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Effects of a physical exercise intervention on employees' perceptions of quality of life: a randomized controlled trial

Submitted: 25 May 2005
Accepted: 12 October 2005

Summary

Objectives: To determine the effects of an exercise intervention in workplace health promotion, WHO multidimensional quality of life was chosen as the main outcome variable. Secondary outcomes were different physical fitness indicators.
Methods: 110 employees (83 male, 27 female, modus age group 36–45 years) volunteered to participate and were randomly allocated to intervention (n = 52) or control group (n = 58). Intervention subjects exercised 13 weeks, at leisure time, in off-worksite training facilities. Outcome measures were assessed before and after the intervention, and at 3 month follow-up.
Results: Significant training effects resulted for overall perception of quality of life, and for psychological and physical health sub-domains. Physical strength indicators improved significantly as well, with these changes being independent from psychological health benefits. At follow-up, elevated psychological scores held steady only for those who continued to exercise on their own.
Discussion: This intervention had impact on important health indicators. Since it was arranged on top of a "real world" occupational health promotion program, the observed findings should even more encourage employers to invest in their employees' health.

Keywords: Workplace health promotion – Physical exercise – Quality of life.

The Ottawa Charter for Health Promotion stresses the influence of settings on individual health behavior. Workplace Health Promotion (WHP) is such a setting oriented program and a promising means to improve the physical and mental health of employees (Cotton & Hart 2003; Pelletier 1999; Pelletier 2001). WHP is multi-facetted. Besides components such as safety at work, workplace ergonomics, organizational development or human resource development, WHP aims at healthy lifestyle behaviors, such as physical activity. Enhancing the physical activity levels of employees promises a variety of effects on the individuals' health (Dishman et al. 1998). Opportunities to be active exist in four major domains of daily life: at work (for example in manual labor), at home (for example doing housework, gardening), for transport (for example cycling to work) and in leisure time (for example participating in exercise or sports activities). Especially leisure time physical activity has been shown to be a critical variable for risk reduction on several health outcomes, e.g. coronary heart disease or stroke (Dishman et al. 2004).
Though enhancing employees' health statuses should be the primary orientation in designing WHP programs, economic viability is a most relevant argument. Various forms of WHP, with the potential to positively influence employee absenteeism, productivity, job satisfaction, job stress, or employee turnover have been under investigation for years (Pelletier 2001). Taken together with some additional studies on cost-effectiveness (Aldana 2001; Chapman 2003; Golaszewski 2001), one may ask, why many of business organizations are still sceptic about investing in WHP. It is important to recognize that a lot of research done in this area is difficult to interpret (DeGroot & Kiker 2003). Concerning physical exercise interventions, a lot of studies are of poor methodological quality. Consequently, Proper et al. (2002) conclude to state limited evidence of an effect for absenteeism, inconclusive evidence for job turnover, and, because of sheer absence of high quality studies, no evidence for productivity. However, due to recently published research, limited evidence for productivity can be stated (Nurminen et al. 2002). One study addresses the crucial question of financial viability directly

Soz Praventiv Med 51 (2006) 14–23
0303-8408/06/010014-10
DOI 10.1007/s00038-005-0002-z

(Proper et al. 2004). In a randomized controlled trial, sick leaves of participants and non-participants in a physical activity WHP counseling program were monitored over two nine-month periods in two consecutive years. Employer's investment for each participant was 430 Euro. Over the nine months of intervention, average financial pay-back due to sick leaves was 125 Euro per person. But only few people were responsible for large proportions of costs. As the authors note, the difference in sick leave costs between those who received tailored physical activity counseling and those who did not "was large and might be considered relevant from an employer's perspective" (Proper et al. 2004). They further argue that positive health effects were detected for participants' energy expenditure and cardiorespiratory fitness. This may lead to long term savings of employer's disease expenses. However, no evidence for statistically significant cost savings could be found in this study.

Still, even moderate increases of life-style physical activity result in significant reductions of morbidity and overall mortality (Lee & Skerrett 2001; Oguma et al. 2002). So it is good to know that corporations in western societies start programs to enhance the fitness levels of their employees (Proper et al. 2002; Gebhardt & Crump 1990). There is evidence that personal fitness can be improved by workplace health promotion programs (Dishman et al. 1998; Pohjonen & Ranta 2001; Proper et al. 2003; Shepard, 1996; Titze et al. 2001). But this is not particularly surprising. From the viewpoint of sport physiology, regular exercising will almost certainly lead to increased levels of fitness. Basic work in this area shows that untrained or widely inactive persons gain already by a moderate increase of their physical activity level (Wilmore & Costill 1994).

Psychological constructs have also been taken as WHP outcome variables. A lot of this research is at least implicitly based on the so called "happy-productive worker hypothesis" (Spector 1997). This idea predicts that unhappy employees are more often absent from work and that they produce less quality at their jobs. Wright and Cropanzano (2000) propose that the happiness component of the hypothesis should best be conceptualized as subjective well-being (SWB). SWB, as a most relevant health outcome and a common variable in evaluating "soft" effects of WHP programs (Harter et al. 2003), can be defined as the individual's current evaluation of his or her happiness and life satisfaction. It is often expressed in affective terms and thus, at least in part, a proxy for a global affective evaluation (Schwartz & Strack 1999). The setting-sensitive construct of job-satisfaction is subordinate but closely linked to well-being (Diener et al. 1999). It is narrower in scope and summarizes the individual's reaction to the job experience (Berry 1997). There is good evidence that job-satisfaction is linked to work-relevant outcome variables, e. g. job-performance (Judge et al. 2001), and at least some studies demonstrate that it can be positively influenced by physical activity WHP programs (Proper et al. 2002). Still, there are good (empirical) reasons to focus on SWB which has recently been shown to be significantly related to performance ratings beyond the effect of (composite) job-satisfaction (Wright & Cropanzano 2000).

In our view, quality of life (QOL) as defined by the World Health Organisation is an upcoming alternative to address the concept of subjective well-being. QOL is structurally related to SWB and, not the least, due to reasons of international comparability of study findings, it is a promising outcome measure of current interest (Dugdill & Springett 2001; World Health Organisation Quality of Life-Group 1993; Kahneman et al. 1999; Rapley 2003). To our best knowledge there are no studies in the area of WHP which have taken QOL into account as a dependent variable.

Quality of life as defined by the World Health Organisation, is "an individual's perception of their position in life in the context of culture and value systems in which they live and in relation to their goals, expectations, values and concerns (…) incorporating in a complex way the person's physical health, psychological state, level of independence, social relationships, personal beliefs and their relationship to salient features of the environment (…) Quality of life refers to a subjective evaluation which is embedded in a cultural, social and environmental context" (World Health Organisation Quality of Life-Group 1993).

The WHP program Prevention First was initiated in 2003 as a concerted pilot project of three business organizations and two health insurance companies. The idea was to implement an "exercise-only" health promotion offer for employees to exercise in leisure time, at medical fitness centers away from the worksite. Thereby the program should impose no financial strains on the participating employee. It is most important to note that initially, Prevention First was designed as a best practice model. The accompanying scientific evaluation, the field experiment which is reported in this article, was set on top of this organizational prerequisite.

Prevention First primarily aims at increasing participants' well-being as an integrated indicator of individual health (World Health Organisation 2002). One of its central goals is to contribute to the view that WHP programs should address and positively influence well-being beyond the scope of the worksite. From this viewpoint, there is a difference, if employees exercise during the working day in full onsite facilities, or if they are given the opportunity to take part in a program outside of the working day, away from the worksite (Taylor 2000). Helping people to exercise after work should

Table 1 Outline of the physical exercise intervention program (group sessions)

Intervention week	Topic
	All sessions started with 15–20 min of light to moderate endurance exercising for general warming up.
1	Basic calisthenics for vertebral column; introduction to site's fitness training equipment.
2	Calisthenics for vertebral column; basic stretching.
3	Relieving the vertebral column in activities of daily life.
4	Calisthenics with the Pezziball; basic muscular relaxation.
5	Basic strengthening with the Thera-Band; basic muscular relaxation.
6	Calisthenics (esp. bodily strengthening) for vertebral column.
7	Basic coordination and flexibility exercises.
8	Advanced calisthenics with the Pezziball; basic muscular relaxation.
9	Circuit training for general muscular strengthening.
10	Basic coordination and balance exercises.
11	Relieving the vertebral column in activities of daily life; circuit training for general muscular strengthening.
12	Calisthenics (esp. for vertebral column) and muscular relaxation exercises, introduction to home training methods.
13	Calisthenics (esp. for vertebral column) and muscular relaxation exercises; elaboration of home training methods.

be a better strategy in motivating employees to give up their sedentary life style and to enhance leisure time physical activity. Therefore we focus on the much broader WHO concept of Quality of Life, as the main outcome variable. Beside this internationally standardized measure, job-satisfaction and five selected physical fitness indicators (see below) were chosen as specific side measures to indicate program effectiveness.

Methods

Study Design and Study Population

A randomized, controlled, single trial was conducted. Subjects were recruited by and from three business organizations. Because of the companies' fixed budget for this pilot program, which allowed participation of 240 employees at most, no sample size estimations or determinations of sample size power have been calculated at the time when the study was planned. Target groups were office as well as blue collar workers. The companies' medical departments put on a marketing campaign (posters and flyers) that informed employees about the upcoming Prevention-First training program. Interested persons enrolled after a group information session, where they have been informed about the training program, the randomization and measurement procedures. Written informed consent to all parts of the study was prerequisite for participating. Subjects who agreed to participate were randomly assigned to one of two conditions, either the exercise intervention group, or a waiting list (control group). Participants completed paper-pencil tests to assess health related quality of life and job-satisfaction, and were tested for selected physical fitness indices before and after the intervention period (T1 and T2 measures). Subjects in the intervention group were asked to fill out the questionnaire and participate in the physical fitness testings three months after the end of the intervention (T3 follow-up measure).

Intervention

The intervention took place over 13 weeks and consisted of 26 sessions of exercise provided by two different medical fitness companies. Subjects could take additional free exercise sessions in the course of the intervention period. One session per week was guided by a fitness coach and was conducted in a small group training situation (6 to 8 persons per group). At the second or at voluntary additional sessions subjects exercised individually and without direct instruction. Exercise programs for group sessions were identical, though delivered by different trainers, at different training sites. This was ensured by detailed and binding training schedules, which have been developed with the relevant fitness trainers' help beforehand. Recommendations for individual sessions were tailored for comparable groups of exercisers, based on trainers' expert judgments drawn from the group exercise sessions. The overall structure of the training intervention is depicted in Tab. 1.

Measures

Health related quality of life, as the primary outcome measure of the study, was assessed with the short form of the World Health Organisation Quality of Life inventory (WHOQOL-BREF; World Health Organisation Quality of Life-Group

Table 2 WHOQOL-BREF sample items[a]

WHOQOL-BREF	Sample item
Global evaluation	How satisfied are you with your health?
Domains	
Physical health	To what extent do you feel that physical pain prevents you from doing what you need to do?
Psychological	How satisfied are you with yourself?
Social relationships	How satisfied are you with your personal relationships?
Environment	How safe do you feel in your daily life?

[a] WHOQOL-BREF, short form of the World Health Organization Quality of Life Questionnaire.

1998). The WHOQOL-BREF is a cross-culturally normed test, which is available in a variety of different languages, among them a well-developed German version (Angermayer et al. 2000). This should positively contribute to the possibility of replicating the study and therefore strengthen the studies' general layout. The WHOQOL-BREF consists of 26 questions. It is based on a four domain structure (physical health, psychological, social relationships and environment), with one additional scale to measure overall quality of life and general health (Tab. 2) (World Health Organisation Quality of Life-Group, 1998). Responses are made on a 5-point Likert scale ranging from (1) *very dissatisfied* to (5) *very satisfied*. There is demonstrated good validity and good reliability for all subscales, with Cronbach's alphas ranging from .76 to .88 (Angermayer et al. 2000). As a setting-sensitive side measure of well-being, job-satisfaction was assessed using the respective scale of the Life Satisfaction Questionnaire (FLZ). The FLZ is also a standardized and validated German test (Fahrenberg et al. 2000). Higher scores on the 'job and profession' scale indicate that subjects are satisfied with their professional position, with their success and with their promotion possibilities. They judge their professional future as save and climate at work as positive. They are satisfied with the demands and strains of their jobs. Associated with lower scores are physical aches and pains, and depressive moods in general. The scale consists of 7 items which are answered on 7-point Likert scales ranging from (1) *very dissatisfied* to (7) *very satisfied*. Cronbach's alpha coefficient for scale reliability is .93 (Fahrenberg et al. 2000).

Five indices of physical fitness were chosen as additional outcome measures. Testing of the trunk stabilizing muscular system was performed, using a computerized test system ("Back Check by Dr. Wolf"). It measures the strength of the dorsal and ventral muscular system with subjects standing in an upright position with fixed hip, pushing the upper part of their body forward or backwards against a pressure sensitive system (strength indexed in pressure kilograms [kg] for vertebral column's flexors and extensors). The Schober test was chosen for diagnosis of body flexibility. It measures the degree of lumbar forward flexion as the patient bends over as though touching her toes (indexed DF-S1 10 cm cranial). A corresponding measure (Ott-Test) was applied for the upper back (indexed DF-C7 30 cm caudal). For approximating endurance levels a PWC-150 bike ergometer test was used (starting from 50 Watts with 60 to 80 rounds per minute, raised by 25 Watts every two minutes, test stopped at reaching 150 heart beats per minute; indexed Watt/kg body weight).

Randomization and testing

The randomization procedure was performed by a statistician who was not involved in the study. Random lists were prepared and detailed information on their handling was provided for contact persons of the companies' Human Resources Departments, so that they could allocate subjects to study conditions. Those who assisted with the psychological or physical fitness tests were blinded to the allocation of subjects into groups. This procedure was approved by the University of Stuttgart review board on February 12, 2003.

Data Analysis

Repeated-measures analysis of variance models were used to detect changes from T1 to T2. Criteria for multivariate testing were conceptual and statistical correlation of grouped dependent variables. All analysis of variance models were controlled for the covariates gender and T1 exercise status. Separate univariate models (ANCOVA) were run to test effects on WHOQOL-BREF overall, and job-satisfaction scores. Multivariate modeling (MANCOVA) was used for the multiple dependent domains of quality of life (physical and psychological health, social relationships and environment), for changes in vertebral column's muscular strength (flexor and extensor indices) and flexibility (Schober and Ott indices). ANCOVA was run to judge PWC changes. Product-Moment-Correlation Coefficients were calculated to check for independency of psychological and physical fitness changes. Paired *t* tests were used to evaluate changes in the intervention group from T2 to T3. Randomization-checks and lost to follow-up analyses were

Table 3 Baseline demographic and behavioral data on study sample and checks for successful randomization (N = 110)

	Subjects				
	Intervention	**Control**	χ^2	*df*	*p*
Modus age group	36–45	36–45	1.39	3	.71
Women / Men	*n* = 16/*n* = 36	*n* = 11/*n* = 47	2.06	1	.15
Blue collar workers	47.1 %	43.4 %	0.16	1	.69
Regular phys. exercise (T1 exercise status)	42.3 %	42.9 %	0.03	1	.87
Body mass index (kg/m^{-2})	Mean = 25.97 SD = 4.52	Mean = 26.21 SD = 3.61	–	–	–

SD, standard deviation.

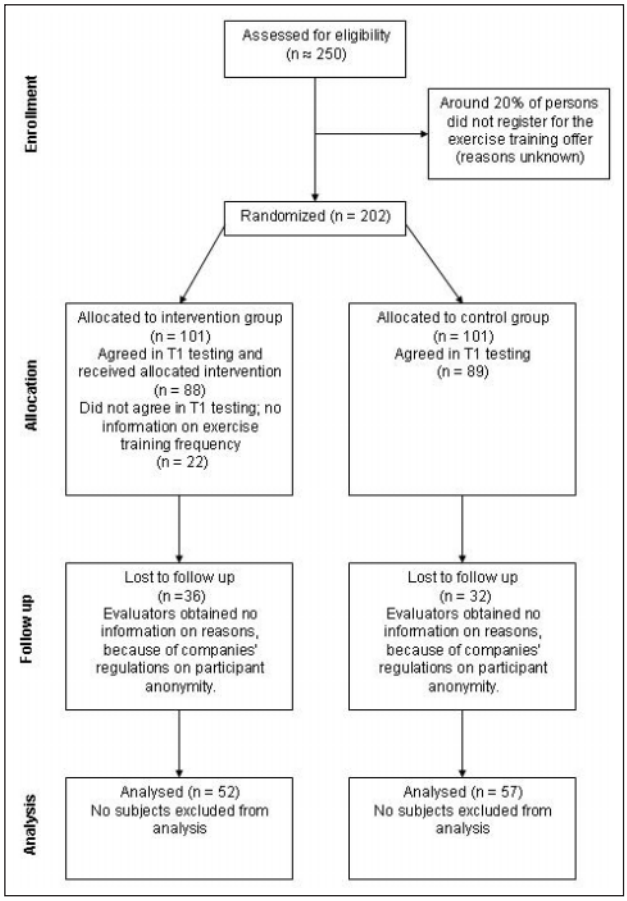

Figure 1 Flow diagram of subjects in the trial.

performed using χ^2 and unpaired *t* Tests. Whenever possible, effect sizes (η^2) were calculated for change scores and were interpreted as small (.01), medium (.06), or large (.14).

Results

Subjects and Randomization

Around 250 employees attended the information session. 202 persons enrolled for the exercise training and were randomly allocated to intervention (n = 101) or control group (n = 101). Of those, only 177 agreed in testing for T1 baseline measurements, so data could be obtained for 88 subjects of the intervention group and for 89 subjects of the control group. In the intervention group, the loss to follow-up for completion of measurements (T1 to T2) was 41 %. Another 27 % (*n* = 14) of remaining subjects were lost from T2 to T3. Within the control group the loss to follow-up was 35 % (T1 to T2). The principal reason for loss to follow-up was refusing to continue with the study. Statistics show that there were no significant differences for gender, $\chi^2(1, N = 177) = 0.10$, $p = .92$; exercise status, $\chi^2(1, N = 170) = 0.49$, $p = .48$; nor for any psychological or physical fitness variable (unpaired *t* Tests for the six psychological and five physical fitness outcome measures; data not shown) between subjects who withdrew from the study (*n* = 67) and those who continued (*n* = 110).

For analyzing changes from T1 to T2, psychological and behavioral data of 110 employees (*n* = 52 in the intervention group) could be included into the study's data pool (Fig. 1). About half of all subjects were blue-collar workers (45.2 %). 78 % of subjects belonged to an age group ranging from thirty-six years to fifty-four years (percent per age groups; age 20–35, 10.9 %; age 36–45, 50.0 %; 46–55, 28.2 %; age 56–65 = 10.9 %). At baseline 57 % of the participants were not engaged in any kind of regular physical exercise. There were no significant group differences on baseline demographic, behavioral, nor on any psychological or physical fitness measures (see Tab. 3 for additional information on samples). Tab. 4 and 5 contain psychological and physical fitness data at baseline and at post tests for subjects with complete data for the variables of interest. Due to single missing values the number of subjects in Tables can differ by variable.

Compliance

More than half of the intervention subjects (57.6 %) attended the full set of the 26 prescribed exercise sessions at least. The

Table 4 Means, standard deviations, and analysis of variance statistics for psychological outcome variables

	Intervention group		Control group		Analysis of variance[a]		
	T1 Mean (SD)	T2 Mean (SD)	T1 Mean (SD)	T2 Mean (SD)	Effect	F*(df)*	*p* (η2)
Quality of life, global (ANCOVA)[b]	60.8 (17.3)	74.5 (11.3)	65.0 (15.3)	67.2 (15.9)	G × T	15.91 (1, 104)	.001 (.13)
Quality of life, domains (MANCOVA)[b]	–	–	–	–	G × T	4.39 (4, 100)	.003 (.15)
Physical health	74.4 (15.0)	82.2 (11.0)	75.1 (13.0)	76.6 (13.4)	G × T	10.14 (1)	.002 (.09)
Psychological	70.4 (11.2)	76.4 (10.0)	69.8 (11.5)	70.6 (13.1)	G × T	9.13 (1)	.003 (.08)
Social relationships	72.5 (15.9)	73.6 (12.8)	69.2 (17.0)	71.7 (16.8)	G × T	0.19 (1)	.661 (---)
Environment	73.9 (10.5)	77.0 (8.9)	72.1 (10.9)	72.5 (11.9)	G × T	3.82 (1)	.069 (---)
Job-satisfaction (ANCOVA)[b]	36.9 (7.1)	38.6 (6.3)	36.8 (6.6)	36.9 (5.5)	G × T	3.57 (1, 101)	.062 (---)

[a] Main effects left out with significant interaction effects, or if insignificant themselves.

[b] Gender and T1 exercise status as covariates, data not shown.

ANCOVA, analysis of covariance; MANCOVA, multivariate analysis of covariance; G, group; T, time; SD, standard deviation.

Table 5 Means, standard deviations, and analysis of variance statistics for physical outcome variables

	Intervention group		Control group		Analysis of variance[a]		
	T1 Mean (SD)	T2 Mean (SD)	T1 Mean (SD)	T2 Mean (SD)	Effect	F*(df)*	*p* (η2)
PWC 150 (ANCOVA)[b] [Watt/kg body weight]	2.1 (0.6)	2.3 (0.6)	2.2 (0.5)	2.8 (1.8)	G x T	1.24 (1, 101)	.268 (---)
VC, Muscular Strength (MANCOVA)[b]	–	–	–	–	G x T	9.32 (2, 99)	.001 (.16)
flexors [kg]	35.7 (16.0)	49.8 (17.6)	40.8 (18.9)	43.1 (17.5)	G x T	18.18 (1)	.001 (.15)
extensors [kg]	56.4 (19.0)	64.5 (22.8)	60.6 (21.2)	58.9 (21.8)	G x T	5.14 (1)	.026 (.05)
VC, Flexibility (MANCOVA)[b]	–	–	–	–	G x T	0.81 (2,103)	.446 (---)
Schober [DF-S1 10/…cm cranial]	14.8 (1.2)	15.5. (1.2)	14.7 (0.9)	15.2 (1.0)	G x T T	1.44 (1) 4.70 (1)	.233 (---) .032 (.04)
Ott [DF-C7 30/…cm caudal]	32.2 (1.4)	32.3 (1.4)	31.9 (0.9)	32.3 (2.8)	G x T	0.29 (1)	.594 (---)

[a] Main effects left out with significant interactions, or if insignificant themselves.

[b] Gender and T1 exercise status as covariates, data not shown.

ANCOVA, analysis of covariance; MANCOVA, multivariate analysis of covariance; SD, standard deviation; G, group; T, time; VC, Vertebral Column.

average attendance frequency of all intervention subjects was 23.01 (*SD* = 5.15).

Changes in quality of life and job-satisfaction

Main analyses showed that for WHOQOL-BREF global score, Group x Time interaction was significant, with no significant effect for any covariate variable (data not shown). Mean quality of life increased for the intervention group by 13.70 score-points, which can be interpreted as a medium to large intervention effect. Repeated measures MANCOVA for the four domain scores also indicated a large significant Group x Time interaction. Univariate analyses show that this interaction is based on significant effects in the physical and psychological health domains. For both levels of analyses, covariate statistics were not significant (data not shown). Analyses on job-satisfaction were not significant. (Tab. 4)

Changes in physical fitness

Repeated measures MANCOVA shows a large intervention effect for vertebral column's muscular strength with no covariate statistic reaching the significance level. Test scores in the intervention group increased significantly for the flexor and the extensor muscular system. This was not the case for the flexibility indices. Interaction effects for 'Schober' as well as for 'Ott' were not significant. There is a small time-effect for the 'Schober' measure though. But due to the small effect size, we suggest not to interpret it. ANCOVA for analyzing the PWC 150 data showed neither the expected interaction effect, nor significant main effects for time or group. (Tab. 5)

Table 6 Results of paired t-tests, three month follow-up

Subscales	M_{T2-T3} (SD)[a]	*t*	*df*	*p*	*effect size d*
	Exercisers at T3 (*n* = 17)				
Quality of life					
Global	4.41 (14.62)	1.24	16	.23	0.27
Physical health	3.05 (7.14)	1.76	16	.10	0.21
Psychological	2.45 (8.08)	1.25	16	.23	0.23
VC strength					
Flexors	0.79 (10.48)	0.31	16	.76	0.04
Extensors	5.81 (13.14)	1.77	16	.10	0.31
	Non-Exercisers at T3 (*n* = 16)				
Quality of life					
Global[b]	13.28 (17.36)	3.06	15	.01	1.05
Physical health	7.07 (9.19)	3.08	15	.01	1.36
Psychological	3.65 (7.89)	1.85	15	.08	0.42
VC strength					
Flexors	–0.66 (24.68)	–0.11	15	.92	–0.04
Extensors	6.44 (14.90)	1.73	15	.11	0.29

[a] Paired Differences

[b] Correlation between T2 and T3 scores is not significant, $r(16) = .08$, $p = .76$

VC, vertebral column

Independency of changes in psychological variables and physical fitness

A correlation matrix was computed to check whether changes in psychological and physical fitness indices were interdependent. Entered variables were change scores (T1-T2 differences for intervention group members) of the five physical fitness indices and the six psychological measures. Only two of the resulting 30 correlation coefficients reached the required significance level of $< .05$, with both being low in figure (data not shown).

Follow-up analyses

Exercise status. 38 out of the 52 intervention group subjects (73.1 %) sent back questionnaires at T3. Asked about their exercise status, 51.5 % (n = 17) of our subjects claimed to be exercising regularly. But less than one-third of the inactive subjects at T1 have actually changed *and* maintained their exercising behavior until T3 (n = 5). It is important to note that most of those exercising at T3, were already exercising at T1 (n = 12).

Stability of improved psychological and physical health. For those who continued to exercise regularly, WHOQOL-BREF scores as well as physical fitness indices remained stable. Contrarily, for those who stopped exercising regularly at the end of the program, WHOQOL-BREF global- and physical health-score decreased significantly. In a comparable manner, both indices for vertebral column's muscular strength seem to remain stable even for those participants, who chose to stop regular exercising (Tab. 6).

Lost to follow-up. Additional analyses show that T3 participants ($n = 38$) are not different compared to those, who did not answer the follow-up questionnaire ($n = 14$). There are no significant differences for gender, $\chi^2(1, N = 52) = 0.79$, $p = .51$; exercise status at T1, $\chi^2(1, N = 52) = 0.34$, $p = .56$; blue vs. white collar $\chi^2(1, N = 52) = 1.86$, $p = .21$; or any psychological or physical fitness variable (unpaired *t* tests for the respective outcome measures, data not shown).

Discussion

Results of our field experiment clearly indicate that participation in the WHP program was associated with gains in quality of life and increased strength scores, the latter indicating an improved status of the vertebral column's muscular corset. This is valid for women as well as for men, for white collar as well as for blue collar workers. 177 employees, most of them between 36 and 45 years of age, followed the call for participation in an exercise program. A little more than half of these persons have not been engaged in any kind of regular exercise before their decision to participate in the program. There was no formal obligation for any participant to attend the exercise offers regularly. The drop-out rate of 41 % in the intervention group is inconspicuous for physical activity or exercise interventions (Dishman 1994). Though the program was held during high summer time, subjects missed hardly 15 % of the 26 indoor exercise offers at the medical training center. The attractiveness of the chance to participate in a (more or less)

strenuous, but cost free and high quality, physical exercise program obviously was very high. And this, in spite of the fact that subjects had to invest a considerable amount of leisure time to participate in the program. Subjects in the intervention group gain in perceived quality of life from doing exercise twice a week over a period of 13 weeks. They show medium to largely enhanced levels in global self-assessment of QOL, as well as large increases for the physical health and psychological sub-domain. QOL indices for social relationships and environment were not affected by the intervention and remained stable. It is plausible that these latter aspects of quality of life are less dependent on the person's actions, but more on setting specific aspects which lie outside of the individual.

These results are in line with a lot of data in health and exercise psychology, showing that engagement in moderate physical activity or sports can come along with elevated subjective well-being. Worth pointing out, but also in line with existing research, is the correlational independency between psychological and physical fitness gains (Petruzzello et al. 1991; Schlicht 1994).

An important open question to discuss is whether the found psychological effects may simply be due to the organizational offer to invest in their employees' health. When the follow-up adherence data is taken into account, things seem to be compatible to this view. Most of the subjects who were not involved in regular physical exercise before participating in the program, quit exercising after the end of the financially sponsored opportunity. Since two of the three QOL indices dropped back for these subjects, the psychological gains of Prevention First therefore could be attributed mainly to the companies' health sponsorship. But on the other hand, the training's gains in quality of life remained stable (at least for three months after the intervention) for those who continued exercising on their own. This still could be considered as a delayed effect of the sponsorship and we have no data to clear up this objection. However, consistent with a considerable amount of empirical findings, we think it is more plausible to attribute the increased state of well-being to regular exercising (Schlicht 2002; Biddle & Mutrie 2001). In summary, we take this aspect of our findings as an encouraging clue to further explore the contribution of physical activity WHP to the formation of general well-being, i.e. on top of the working life aspect.

Of course, our study is not without limitations. On the part of the initiating business companies, the program was designed rather to be a best practice model than a sophisticated research program. So, when arranging the field experimental setting on top, sound organizational politics needed to be balanced with methodological requirements. For this reason, we were not given the chance to re-contact drop-out subjects. An intention to treat analysis with subjects as randomized was impossible therefore. Another source of bias resulting from these difficulties concerns the study design. Only the members of the intervention group but no control subjects were tested at follow-up, three months after the training program. The main reason for this was that at T3, control group subjects had already begun their Prevention First program. Since the intervention program ended in midsummer (July 2003) the decision of some subjects not to further engage in regular self-organized exercise may have simply been due to the vacation season. However, we feel confident, that our field experiment can significantly contribute to health prevention research and practice, especially concerning the organizational setting.

In sum, employees who wanted to exercise were invited by their employers to engage in a high quality exercise program. As a countermove, participants had to bring in their leisure time. Though financial costs were on the side of the initiating companies, we have no doubt about the program's possibility to return the companies' investment. Our natural setting data shows that on the individual employee's level, substantive changes in perceived quality of life arose. The same is true for selected indicators of physical fitness, e. g. the elevated vertebral column's muscular strength scores. Since a correlation between back pain and muscular deconditioning is evident, one can hope that such improvement will contribute to reduce symptomatology (Verbunt et al. 2003). We propose not to overemphasize the fact that no changes in flexibility or physical endurance were found as a result of the intervention. To reach significant gains in general flexibility, the 13 week intervention period might have been too short. Plausible explanations for the missing training effects on physical endurance include the programs emphasis on calisthenics, or simple seasonal effects, which may have invited control group members to self organized exercising. What we believe to be the main outcome of our study is that Prevention First participants felt healthier at the end of the program. According to the evidence presented above, considerable impact on employees' work related behaviors are expectable. For reasons of the general layout of our study, we cannot present data on the actual financial payback. Further (long term) studies should investigate into this, as well as into the question of program specificity. It makes sense to believe that some people take extra profit out of exercise programs, whereas other people gain more from participating in stress management courses or by receiving dietary counseling. But as long as health outcomes seem to be comparable (Pelletier 1999, Pelletier 2001), and as long as there is empirical evidence for the effectiveness of the specific program these are powerful arguments to further convince companies' decision makers to invest in the "happy" healthy worker in general.

Acknowledgements
The program Prevention First was designed, and the program was funded in Germany by Dr. Ing. Ferdinand F. Porsche AG, Behr AG, Durr GmbH, the Allgemeine Ortskrankenkasse Stuttgart (AOK) and the Techniker Krankenkasse Stuttgart (TK). The reported field experiment was performed by the University of Stuttgart (i. e. first two authors in this paper), acting as an independent evaluation agency to the above mentioned initiators.

Zusammenfassung

Auswirkungen einer Sportintervention auf die subjektive Wahrnehmung von Lebensqualität. Ein randomisiertes Feldexperiment im Kontext der betrieblichen Gesundheitsförderung.
Fragestellung: In einem Feldexperiment werden Auswirkungen einer Sportintervention im Kontext betrieblicher Gesundheitsförderung bestimmt. Wichtigste Outcome-Variable bilden das multidimensionale WHO Konzept der Lebensqualität und außerdem verschiedene Maße zur Abschätzung der körperlichen Fitness.
Methoden: 110 freiwillig teilnehmende Angestellte (83 Männer, 27 Frauen, die meisten im Alter zwischen 36–45 Jahren) wurden zufällig einer Interventions- (n = 52) oder Kontrollbedingung (n = 58) zugeteilt. Die Interventionsgruppe trainierte 13 Wochen lang, außerhalb der Arbeitszeit in externen medizinischen Gesundheitszentren. Messzeitpunkte fanden vor und nach der Intervention, sowie drei Monate nach Ende der Intervention statt.
Ergebnisse: Es resultieren signifikante Trainingseffekte in der globalen Lebensqualität und deren psychischer und physischer Facette. Unabhängig davon verbessern sich einige Kraftparameter. Die psychologischen Veränderungen erweisen sich nur für diejenigen als zeitlich stabil, die nach Ende der Trainingswochen selbständig weiter trainieren.
Diskussion: Für die Trainierenden resultierte ein verbesserter Gesundheitszustand. Insbesondere weil die wissenschaftlichen Ergebnisse in Begleitung einer tatsächlichen Intervention zur betrieblichen Gesundheitsförderung erzielt wurden, bleibt zu hoffen, dass das Berichtete zur Durchführung ähnlicher Maßnahmen ermutigen wird.

Résumé

Les effets d'une intervention sportive sur la perception subjective de la qualité de vie.
Une expérience en milieu naturel randomisée dans le cadre de la promotion de la santé en entreprise.
Objectifs: Déterminer les effets d'une intervention de promotion de l'activité physique. Le concept de qualité de vie multidimensionnelle de l'OMS a été utilisé comme variable principale. Les variables secondaires sont différents indicateurs de forme physique.
Méthode: 110 employés volontaires (83 hommes, 27 femmes, âgés de 36 à 45 ans) ont été répartis au hasard dans un groupe d'intervention (n = 52) ou dans un groupe contrôle (n = 58). Les participants à l'intervention ont suivi un entraînement pendant 13 semaines. Les séances d'entraînement se sont déroulées lors des congés des travailleurs, dans des centres d'entraînement situés hors du milieu de travail. Les mesures ont été effectuées avant et après l'entraînement, et trois mois après la fin du programme.
Résultats: Les résultats suivants sont significativement positifs chez les individus ayant bénéficié de l'intervention: perception de la qualité de vie globale, dimensions psychologiques et physiques. Les paramètres en lien avec la force sont également améliorés. Les améliorations sur le plan psychique ne perdurent que chez les personnes ayant continué à s'entraîner de façon autonome après avoir terminé les 13 semaines du programme.
Conclusion: Cette expérience a amélioré la santé globale des participants. Comme cette recherche a été effectuée dans le cadre d'une mesure de promotion de la santé en entreprise et qu'elle s'avère positive, il est à espérer qu'elle encouragera les employeurs à mettre en place des mesures semblables.

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Soz Praventiv Med 51 (2006) 14–23