work and health. Toronto
Schelvis RMC, Wiezer NM, Blatter BM et al (2016) Evaluating the implementation process of a participatory organizational level occupational health intervention in schools. BMC Public Health 16:1212. https://doi.org/10.1186/s12889-016-3869-0
Schütte S, Chastang J-F, Malard L et al (2014) Psychosocial working conditions and psychological well-being among employees in 34 european countries. Int Arch Occup Environ Health 87:897–897. https://doi.org/10.1007/s00420-014-0930-0
Semmer NK (2006) Job stress interventions and the organization of work. Scand J Work Environ Health 32:515–527. https://doi.org/10.5271/sjweh.1056
Smet K, Vander Elst T, Griep Y, De Witte H (2016) The explanatory role of rumours in the reciprocal relationship between organizational change communication and job insecurity: a within-person approach. Eur J Work Organ Psychol 25:631–644. https://doi.org/10.1080/1359432X.2016.1143815

Stalder T, Kirschbaum C (2012) Analysis of cortisol in hair–state of the art and future directions. Brain Behav Immun 26:1019–1029. https://doi.org/10.1016/j.bbi.2012.02.002

Stalder T, Steudte S, Miller R et al (2012) Intraindividual stability of hair cortisol concentrations. Psychoneuroendocrinology 37:602–610. https://doi.org/10.1016/j.psyneuen.2011.08.007

Stalder T, Steudte-Schmiedgen S, Alexander N et al (2017) Stress-related and basic determinants of hair cortisol in humans: a meta-analysis. Psychoneuroendocrinology 77:261–274. https://doi.org/10.1016/j.psyneuen.2016.12.017

Strazdins L, D'Souza RM, Clements MS et al (2011) Could better jobs improve mental health? A prospective study of change in work conditions and mental health in mid-aged adults. J Epidemiol Community Health 65:529–534. https://doi.org/10.1136/jech.2009.093732

Sverke M, Hellgren J (2002) The nature of job insecurity: understanding employment uncertainty on the brink of a new millennium. Appl Psychol 51:23–42. https://doi.org/10.1111/1464-0597.0077z

Sverke M, Hellgren J, Näswall K (2002) No security: a meta-analysis and review of job insecurity and its consequences. J Occup Health Psychol 7:242–264. https://doi.org/10.1037//1076-8998.7.3.242

Theorell T, Hammarström A, Aronsson G et al (2015) A systematic review including meta-analysis of work environment and depressive symptoms. BMC Public Health 15:14. https://doi.org/10.1186/s12889-015-1954-4

Van Breukelen GJP (2006) ANCOVA versus change from baseline: more power in randomized studies, more bias in nonrandomized studies [corrected]. J Clin Epidemiol 59:920–925

Vander Elst T, Baillien E, De Cuyper N, De Witte H (2010) The role of organizational communication and participation in reducing job insecurity and its negative association with work-related well-being. Econ Ind Democr 31:249–264. https://doi.org/10.1177/0143831X09358372

Virtanen M, Nyberg ST, Batty G et al (2013) Perceived job insecurity as a risk factor for incident coronary heart disease: systematic review and meta-analysis. Br Med J 347:f4746. https://doi.org/10.1136/bmj.f4746