

Can sickness absence be reduced by stress reduction programs: on the effectiveness of two approaches

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Abstract

Objectives The aim of the study was to evaluate the effectiveness of two brief preventive stress reduction programs—a cognitive focused program and a combined intervention of physical exercise and relaxation—on sickness absence in stressed and non-stressed employees working in various jobs in a telecom company.

Methods The study was designed as an a priori randomized trial and the follow-up period for sickness absence was 1 year. Sickness absence data of 242 employees were analyzed with respect to spells of sickness (frequency, incidence rate), days (length, duration) and time between intervention and first subsequent absent spell.

Results For stressed employees this study suggests that the illness burden represented by absenteeism is

not affected by the interventions. There is no substantial difference in effectiveness between the cognitive and physical interventions. However, in comparison with the physical intervention the cognitive intervention decreases the period between the intervention and the first recurrence of a sick leave period with 144 days (marginal significant).

Conclusion The illness burden represented by absenteeism is effected in detail but not substantially by the interventions.

Keywords Physical intervention · Cognitive intervention · Sickness absence · Occupational health

Introduction

Stress is increasingly being recognized as a psychological hazard facing working people today. High levels of stress may result in increased staff turnover (de Croon et al. 2000; Jamal 1999; Kirchmeyer and Cohen 1999), diminished productivity (Yeh et al. 1986), higher accident rates (Boyce et al. 1998), more physical ill-health (Black and Garbutt 2002; Johnson and Hall 1988; Karasek et al. 1981), more psychological ill-health (Evans and Steptoe 2002; Sheffield et al. 1994) and absenteeism (Evans and Steptoe 2002). Absenteeism in particular has become a major concern in industrialized countries because of its economical consequences. For instance, sickness absence figures show that the loss of working days for industry in the US amounts to about 550 million (3–7%) each year (Elkin and Rosch 1990) and for the UK this figure is 3.7% of the total number of working days (Confederation of British Industry 2003). UK figures from the Office for

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National Statistics Labour Force Survey, released in early 2002, show that more working days than ever before (2.2 million per trimester) are being lost due to sickness absence (Wigham 2002).

Sickness absence is defined as “temporary, extended or permanent incapacity for work as a result of sickness or infirmity” (Gründemann and van Vuuren 2002). In the Netherlands, for legal reasons, temporary work incapacity refers to absenteeism limited to the first 104 weeks of disability, whereas extended or permanent work disability refers to a period thereafter.

Mental and musculoskeletal disorders are the two main categories of illness responsible for sickness absence (Calnan et al. 2001; Frese 1985; Gillespie et al. 2001; Leitner 1993), a substantial part is work-related. A self-report study among 40,000 employees in the UK demonstrated that 25% of the employees (implying a national prevalence of about half a million affected individuals) complained about work-related mental disorders (Griffiths 1998). In the Netherlands, the prevalence of psychological complaints in a working population during 1 year is 36% (Veerman et al. 2001), whereas 12% (Veerman et al. 2001; Houtman 1996) of the employees attribute their absenteeism to mental or psychological disorders. Although women may have a higher incidence of sickness absence for mental disorders, men may take up more sickness absence days due to longer spells (Hensing et al. 1996, 2000; Laitinen-Krispijn and Bijl 2000). Furthermore, in the Netherlands, for one-third of the population with extended incapacity for work, mental or psychological disorders are the cause (Houtman 1996).

Sickness absence is multifactorial and complex. The decision to be absent depends on—and is influenced by—several factors, including the perception of behavior in response to illness, potential wage reduction, dispensability at work, unfairness at work, and informal and formal norms about acceptable levels of absence among colleagues and management (de Boer et al. 2002; Kristensen 1991; North et al. 1996). Therefore, absenteeism may be considered as a passive and individual strategy for coping with work-related problems (Peter and Siegrist 1997), whereas prevention of absenteeism or resuming work after sick leave may be considered as an active strategy for coping. The “advantage” for an employee to use absence as a coping strategy is reduced exposure to job stressors and recuperation from (physical and mental) strain (Kristensen 1991).

Because of the size of the problem, reducing sickness absenteeism by developing interventions to reduce work-related stress is of great importance. The

workplace measures and individual interventions are usually referred to as job redesign and stress management training, respectively (van der Klink et al. 2001; Murphy et al. 1995; Semmer 2003). Although the term stress management training may suggest a rather uniform set of intervention strategies, it usually refers to a mixture of treatment techniques. In practice, two main intervention types can be distinguished: psychological interventions such as cognitive-behavioral and client-centered approaches, and physical interventions such as relaxation methods and physical exercise. In our study we compare a psychological focused program with a physical focused program. Both programs aim at improving mental health but use a different approach. Interventions based on physical-oriented approaches such as relaxation and physical exercise aim at improving mental health by reducing physiological arousal (Benson et al. 1975; Byrne and Byrne 1993; Folkins and Sime 1981; Plante and Rodin 1990; Salmon 2001), whereas individual focused interventions based on cognitively oriented techniques aim at reducing complaints through changing appraisal processes (cognition) and/or enhancing coping skills (behavior) (Lazarus and Folkman 1984; Meichenbaum and Deffenbacher 1988a, b).

To a certain extent these (work-related) stress interventions claim to reduce absenteeism (Cooper and Sadri 1991; Michie 1996; Proper et al. 2002; Schaufeli and Kompier 2001), although the effects on absenteeism are still subject to debate. A comprehensive meta-analysis (van der Klink et al. 2001) on the benefits of work-related stress interventions, showed that in only 4 out of 48 studies absenteeism was conducted as an outcome measure. Neither a cognitive approach nor relaxation appeared to be successful. These findings were confirmed by Reynolds (1997), Kawakami et al. (1999), Peters and Carlson (1999) and Nurminen et al. (2002) but contradicted by other recent studies (Maes et al. 1998; Bond and Bunce 2001; Kawakami et al. 1997; Lechner et al. 1997; Munz et al. 2001), which revealed a significant decline in the number of sick days. Differences between the intervention programs and methodological differences between these studies may explain the inconsistent results.

To resolve some of these problems in sickness absence studies, firstly a reference or control population is required to correct for a potential general trend of sickness absence in a company, branch or country. A second useful design is the comparison of two or more alternative intervention programs.

Secondly, the collection of sickness absence data has to be adequate. According to van Poppel et al. (2002) data on sick leave gathered from company records are

clearly preferable to data obtained from questionnaires or interviews, since self-administered questionnaires have a high specificity but a low sensitivity (Agius et al. 1994; Burdorf et al. 1996; Fredriksson et al. 1998). Furthermore, there is a tendency to underestimate short episodes of sick leave (van der Weide et al. 1997), particularly when the recall period is longer than 2–6 months (Severens et al. 2000).

Finally, the implications of different quantitative measures of sick leave, such as sick leave days or sick leave spells, for the interpretation of the results have to be considered seriously. In their literature review Hensing et al. (1998) pointed out the multi-interpretability of sick leave indicators. They recommended five basic measures (frequency, length, duration, incidence rate and cumulative incidence) to encompass the full spectrum of the sickness absence phenomenon. The use of common terminology and of a standardized set of measures in research and practice would provide the opportunity to compare outcome data from various studies. Recently, a study by Landstad et al. (2001) affirmed this line of reasoning by concluding that different forms of absenteeism need to be studied together, in order to distinguish changes in sickness absence pattern correctly.

Another matter for attention is the target population. So far, it is not clear whether already stressed employees are the most optimal target group. It may be postulated that a stress-reducing intervention should be performed as a primary preventive measure before adverse effects become apparent (van der Klink et al. 2001). Therefore, we included two populations in the study: stressed and non-stressed employees.

The aim of the present study is to investigate whether a brief cognitive intervention is more successful than a brief physical intervention on the reduction of sickness absence in stressed respectively non-stressed employees. We used sickness absence data from the medical company records and applied comprehensive sickness absence measurements in order to assess more precisely the effects on sickness absence of both interventions. In addition, the sickness absence of a large reference population has been used to compare findings with general developments in sickness absence.

Subjects and methods

Study population

The present study was designed as a randomized controlled trial. Participants were recruited (Fig. 1) dur-

ing an occupational health survey with the focus on occupational stress in a large Dutch telecom company ($n = 7,522$). The study population consisted of a mixture of employees from several jobs in a telecom company, including, e.g., engineers, desk workers and office staff. The response rate was 51% ($n = 3,852$).

A total number of 792 employees were invited to participate in a stress intervention-prevention program. First, all employees with elevated levels of distress were identified ($n = 396$) and selected to be invited for the intervention. Second, a random sample of the same size of employees without elevated levels of distress has been selected ($n = 396$).

To distinguish between high and normal levels of distress, a cut-off point of 0.32 on the 4DSQ-Distress subscale (Terluin 1994) was used. This cut-off point is based on data obtained from employees participating in previous stress reduction programs in the same company (van der Klink et al. 2003). In this population, 10% of the employees rated higher than 0.32 on the 4DSQ-Distress subscale (Terluin 1994; Terluin et al. 2004).

Potential participants in both groups of stressed and non-stressed employees were a priori randomly assigned to one of two treatment methods: physical intervention or cognitive intervention. Of the 396 stressed employees 70 ultimately participated in the physical intervention group and 57 in the cognitive intervention group. Of the 396 non-stressed employees, the numbers of participants were 129 and 108, respectively. Table 1 presents baseline characteristics of the intervention groups. The intention to treat group ($n = 364$) comprised 330 men, aged 27–60 years (mean age = 44.6, SD = 7.3) and 34 women, aged 28–57 years (mean age = 41.1, SD = 8.1). The intervention groups were monitored for 1 year by a self-administered questionnaire and through absenteeism data from the company files.

From the intention to treat group, 242 completed the intervention. Of the stressed employees, 44 employees in the physical and 45 in the cognitive intervention group completed the intervention. The number of non-stressed employees who completed the intervention was 72 for the physical and 81 for the cognitive intervention group.

The invitation to participate in the intervention was not accepted by 269 stressed employees (73%) and by 159 non-stressed employees (43%).

To compare sickness absence with general trends in time the total population of the company was used as a reference population. Because of the follow-up time of 1 year, missing data reduced the total sample of 7,522

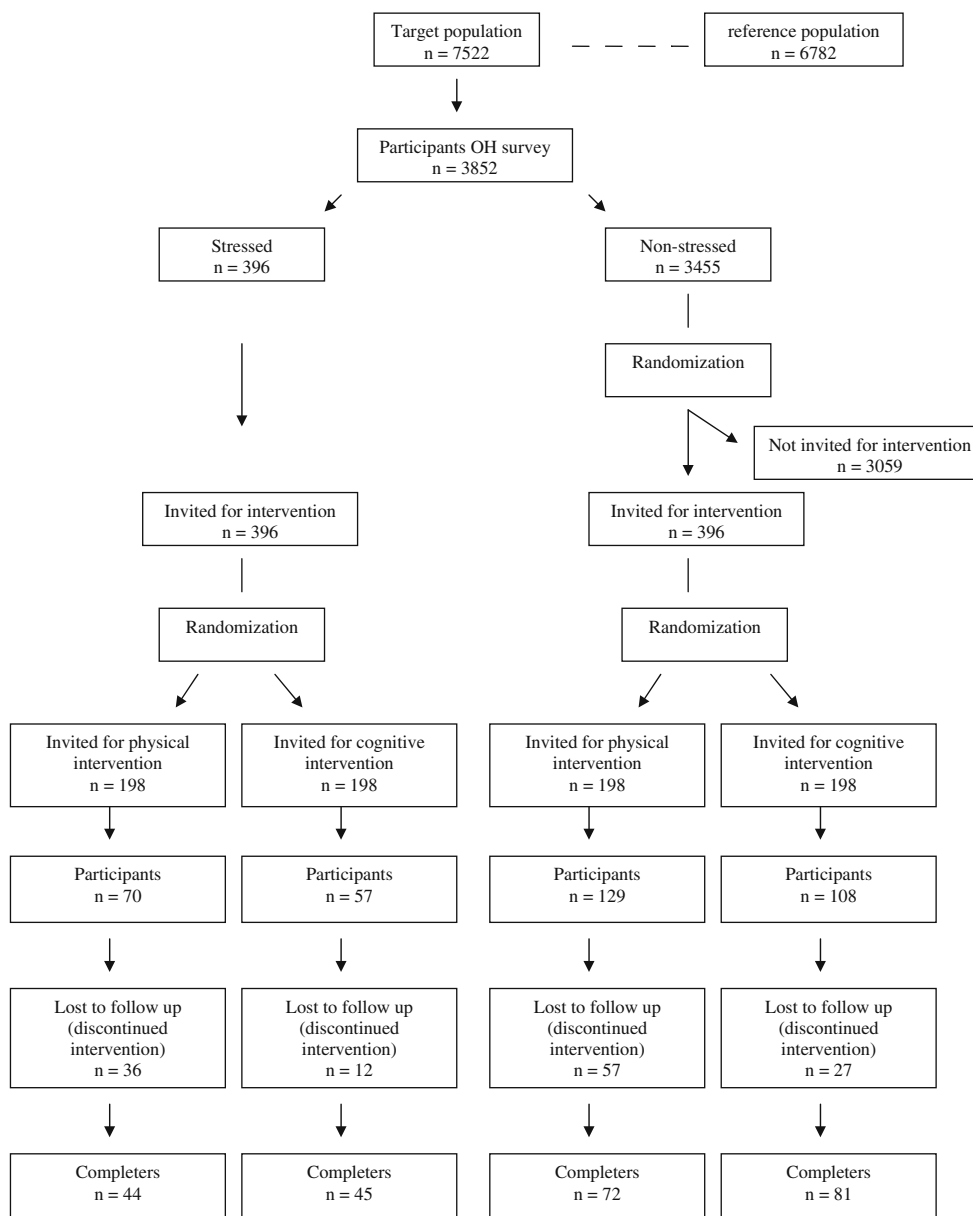


Fig. 1 Flow chart of subjects participating in the interventions

employees to 6,782 employees [6,035 men (mean age 43.8, SD = 7.9) and 747 women (mean age 38.8, SD = 8.7)].

Interventions

The stress intervention program revealed both a physically oriented and a cognitively oriented approach. Meichenbaum’s so-called “stress inoculation training” (SIT) (Meichenbaum and Deffenbacher 1988a, b; Meichenbaum 1993) was used as the guiding principle for both types of interventions. SIT consists of three training stages. The goal of phase 1, focusing on education and information is to help understand the nature of

stress and its effects. The second phase of skill acquisition focuses on the development and practicing of problem-solving strategies for causes of stress. In the final phase, these coping skills are applied to practical situations at work and at home, and an attempt is made to extend the range of activities to include more demanding ones.

The aim of the cognitive intervention was to restructure irrational beliefs. After making an inventory of complaints and placing them in a positive framework, participants were introduced to specific coping techniques and exercises of rational reasoning, resembling the Rational Emotive Therapy, after which the session ended with a homework assignment.

Table 1 Baseline characteristics for the intervention groups and reference population

Intervention type	Stressed		Non-stressed		P*	Reference population (n = 6,782)
	Physical (n = 70)	Cognitive (n = 57)	Physical (n = 129)	Cognitive (n = 108)		
Gender						
Men (%)	90	91	89	93	NS	89
Women (%)	10	9	11	7		11
Age						
Mean	44.2 (SD 7.0)	44.6 (SD 7.8)	44.9 (SD 6.9)	43.6 (SD 8.0)	NS	43.3 (SD 8.1)
Work experience						
<10 years %	14	16	15	21	NS	17
>10 years %	86	84	85	79		83
Education						
Elementary %	24	33	25	18	NS	27
Middle %	44	41	46	47		49
High %	32	26	29	35		24

*NS not statistically significant, $P < 0.05$

The aim of the physical intervention was to increase awareness of stress symptoms and to introduce physical and relaxation exercises in daily activities. Every session consisted of an introduction, a warming-up and physical exercise, a relaxation exercise, and a homework assignment. The ultimate purpose of both interventions was the reduction of stress symptoms and, as a consequence, the reduction of absenteeism. Both training programs consisted of four 1-h sessions given during working hours over a period of 8 weeks.

Sickness absence data

In the present study, sickness absence is reported in terms of spells and days. According to the classification of Hensing et al. (1998) for spells, the following definitions emerged (1) “frequency of sick leave” = current or new sick-leave spells during the study period (365 days)/number of persons in the study group and (2) “incidence rate” = new sick leave spells during the study period (365 days)/number of persons at risk \times number of days in study period minus all sick leave days in current and new spells during the study period emerged. Similarly, the following definitions for days were applied: (1) “length of absence” = sick leave days in current and new spells during study period (365 days)/number of sick-listed persons in current and new spells during study period and (2) “duration of absence” = sick leave days in new spells during study period/number of new sick leave spells during study period.

Sickness absence data were provided by the sickness absence records of the employees filed in the database of ArboNed, the occupational health service of the telecom company. All spells of sickness absence were centrally reported and registered by the executive manager. Absence spells longer than 2 weeks were

verified by a company doctor by inviting the employee that had reported sick. Therefore, the validity of the absence data is assumed to be high.

Statistical analysis

All data were checked and analyzed using the Statistical package for the Social Sciences (SPSS-14.0). All data were analyzed based on the groups as randomized.

Descriptive data were determined for the baseline characteristics. Differences in baseline characteristics were tested with t tests for continuous data and χ^2 tests for ordinal data.

Due to skewed sickness absence data, non-parametrical statistical analyses were performed. First, to evaluate differences in frequency, incidence rate, duration and length of absenteeism before and after the intervention, we analyzed the data of the four treatment groups using the Kruskal–Wallis test, a non-parametric equivalent of one-way ANOVA. Second, a before–after intervention difference score was calculated for frequency, incidence rate, duration and length of absenteeism using the Wilcoxon signed-ranks test, also a non-parametric procedure. Due to multiple testing for before–after comparisons tested with Wilcoxon signed-ranks test, P -values are set at $P < 0.01$ for these tests. Third, the difference scores were compared between the physical and cognitive intervention groups for both the stressed and non-stressed groups by means of a two-sample Mann–Whitney U test.

The period between the intervention and the beginning of a new period of absenteeism was evaluated using survival analysis. “Survival” here means that the event of interest, the beginning of absenteeism, has not occurred. Kaplan–Meier analyses have been used to obtain means, medians, and confidence intervals of the survival.

Results

Non-response

Of the 792 invited employees (396 stressed and 396 non-stressed), ultimately 364 persons accepted the invitation to participate in the intervention, comprising 127 stressed employees (response rate 27%) and 237 non-stressed employees (response rate 57%). Chi-square and *t* tests were used to compare stressed and non-stressed groups on sociodemographic characteristics. Although significantly more employees dropped out of the stressed employees group compared with the non-stressed group, no significant differences were found between the groups regarding age, gender, work experience or educational status. The mean age for the stressed group was 44.3 years (SD = 7.3), 91% of this population was male, 85% had more than 10 years of work experience and 29% had only an elementary occupational education. In the non-stressed group, the characteristics were similar.

The number of participants in the physical intervention was 199, in the cognitive intervention 165. No significant differences were found between these groups regarding age, gender, work experience and educational status. This confirms that the randomization procedure was successful, at least as far as these variables are concerned.

From the initial participants, 242 employees (66%) completed the intervention. Comparing the completers with the initial participants no significant differences were found for age, work experience and absenteeism history. However, significant differences were found for gender ($\chi^2_1 = 10.78$, $P = 0.00$) and education ($\chi^2_2 = 9.09$, $P = 0.01$). More than 16% of the “lost to follow-up group” comprised women, in contrast with just 6% of the group who completed the intervention. Almost 41% of the “lost to follow-up group” were higher educated employees compared with just 26% of the group who finished the intervention.

The number of employees who completed the intervention was 116 for the physical group and 126 for the cognitive group. No significant differences were found between these groups regarding age, gender, work experience, education or absenteeism history ($\chi^2_1 = 0.12$, $P = 0.73$).

Intervention effects

As can be seen in Tables 2 and 3, the pattern of changes in sickness absence in the treated group is in most cases identical with the changes in the intention to treat group.

Differences between the four intervention groups in sickness absence before the intervention

As demonstrated in Tables 2 and 3, there is a tendency for stressed employees to have a higher frequency, incidence rate, duration and length of sickness absence compared with non-stressed employees (and the reference group). For frequency and length, the differences between the four intervention groups are significant ($\chi^2_3 = 8.30$, $P = 0.04$ and $\chi^2_3 = 15.03$, $P = 0.00$, respectively). For incidence rate and duration, the differences are not significant ($\chi^2_3 = 3.86$, $P = 0.28$ and $\chi^2_3 = 5.19$, $P = 0.16$, respectively). For the treated group the results are similar (χ^2_3 frequency = 7.74, $P = 0.05$; χ^2_3 length = 10.02, $P = 0.02$; χ^2_3 incidence rate = 4.63, $P = 0.20$; χ^2_3 duration = 8.30, $P = 0.32$).

Differences between the four intervention groups in sickness absence after the intervention

The differences between the groups after the interventions are not significant (results for the intention to treat group are: frequency, $\chi^2_4 = 6.19$, $P = 0.19$; incidence rate, $\chi^2_4 = 7.75$, $P = 0.10$; duration, $\chi^2_4 = 4.30$, $P = 0.37$; length, $\chi^2_4 = 4.04$, $P = 0.40$).

Effects in time and effects of the intervention (interaction)

As can be seen in Tables 2 and 3, a significant effect in time was demonstrated for the reference group for all four sickness absence measures. For stressed employees with a physical intervention, a marginal significant decline was found for frequency and incidence rate. The observed marginal significant reduction of duration and length in the “intention to treat group” (non-stressed physical intervention) disappeared in the “treated group.” As a consequence we consider these changes as marginal and potentially influenced by participants who did not complete the intervention. No interactions effects were found [frequency $F(2.99) = 1.452$, $P = 0.21$; incidence rate $F(0.00) = 1.467$, $P = 0.21$; duration $F(1982.05) = 1.045$, $P = 0.38$; length $F(1462.53) = 0.422$, $P = 0.79$].

Effects on the beginning of a new period of absenteeism

During the first year after the intervention, the median time for the onset of a new episode of absenteeism was significantly decreased for the group of stressed employees with a cognitive intervention (144 days), compared with the reference group. Compared to the physical intervention, the onset of a new episode of a absentee-

Table 2 Means and medians of absenteeism in four intervention groups (intention to treat) and the reference population

	Before intervention		After intervention		Before–after comparisons tested with Wilcoxon <i>P</i>	After intervention score corrected with pre-intervention score		Mann–Whitney <i>U</i> test
	Mean	Median	Mean	Median		Mean	Median	
Frequency (times/year)								
Stressed physical intervention	1.80	1.00	1.43	1.00	0.05	−0.37	0.00	<i>P</i> = 0.52
Stressed cognitive intervention	2.11	2.00	1.82	2.00	0.36	−0.28	0.00	
Non-stressed physical intervention	1.39	1.00	1.40	1.00	0.98	0.01	0.00	<i>P</i> = 0.52
Non-stressed cognitive intervention	1.47	1.00	1.36	1.00	0.44	−0.11	0.00	
Reference population	1.34	1.00	1.28	1.00	0.00*	−0.06	0.00	
Incidence rate ($\times 10^{-4}$)								
Stressed physical intervention	2.65	1.56	2.03	1.56	0.02	−0.62	−0.04	<i>P</i> = 0.28
Stressed cognitive intervention	3.15	3.11	2.74	1.56	0.44	−0.41	−0.00	
Non-stressed physical intervention	2.13	1.56	2.12	1.56	0.56	−0.02	0.00	<i>P</i> = 0.56
Non-stressed cognitive intervention	2.28	1.56	2.08	1.56	0.35	−0.20	0.00	
Reference population	1.99	1.56	1.87	1.56	0.00*	−0.13	0.00	
Duration (days/spell)								
Stressed physical intervention	21.2	5.3	26.8	6.0	0.38	6.6	1.3	<i>P</i> = 0.97
Stressed cognitive intervention	13.4	6.5	25.3	5.8	0.37	15.6	1.0	
Non-stressed physical intervention	10.8	5.0	16.6	6.0	0.04	10.6	2.3	<i>P</i> = 0.19
Non-stressed cognitive intervention	9.4	4.5	17.0	5.0	0.97	10.1	1.0	
Reference population	12.5	5.1	15.6	6.0	0.00*	7.2	2.0	
Length (days/person)								
Stressed physical intervention	40.6	12.5	51.3	14.0	0.75	14.9	1.0	<i>P</i> = 0.69
Stressed cognitive intervention	39.1	20.5	46.6	16.5	0.40	13.1	1.5	
Non-stressed physical intervention	17.0	11.5	28.0	11.0	0.03	14.5	3.5	<i>P</i> = 0.26
Non-stressed cognitive intervention	19.7	8.5	26.9	10.0	0.80	11.0	2.0	
Reference population	26.7	11.0	29.8	11.0	0.00*	9.4	3.0	

*Significant ($P < 0.01$)

ism is marginally significant. For the other groups, this conditional probability to report oneself sick during the first year after the intervention did not differ significantly from the reference group (Table 4; Fig. 2).

Discussion

We found that for stressed employees, the physical intervention marginally decreased the frequency and incidence rate of sickness absence, although we could not find significant effects on duration or length, nor on the period between the intervention and first new sickness absence spell. In contrast, there was a significant effect for stressed employees of the cognitive intervention on sickness absence by shortening the period before the first new sickness absence spell after the intervention. On the other hand, this outcome was not accompanied by a significant prolongation of days of sickness absence, i.e., “length” or “duration,” nor by a significant effect on spells, i.e., “frequency” and “incidence rate.”

The results of our study once more bring in focus the arguments for stress management programs. An important reason for implementing stress management

interventions in companies is the assumed cost-effectiveness of these interventions. From this perspective of cost control, our results may appear discouraging at first glance. After all, the interventions did not alter or modify the cost burden of absenteeism significantly because the length and duration of absenteeism—variables that contribute strictly toward the expenditures that employers face—are not obviously affected. This finding may challenge the widely held beliefs about the absenteeism-reducing efficacy of stress management interventions (Francis and Pennebaker 1992; Murphy and Sorenson 1988; Seamonds 1982, 1983; Toivanen et al. 1993) and undermines the arguments for sales.

The most common type of stress management intervention is the combination of muscle relaxation and a cognitively oriented training. This is, in combination with a solid cognitive training, generally accepted as the most effective intervention across all types of outcome measures (van der Klink et al. 2001; Murphy 1996). In our study, the effectiveness of the physical intervention for stressed employees with respect to duration of sick leave was similar to that of the cognitive intervention, which may be due to a synergistic effect of exercise and relaxation, possibly by diminishing complaints related to depression and anxiety (Craft

Table 3 Means and medians of absenteeism in four intervention groups (treated) and the reference population

	Before intervention		After intervention		Before–after comparisons tested with Wilcoxon <i>P</i>	After intervention score corrected with pre-intervention score		Mann-Whitney <i>U</i> test
	Mean	Median	Mean	Median		Mean	Median	
Frequency (times/year)								
Stressed physical intervention	1.75	2.00	1.36	1.00	0.03	−0.39	0.00	<i>P</i> = 0.
Stressed cognitive intervention	1.98	2.00	1.87	2.00	0.65	−0.11	0.00	
Non-stressed physical intervention	1.40	1.00	1.28	1.00	0.44	−0.13	0.00	<i>P</i> = 0.
Non-stressed cognitive intervention	1.40	1.00	1.32	1.00	0.63	−0.07	0.00	
Reference population	1.34	1.00	1.28	1.00	0.00*	−0.06	0.00	
Incidence rate ($\times 10^{-4}$)								
Stressed physical intervention	2.60	2.31	1.89	1.56	0.02	−0.71	−1.54	<i>P</i> = 0.
Stressed cognitive intervention	3.03	3.11	2.82	1.56	0.58	−0.21	−0.00	
Non-stressed physical intervention	2.14	1.56	1.94	1.56	0.35	−0.20	0.00	<i>P</i> = 0.
Non-stressed cognitive intervention	2.16	1.55	2.01	1.56	0.58	−0.15	0.00	
Reference population	1.99	1.56	1.87	1.56	0.00*	−0.13	0.00	
Duration (days/spell)								
Stressed physical intervention	24.1	6.0	15.6	6.0	0.87	−5.3	1.0	<i>P</i> = 0.
Stressed cognitive intervention	14.6	6.5	15.0	5.0	0.67	4.4	0.9	
Non-stressed physical intervention	7.5	5.4	16.9	5.5	0.95	11.0	0.0	<i>P</i> = 0.
Non-stressed cognitive intervention	11.2	4.5	9.0	4.8	0.36	1.2	0.8	
Reference population	12.5	5.1	15.6	6.0	0.00*	7.2	2.0	
Length (days/person)								
Stressed physical intervention	43.5	13.5	45.8	12.0	0.84	7.0	0.0	<i>P</i> = 0.
Stressed cognitive intervention	23.4	16.0	39.5	16.5	0.34	16.2	1.0	
Non-stressed physical intervention	14.0	10.0	26.1	1.0	0.49	13.7	2.0	<i>P</i> = 0.
Non-stressed cognitive intervention	24.3	8.0	19.8	9.0	0.27	1.5	1.0	
Reference population	24.9	9.0	29.8	11.0	0.00*	9.4	3.0	

*Significant ($P < 0.01$)**Table 4** Absenteeism-free intervals

	Intention to treat						Treated					
	Median	SE	95% CI	Logrank			Median	SE	95% CI	Logrank		
				Stat	<i>df</i>	Sign				Stat	<i>df</i>	Sign
Stressed												
Physical intervention	209	81	50–368	2.98	1	0.08	209	83	45–373	0.85	1	0.36
Cognitive intervention	65	16	33–97				65	20	26–104			
Non-stressed												
Physical intervention	153	43	69–237	0.93	1	0.33	152	57	40–264	0.69	1	0.41
Cognitive intervention	254	39	177–331				262	31	201–323			
Reference population	211	8	195–227				211	8	195–227			
×Stressed physical intervention	209	81	50–368	0.73	1	0.39	209	83	45–373	1.32	1	0.25
×Stressed cognitive intervention	65	16	33–97	10.96	1	0.00	65	20	26–104	6.44	1	0.01
×Non-stressed physical intervention	153	43	69–237	2.37	1	0.12	152	57	40–264	1.03	1	0.31
×Non-stressed cognitive intervention	254	39	177–331	0.01	1	0.94	262	31	201–323	0.02	1	0.89

Kaplan–Meier: summary statistics and statistical test for the four intervention groups (physical and cognitive interventions for stressed and non-stressed employees) plus comparison to the reference population

and Landers 1998; Vickers and Zollman 1999). The effect on frequency and incidence was even marginal significantly better.

Based on the understanding that characteristics of the individual are strongly associated with sickness absence, some theories regard frequent short-term sickness absence as a coping strategy (Kristensen 1991;

Alexanderson 1998). By using this coping strategy, Kristensen (1991) asserted that an employee achieves either reduction of work-related strain or recovery from work. The purpose of this strategy for an employee may be to prevent more serious diseases. Therefore, we expected a reduction of the frequency of sickness absence in the intervention groups of participants

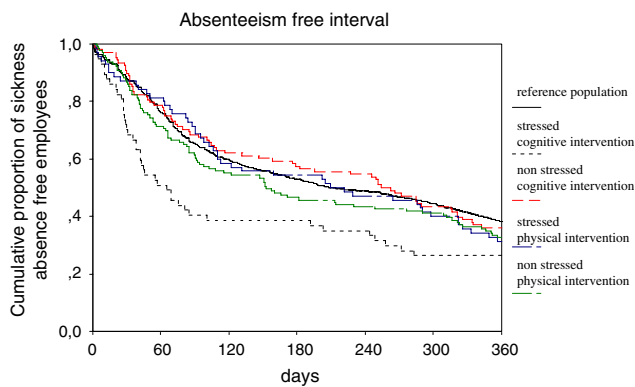


Fig. 2 Cumulative absenteeism-free interval function of the intention to treat group

especially those with high levels of distress. Apparently, the expected change in coping did not contribute to a specific reduction in the number of spells in the intervention groups. Unfortunately, we do not have data on whether the exercises conducted in the treatment setting are also conducted outside the treatment setting. Future outcome research on stress management interventions may add this subject of “transfer of change” to the study design.

The shortening of the sick-leave-free period of stressed employees attending the cognitive intervention was unexpected. It was assumed that the coping strategy of the employee was modified by the cognitive intervention in such a way that he was able to reinterpret the stressful situation. Redefining the situation could prevent the employee from taking up sickness absence. However, in the present study, it may be more likely that the shortening of the sick-leave-free period is a result of awareness of stress and the decision “to stop for a while” to recuperate rather than a cognitive restructuring that encourages realistic assessments of hazardous situations. In that case, “to stop for a while” may be an accurate response to the situation and may therefore be a positive coping self-statement (Alexanderson 1998).

The major increase in length of absenteeism for stressed employees with intervention further underlines the relevance of using distinguished sickness absence data. In this study, only focusing on length of absenteeism may have lead to misinterpretations of the sick leave pattern. Length of absence is, according to its definition, based on sick leave days and is a measure of the cumulative individual illness burden during the study period. The illness burden of all stressed employees with or without intervention in our study seems to have increased. This is in contrast to the decreasing trend for duration and frequency. Because the numerator of these measures (new sick leave days and total

sick leave spells, respectively) is similar or has decreased, the only explanation for the increase in length (total sick leave days/sick-listed persons) may be the difference in current spells in the numerator of length. This indicates that the sick leave days of sick-listed persons in current spells—thus at the beginning of the intervention—are represented disproportionately.

To the authors’ knowledge, this is the first intervention study with four sick leave outcome measures to reveal a more complete picture of changes in the sick leave pattern. In line with Isacson et al. (1992) we can conclude that “adding more measures gives a more comprehensive picture of sickness absenteeism and of differences between groups.”

One strong point of our study is the design. Randomized controlled trials have proved to be the most valid study design for producing valid information on the effectiveness of an intervention.

A second quality of the present study is the detailed description of the sickness absence data. Thus far, very little attention has been paid to the implications of different quantitative measures of sickness absence for the interpretation of intervention studies. As far as we know, this is the first intervention study in which the data processing has been carried out in such a detailed way. In addition, we did not rely on self-reported sickness absence data, which are less precise and more prone to bias. Moreover, self-reported data could increase the problem of common method variance.

Despite methodological rigor of the present study, such as RCT and refined absence data, there are two limitations that should be addressed in future research on this topic.

The first limitation of the study is the nature of the study sample. All groups were occupational cohorts of personnel working in a telecom company consisting mainly of men. Therefore, this population is not necessarily representative of the general working population.

The second limitation is the relatively small sample size of the intervention groups. Some caution must be applied when interpreting the results of this study, because the small groups may easily negatively influence the authority of the study, whereby an association that is actually present might be missed (type II error). Despite these limitations, the results of this study suggest that the illness burden represented by absenteeism is effected in detail but not substantially by the interventions.

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