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Workplace Health Interventions and Physical Fitness Status among Managers of Small-Scale Enterprises in Norway and Sweden

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Abstract

Background: The ability of managers of small-scale enterprises (SSEs) to prioritize health, working conditions, and their own physical fitness is an important issue for workplace health promotion in Norway and Sweden, where most owner-manager positions are in SSEs. ***Aim***: To assess the physical fitness status of SSE managers compared to a norm population and to study changes in physical fitness status, self-reported physical activity, and sickness outcomes after workplace health interventions. ***Methods***: The study allocated SSE managers to either an intervention or a reference group. The intervention, over twelve months, consisted of motivational input related to lifestyle and physical activity through tests and feedback, individual support, and courses on health and psychosocial working conditions. The participants (N = 28) completed health screening checks, questionnaires and testing before and after the intervention. ***Results***: SSE managers in the study had positive outcomes for BMI levels and strength compared to the norm population, while percentage of fat for both men and women indicated poor results. There were no further improvements in the intervention group after comparison with the reference group. Separately, both groups seemed to improve strength and body composition. ***Conclusion***: Workplace health interventions with essentially motivational components may increase SSE managers' attention to physical fitness, but appear to have limited effects on objective and subjective physical fitness outcomes.

Keywords

Managers, Physical Fitness, Workplace Health Intervention, Small-Scale Enterprises

1. Introduction

In many countries, small-scale enterprises (SSEs) are regarded as important contributors to national and regional economic sustainability [1] [2], because they contribute to economic growth and job creation [3] [4]. The workplace has been suggested as a particularly important arena for improving psychosocial wellbeing through health and physical exercise interventions [5] [6] [7]. However, workplace health interventions are less developed in SSEs [8] [9]. One often overlooked factor is the SSE manager's own physical fitness status, health and well-being, which can be seen as a resource for entrepreneurial behavior [10] [11] and may influence stress and well-being among other staff in the organization [12].

Historically, a focus on health issues has been more common in workplaces with many employees. However, practitioners and researchers working in this area need a broader understanding with greater attention to small-scale enterprises, and to the importance of managers' knowledge, physical fitness or capacity [13], and skills in prioritizing health and improving the work environment [14] [15]. The cost-effectiveness for society, the enterprise and its employees is complex, in terms of sick leave, injury rates, stable employment levels and other factors. Separate or multifactorial interventions may contribute to improved health or prevent ill health in an SSE [16] [17].

Scientific reviews have shown that workplace health interventions can contribute to health and well-being among employees and reduce health risks [18] [19]. One review [7] showed moderate evidence that workplace health interventions focusing on exercise, lifestyle and ergonomics were more effective in reducing sickness absence than interventions focusing on educational and psychological aspects. Another systematic review [20], on the effectiveness of various approaches to increase physical activity, recommends implementing individually adopted health behavior change programs. However, another systematic review and meta-analysis [21] indicate that workplace health interventions have small but positive effects on increasing physical activity. This effect is smaller when objective fitness measures are reported compared to self-reported outcomes. Interventions targeting physical activity specifically, as opposed to general lifestyle change, were found to be more effective, in terms of both increased fitness and self-reported outcomes [21]. This is consistent with the results of a Swedish study [22], in which staff at six workplaces undertook compulsory physical training at moderate to high intensity for 2.5 hours per week during one year. Compared to a control group in the same organization, the exercise group significantly increased their level of physical activity, and there were positive results associated with specific biological measures, ratings of work ability, and general health symptoms [22]. Effectiveness of leader-based workplace health interventions has focused more on co-workers' health [23]. One exception is a Swedish study of an insurance company where the leaders held meetings that included education about workplace health issues during the second week of each month over one year [24]. Compared to a control group of leaders in the same company, both leaders and co-workers in the intervention group showed significantly improved biological stress measures and rated their opportunities to influence their work situation higher after the intervention period. According to the researchers, the important factors that led to the successful results included that the meetings were obligatory, they took place at the workplace over a long time period, and the leaders were able to support each other because they came from the same organization [24].

The literature reveals a general lack of sustainable standards, procedures, implementation methods and interventions to promote physical activity [19] [25]. Although research has progressed in this area in recent years, knowledge about the effectiveness of workplace health interventions remains limited, especially concerning SSEs [9] [26]. Further, several studies suffer from limitations such as the absence of a longitudinal design and inadequate documentation of interventions [26].

The purpose of this study is to assess the physical fitness status of SSE managers compared to a norm population and to study changes in physical fitness status, self-reported physical activity, and sickness outcomes after workplace health interventions.

2. Methods

2.1. Recruitment and Participation

This non-randomized longitudinal study involved a workplace health intervention with pre- and post-intervention measurements, and a reference group. The enterprises were recruited by two occupational health services in Norway and Sweden. The enterprises agreed to participate in a workplace health intervention project in SSEs. The inclusion criteria comprised managers from workplaces with fewer than 20 employees, representing different industrial sectors in production and service. Further criteria were that the enterprises employed both genders and that they were located in rural areas (comparable geographic regions). The allocation of enterprises to either the intervention or the reference group was performed by the occupational health services aiming at match the groups in terms of company size, industrial sectors, and distribution of gender and age. Originally 30 SSE managers volunteered for the study. Due to injury and/or sickness absence, two could not participate in the study measurements. The intervention group consisted of 15 Norwegian and Swedish SSE managers (9 men, 6 women), and the reference group included 13 Norwegian and Swedish SSE managers (7 men, 6 women), all of whom met the same inclusion criteria. All participation was voluntary. Reference group members were informed that they had been invited for comparative purposes and that the study included fitness tests and self-ratings in questionnaires.

Concerning comparisons between the SSE managers and a comparison population (norm population), the latter group consisted of subjects with a low or modest daily physical activity regime. None of the subjects were considered to be highly physically active or an elite athlete. The study subjects were compared to the comparison population using the same health related physical tests described in the literature [27] [28].

2.2. Ethics

Written informed consent was obtained from each of the participants, in accordance with the requirements of the Helsinki Declaration (World Medical Association). The study was approved by the Regional Committee for Ethics (dnr 2014—28-31 M).

2.3. Description of the Workplace Health Intervention

The workplace health intervention focused on issues associated with leadership and psychosocial working conditions, but also included individual-based components related to lifestyle and physical activity. Thus, the intervention can be described as a multi-component intervention, as proposed by the European Network for Workplace Health Promotion [6]. Apart from the fitness-status measurements undertaken at the Swedish Winter Sports Research Centre (SWSRC) at Mid Sweden University (described in data collection and procedures), the interventions were led by two Occupational Health Services (OHSs), one in Norway and one in Sweden.

The *first phase* of the intervention focused on motivational issues relating to lifestyle, a physical fitness assessment, and company- and individual-based analysis. The findings from the physical fitness measurements were presented both to groups of managers and to the individual manager. The Swedish managers also underwent basic medical examinations and had a one-hour health talk with an occupational health nurse about how to improve their lifestyle and activity. In this phase, consultants from the OHS also investigated the psychosocial working conditions and health of managers and their co-workers by means of questionnaires and visits to each enterprise. These results were summarized and presented at each company and in/or network meetings. In the *second phase*, the managers participated in three to eight network meetings/education led by the OHS consultants over a period of about 12 months. These meetings each lasted for three to four hours, and covered issues such as the managers' work-life balance, physical status and lifestyle, leadership styles and techniques for improving psychosocial working conditions, such as conflict management and providing feedback to staff. These meetings also included discussions about the managers' experiences of organizational challenges, and practical tools for dealing with them. The level of attendance at these meetings varied: some of the managers in the study group took part in all eight meetings and some only in three meetings. The *third phase* of the intervention consisted of continuing individual support from OHS personnel to the managers in telephone conversations or in one-to-one meetings, concerning their own well-being, psychosocial working conditions and leadership challenges. In the *fourth phase* of the intervention, the physical fitness assessment and the original questionnaires were repeated for all participants. In this phase, the Swedish managers had a second talk with an occupational health nurse, and the Norwegians received feedback about the findings of a questionnaire to managers and co-workers, with suggestions for future health-promotion interventions in their enterprises. The managers in the reference group only participated in the physical fitness examinations and the questionnaires before and after the intervention.

2.4. Data Collection and Procedures

Data were collected before the intervention and immediately after the twelve-month intervention period. Members of both the intervention and the reference group completed fitness tests carried out by staff at the SWSRC. On the same occasion, they answered the Stress Profile questionnaire, either in Norwegian or Swedish [29]. This covered self-reported Physical Activity, Sickness Presence and Sickness Absence. The fitness tests included body composition (Weight, Body Mass Index (BMI)), Fat %, Lean Body Mass (kg) and physical fitness measures maximal oxygen consumption (VO_{2max}), using the standardized submaximal Åstrand and Rhyming cycle ergometer test [30] and measures of strength (Push-ups, Press for Thigh RM (1-RM (kg)).

Through an information letter and an oral presentation, the participants were encouraged to avoid alcohol and strenuous exercise the day before the fitness tests. They were also instructed to avoid any form of food or drink for 12 hours before taking part in the bio impedance and DXA (body composition) assessment. After these two measurements had been completed, the participants were served a light breakfast. The participants wore lightweight clothing and shoes suited to exercise. Individual logs were used to record the time of the day (during the morning) the physical tests took place, measurement data and weight loads for each exercise. General information on health conditions was collected using a survey, and the participants completed the stress profile questionnaire electronically. Data collected from health screening, the physical fitness tests and answers to questionnaires were coded into SPSS Statistics 22. The data for each individual were not identifiable by the researchers conducting the statistical task, including the writing and presentation of the results. The whole process was repeated one year after the pre-test. Only the data from individuals who participated in both testing episodes were included in further analysis of the project.

Self-ratings in the questionnaires

As well as requiring background information and details about the individual's psychosocial working conditions, the questionnaire included measures of physical activity (PA), sickness absence and sickness presence. PA was assessed using two items, one asking how many days a week the respondents exercised regularly, and one asking how many days each week they were active in other ways, for instance cycling or walking. Ratings were made on a five-point scale, ranging from 1 = almost never to 5 = 5 - 7 days each week. These items were summarized into a *PA index* with a range of 1 - 5 (Cronbach alpha = 0.84). *Sickness absence* was measured using a single-item question, asking respondents to estimate the number of days they had been absent from work for health reasons in the past two months on a five-point scale, ranging from 1 = 0 - 3 days to 5 = 15 - 28. *Sickness presence* was measured using a single-item question asking respondents to estimate the number of days they had been present at work despite being unwell in the past two months on a five-point scale ranging from 1 = 1 - 3 days to 5 = > 28 days. For sickness absence and sickness presence, high values indicate a negative tendency, and low values a positive tendency.

Physical assessment of the subjects

Clinical measurements included the height and the weight of the participants, taken in the morning while they were wearing undergarments without shoes; height was rounded to the nearest 1.0 cm, and weight to the nearest 0.5 kg.

Body composition assessment (DXA)

The participants were subjected to a whole-body dual-energy X-ray absorptiometry (iDXA) (Lunar iDXA, enCORE software version 13.60, General Electric Company, Madison, WI, USA). The participants arrived in a fasting state before the scan, and their height and weight were measured on a separate scale (7014 SECA 764, Benson Avenue, CA, USA) in minimal clothing. The participant lay supine on the scanner bed for a whole-body scan from head to toe. The scan assessed all body tissues in terms of three different characterizations: the lean body mass (g), bone mineral content (BMC) and fat tissue (g).

Bio-impedance test

A bio-impedance analysis was performed to assess the participants' lean body mass and fat percentage (InBody720, Biospace Co., Ltd., Seoul, Korea). The participants arrived in a fasting state before the assessment, and in minimal clothing. Prior to testing, they had been instructed not to take part in any training sessions the day before testing. An hour before testing they were urged to go to the toilet to increase the accuracy of the measurement. During the test, the participants' arms were positioned to form an angle of approximately 15 degrees between each arm and the side of the body. The participants retained the same posture throughout the test.

Åstrand submaximal cycle ergometer test

Before the start of the test, the individual's height and weight were recorded. The seat height on the cycle ergometer, Monark 828e (MonarkExecise AB, Vansbro, Sweden), was adjusted so that the person would sit in an upright position, with the knee slightly bent when the foot was at the bottom of the crank. The participants were fitted with a heart rate monitor (Polar RS400, Polar Electro OY, Kempele, Finland) for recording the heart rate throughout the test. The starting workload depended on gender and training background, ranging between 450 and 900 kpm·min^{-1}. The test was performed with a cadence of 50 rpm. In all, the test took 6 minutes. The heart rate was recorded after 3 minutes to check that it was in the 120 - 170 beats·min^{-1} range. If the heart rate was below that range, the workload was increased to generate a heart rate above 120 beats·min^{-1}. During the last minute of the test, the heart rate was recorded once again, and then checked continuously to verify steady state with a variation less than ±4 beats·min^{-1}. To obtain the estimated maximal oxygen consumption (VO_{2max}) the final heart rate was compared against the final workload, and corrected for age.

Maximal lower body strength test

A 1-RM leg press test was used to evaluate the subject's maximal lower body strength. The seated leg press has been shown to be a more reliable indicator than the squat exercise, probably due to its less complex movement pattern [31]. Before the test started, the leg press machine was adjusted to ensure a proper position for each subject. The seated leg press was performed using a hip-width feet placement on the machine platform. The foot and chair placement allowed the subject to fully extend their legs and to bend their legs to about 90˚. The subjects were supervised throughout the whole of the testing sequence, to ensure their hips and back remained in contact with the back pad throughout the press. The first set was performed using a submaximal weight, mainly as a familiarization trial. Before the start of the second set, the load was increased by between 25 and 50 kg, depending on the subject's training background and gender. If the subject could perform 10 repetitions with the new weight, a rest period of 2 minutes was taken while the load was further increased by between 25 - 50 kg. At most, the subjects performed a third set. The Brzycki equation, expressed as 1-RM = weight lifted (kg)/[1.0278 − (reps to fatigue × 0.0279)] [32], was used to calculate the participant's 1-RM, depending on the weight lifted and the maximal repetitions to fatigue, ranging from 1 to 10. The Brzycki equation has been shown to have high reliability for untrained subjects performing the seated leg press (ICC = 0.98 and 95% CI for ICC = 0.97 - 0.99) [33].

Upper body muscular endurance test

A push-up test was used to determine the participant's upper body muscular endurance. The starting position for all subjects was hands shoulder-width apart, with a flat back and head up, with straight arms. Men used the toes as pivot point while the women used a modified position, with their knees as pivot point with the ankles plantar flexed. The participants were instructed to lower their body while maintaining a straight-back position until their chin touched the mat. The supervisor conducting the test made sure that the participant's stomach did not touch the mat at any time during the assessment. Once the chin touched the mat, the participants pushed up by extending their arms back to the straight-arm starting position. Every successful push-up was recorded. The test was performed without any rest between push-ups, until the participant either could no longer maintain a straight-back position or could not complete any more push-ups.

2.5. Statistical Analysis

Analysis involved the use of the SPSS 22 statistical package (SPSS Inc., Chicago, IL, USA) for descriptive tests, t-tests, estimated diff-scores, and 2 × 2 repeated measures ANCOVA. For comparison of the groups, the pre-baseline mean values on body composition (Weight, BMI), Fat %, Lean Body Mass (kg), (VO_{2max}), Strength (Push-ups, Press for thigh RM (1-RM (kg)), Self-reported PA, Sickness Presence and Sickness Absence, an independent sample *t*-test was used. Further, descriptive statistics were used to identify the median value, 25^{th} percentile and 75^{th} percentile on the physical measurement variables for comparison with the results from the reference group. Estimated diff-scores (post-pre) were additionally used for comparison values of the two groups, pre-post intervention, by conducting a 2 × 2 repeated measures ANCOVA. Finally, a paired sample t-test was used to investigate the groups separately, to determine whether any possible pre-post changes could be detected. An alpha level of <0.05 was used as the significance level for the physical assessment data. The statistical power was calculated for comparisons over time with a likely estimated change in the physical characteristics approximated of a 10 percent likely change. As the subjects included in the study were not well trained athletes this was a reasonable change over a cycle of 12 months. Values from the Ekblom, Engström & Ekblom [27] was used for power estimation for VO_{2max} for the study population. The estimation shows that with $\alpha < 0.05$ and effect size of 1 the actual power was calculated to 0.8 with a critical t of 2.26. The required sample size of the group was calculated to 10. The changes in another study that used training in a similar population (age, physical status) showed even larger changes than 10% after a 6 month period. The statistical power calculations was performed with the G*3 3.1.7 software [34].

3. Results

In **Table 1**, descriptive background statistics covering gender, age, educational level, civil status, years in company, industrial sector and position are presented for the intervention and the reference group. Demographic data were approximately the same in both groups.

Compared against representative data on a norm population in Sweden (N = 1410 in 1990/1991 and N = 596 in 2000/2001), see Ekblom, Engström & Ekblom [27], and the ACSM Guidelines [28], the study population (**Table 2**), men and women clustered, seems to vary from the norm. The median age for men represented a 40 - 59 years comparative span with norm population data; for women the span was 40 - 49 years. Compared to the norm population group [27] the men's and women's BMI was close to

Table 1. Descriptive demographic data of the study group. Presented as *n* and *%* (N = 28).

	Intervention group (n = 15)	Reference group (n = 13)
Gender		
Men	9 (60.0)	7 (54.0)
Woman	6 (40.0)	6 (46.0)
Age		
20 - 39	2 (13.3)	2 (15.4)
40 - 65	13 (86.7)	11 (84.6)
Education level		
High school/Lower secondary school	5 (33.4)	3 (23.1)
Upper secondary school	2 (13.3)	2 (15.4)
University	8 (53.3)	8 (61.5)
Civil Status		
Single	5 (33.3)	2 (15.4)
Married/cohabiting	10 (66.7)	11 (84.6)
Years in company		
0 - 5	2 (13.3)	2 (15.4)
6 - 10	7 (46.7)	4 (30.8)
>11	6 (40.0)	7 (53.8)
Industrial sector		
Constructions	3 (20.0)	2 (13.3)
Financial and business services	6 (40.0)	5 (38.5)
Personal and cultural services	3 (20.0)	1 (7.7)
Education, health and social care	3 (20.0)	5 (38.5)
Position		
CEO	12 (80.0)	11 (84.6)
Middle manager	3 (20.0)	2 (15.4)

CEO: Chief Executive Officer.

Table 2. Median values of physical fitness measures with 95% CI, and 25th and 75th percentiles values among study participants (men and woman).

Variable	N	Median	95% CI	25th percentile	75th percentile
VO_{2max} ($L \cdot min^{-1}$)	(n = 26)	3.56	2.94 - 3.85	2.76	3.91
VO_{2max} ($mL \cdot kg^{-1} \cdot min^{-1}$)	(n = 28)	34.0	29.0 - 36.0	27.3	38.5
Body weight (kg)	(n = 28)	74.6	69.0 - 85.0	65.5	86.7
BMI	(n = 28)	24.6	22.3 - 27.3	20.8	28.2
Body fat (%)	(n = 28)	27.6	22.6 - 31.3	21.8	34.4
Lean body mass (kg)	(n = 20)	57.6	48.6 - 60.4	48.5	61.2
Push-ups	(n = 25)	13	10 - 20	9.0	22.5
Leg press (kg)	(n = 28)	181	156 - 219	137.5	229.5
Leg press ($kg \cdot bw^{-1}$)	(n = 28)	2.4	2.1 - 2.8	1.9	2.9

N = numberofparticipants.

the 50th percentile (26.1 vs 26.2 and 23.9 vs. 24.4 respectively). The results indicate a fairly normal level for both genders. Regarding the percentage of fat for men and women, both groups showed poor results, with 26.4% for men, representing the 20-30th percentile and 32.2% for women, representing the 20th percentile [28]. Muscular strength values for push-ups were evaluated as Good to Very Good in terms of the reference norm scale [28] for men (15 repetitions) and Good for the women (10 repetitions). Lower relative body strength values ($kg \cdot bw^{-1}$) for both men and women were well above the 90th percentile compared to the norm values (2.5 and 2.2 respectively) [28]. The estimated maximum oxygen uptake (VO_{2max}) in absolute value was 3.8 $L \cdot min^{-1}$ for the men, ranked as Very Good [27]. The men's relative VO_{2max} was slightly above the 50th percentile (34 $mL \cdot kg^{-1} \cdot min^{-1}$). The women's values for absolute VO_{2max} was 2.7 $L \cdot min^{-1}$ which was ranked as Good, while their relative VO_{2max} was 28 $mL \cdot kg^{-1} \cdot min^{-1}$, close to the 25th percentile, and ranked as Poor [27].

At the time of the baseline measurements, the intervention group and the reference group had no significant mean differences on physical fitness measures (Weight, (BMI), Fat %, Lean Body Mass (kg), (VO_{2max}), Strength (Push-ups, Press for thigh RM (1-RM (kg)), nor in their levels of Self-reported PA, Sickness Presence or Sickness Absence (**Table 3**). Further the data material, diff-scores, from the intervention group and the reference group was thoroughly studied during the statistical investigation, in terms of the results of 2 × 2 repeated measures ANCOVA. No significant findings were detected in the material regarding Weight, (BMI), Fat %, Lean Body Mass (kg), (VO_{2max}), Strength (Push-ups, Press for thigh RM (1-RM (kg), neither correlations nor significant differences between the intervention and reference groups, regardless of baseline values, including gender as a covariate. Investigating the groups separately (**Table 3**), performing paired sample t-test, revealed some significant changes. Physical fitness strength measures such as Push-ups (Pre mean: 14.54, SD 10.89, Post Mean: 17.08, SD 10.81, $P = 0.039$) and Leg-press (kg) (Pre mean: 176.40, SD 57.77, Post Mean: 212.20,

Table 3. Mean, SD, t and p-values for pre-post VO_{2max}, Body weight, BMI, Body fat, Lean Body mass, Push-ups, Leg-press, Self-Reported Physical activity, Sickness absence and Sickness presence in intervention group and reference group.

Intervention Group	Mean Pre	SD	Mean Post	SD	t	p-value
VO_{2max} ($L·min^{-1}$) (n = 14)	3.32	0.86	3.25	1.00	0.454	ns
VO_{2max} ($mL·kg^{-1}·min^{-1}$) (n = 15)	31.40	8.91	30.33	10.21	0.932	ns
Body weight (kg) (n = 15)	80.07	16.16	80.47	15.89	−0.792	ns
BMI (n = 15)	25.69	4.48	25.89	4.49	−1.118	ns
Body fat (%) (n = 15)	29.25	9.06	28.28	8.92	1.325	ns
Lean body mass (kg) (n = 12)	54.98	10.89	56.68	11.56	−1.756	ns
Push-ups (n = 13)	14.54	10.89	17.08	10.81	−2.317	**0.039**
Leg press (kg) (n = 15)	176.40	57.77	212.20	52.84	−2.256	**0.041**
Leg press ($kg·bw^{-1}$) (n = 14)	2.29	0.64	2.91	0.95	−1.905	ns
Physical Activity (n = 14)	3.03	1.29	2.60	1.17	1.935	ns
Sickness absence (n = 14)	1.86	1.09	1.78	0.97	0.201	ns
Sickness presence (n = 14)	3.00	1.92	2.14	1.95	1.426	ns
Reference Group						
VO_{2max} ($L·min^{-1}$) (n = 12)	3.34	0.86	3.24	0.75	1.089	ns
VO_{2max} ($mL·kg^{-1}·min^{-1}$) (n = 12)	34.00	5.83	32.25	4.93	1.674	ns
Body weight (kg) (n = 13)	72.57	15.94	74.18	15.46	−2.665	**0.021**
BMI (n = 13)	23.96	3.43	24.52	3.26	−2.869	**0.014**
Body fat (%) (n = 13)	27.77	7.58	29.09	7.20	−1.396	ns
Lean body mass (kg) (n = 8)	56.10	9.49	56.84	8.98	−2.681	**0.032**
Push-ups (n = 12)	15.17	9.77	17.25	12.57	−1.389	ns
Leg press (kg) (n = 12)	185.25	46.93	214.33	72.53	−3.147	**0.009**
Leg press ($kg·bw^{-1}$) (n = 12)	2.65	0.78	2.98	0.96	−3.109	**0.010**
Physical activity (PA) (n = 13)	2.26	0.72	1.96	1.05	1.535	ns
Sickness absence (n = 13)	2.38	1.71	1.46	0.66	2.521	**0.027**
Sickness presence (n = 13)	3.46	2.06	3.23	1.92	0.330	ns

Bold values = significant, p = 0.01 level (2-tailed), N = number of participants.

SD 52.84, P = 0.041) had a significant positive development in the intervention group. In the reference group, there were significant changes in body composition measures involving increased Body Weight (kg) (Pre mean: 72.57, SD 15.94, Post Mean:74.18, SD 15.46, P = 0.021), BMI (Pre Mean:23.96, SD 3.43, Post Mean:24.52, SD 3.26, P = 0.014), Lean Body Mass (Pre mean: 56.10, SD 9.49, Post Mean: 56.84, SD 8.98, P = 0.032), Leg Press (kg) (Pre mean: 185.25, SD 46.93, Post Mean: 214.33, SD 72.53, P = 0.009) and Leg Press ($kg·bw^{-1}$) (Pre mean: 2.65, SD 0.78, Post Mean: 2.98, SD 0.96, P = 0.010). Concerning self-rated PA, Sickness Absence and Sickness Presence, there were no significant differences in the intervention group. In the reference group there was a significant positive development in sickness absence (Pre mean: 2.38, SD 1.71, Post Mean: 1.46, SD 0.66, P = 0.027).

4. Discussion

The purpose of this study was to contribute to knowledge about the physical fitness status of managers of small-scale enterprises, and how workplace health interventions might affect their physical fitness status, physical activity and self-rated sickness absence and sickness presence. This is an important research area, as there has so far been very limited workplace health research in small-scale enterprises. Managers' health, well-being and physical fitness status have implications for organizational effectiveness, quality outcomes, and their employees' health and well-being [10] [12].

The findings of differences and similarities between studied SSE managers and a norm population give support for different characteristics in these two groups. Compared against representative data on the general population in Sweden, as described by Ekblom, Engström & Ekblom [27], and in the ACSM Guidelines [28], the study population appears to vary from the norm in different ways, depending on the outcome variable investigated. The BMI results indicate a fairly normal level for both genders, but fat percent showed poor results for both men and women. Muscular strength values for push-ups were evaluated as Good to Very Good according to the reference norm scale [28] for men (15 repetitions) and Good for the women (10 repetitions). Lower relative body strength values ($kg \cdot bw^{-1}$) for both men and women were well above the norm values [28]. The estimated VO_{2max} in absolute values ($3.8\ L \cdot min^{-1}$) for the men was ranked as Very Good, while the relative VO_{2max} was acceptable [27]. The women's values for absolute VO_{2max} ($2.7\ L \cdot min^{-1)}$) were Good while their relative VO_{2max} ($28\ mL \cdot kg^{-1} \cdot min^{-1}$) was Poor [27]. These findings may be explained by the participants' weight which indicates that the participants' capacity to perform continuous tasks involving moving the body in a vertical direction is limited. The outcomes of the study indicate satisfactory results for the managers' strength, and also in absolute values of oxygen uptake, but there seems to be potential for improvements concerning body composition as measured by weight, BMI and fat percentage.

When looking at changes after performed interventions, it is notable that at baseline there were no significant differences between the managers in the intervention and the reference group concerning physical fitness measures and self-rated outcomes regarding level of PA, sickness absence and sickness presence. Thus, the groups were similar before the intervention started. Regarding the effects of the workplace health intervention between the intervention and the reference group through a comparison of diff-mean values based on before and after the intervention, no significant differences were found. Looking at the effects separately for both groups, there are significant positive effects for push-ups and leg press in the intervention group. A significant positive effect for lean body mass and leg press and a significant negative effect for BMI and body weight were found in the reference group. Self-rated outcomes regarding PA, Sickness Absence and Sickness Presence seemed unchanged, except for a positive development regarding Sickness Absence in the reference group. It is possible that the health screening tests with physical fitness measures and self-ratings of physical activity levels and sickness data together with feedback of results to the managers increased the motivation for managers in both the intervention and reference group to make improvements by taking action regarding their own physical activity and health during the intervention period.

The fact that improvements can be seen only for some variables related to push-ups and leg press is consistent with the results from a review [7] showing limited effects with educationally and psychologically focused interventions. The fact that the intervention did not significantly change the trends for several variables in the intervention group, and the limited differences between the two groups, are somewhat in line with a study by Hansen *et al.* [35]. Also in this study, there were limited changes regarding self-reported health outcomes after performed interventions in the same manager groups. To some extent these findings support those by Harding and colleagues [36], who recommend taking a broad perspective of health in the implementation and evaluation of workplace physical activity programs. Abraham & Graham-Row [21] report that worksite interventions providing individual tailored information or instructions were found not to be more effective in increasing PA, but there was evidence that specific goal setting and goal review techniques might enhance fitness gains. Another explanation for the limited intervention effects may be that some of the managers only attended the network meetings to a limited extent. Research shows that when participation in such educational activities and physical activity measures are obligatory, positive effects of improved PA and self-rated health can be achieved [22] [24]. Also, research point at that health promotion initiatives available only in leisure time mean a lower probability for participation than initiatives available during working hours [37]. SSE managers adverse work environment as low social support, high work demands and fatiguing work can also contribute to low participation [37].

To attain more successful fitness-improvement results in workplace health interventions, it is probably necessary to complement the intervention work with more individually adapted programs including physical activity and health behavior change elements, in accordance with research results in this area [20]. It is also important to adapt implementation strategies to the local context, as research shows that implementation fidelity can differ between organizations, although the interventions may be introduced and supported in the same way [38]. Managers in SSEs have high and conflicting work demands [10] and for reaching successful results it is important to adapt broader workplace health interventions to these circumstances. Also, it is crucial that the managers participate in the intervention components to a high degree [24] [38]. One way of reaching the managers with educational components and training programs can be by company networks [24] [35].

5. Conclusion

The results of the present study indicate that SSE managers had normal to positive outcomes for BMI levels and strength, while percentage of fat for both men and women indicated poor results, compared to the norm population. The results reveal that only limited effects on physical fitness and sickness absence and sickness presence outcomes were achieved among the SSE managers who participated in an intervention program which included health screening, networks and educational activities. The intervention program seems not to be sufficient to contribute to improvements in physical health fitness among the participants. However, the intervention may have contributed to increasing attention to physical fitness and improvement in strength, though it has not substantially improved health measures among the study group. It is probably necessary to complement workplace health interventions with more individually based fitness and health behavior programs over a longer period.

6. Limitations and Strengths of the Study

Optimally, the selection criteria for the subjects taking part in the project should have been stricter, which demands randomization and paring for the scientific design. An optimal solution is problematic because the target group (SSE managers) might then have been difficult to reach. However, the selection of subjects was satisfactory in that the members of the intervention and the reference group were well-matched in terms of company size, industrial sectors, and distribution of gender and age. It is important to note that the findings in this study come from a limited sample of SSE managers and that the results should therefore be interpreted with caution. The empirical base needs to be broadened to further investigate effects of different workplace health interventions with the ultimate goal being to find out more about successful factors for such interventions. The strength of the study is the longitudinal design and the combining of objective and self-rated data.

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Conflicts of Interest

There are no conflicts of interest among the authors. The project (2013-2016) has been financed by AFA Insurance in Sweden (dnr 130190).

References

[1] Pedersini, R. and Coletto, D. (2009) Self-Employed Workers: Industrial Relations and Working Conditions.

[2] Komisija, E. (2010) European Employment Observatory Review, Self-Employment in Europe 2010. *Pribavljeno*, **13**, 2014.

[3] Henrekson, M. and Stenkula, M. (2010) Entrepreneurship and Public Policy. In: *Handbook of Entrepreneurship Research*, Springer, Berlin, 595-637. https://doi.org/10.1007/978-1-4419-1191-9_21

[4] Davidsson, P. (2005) Researching Entrepreneurship Vol. 5. Springer Science & Business Media.

[5] Arena, R., Guazzi, M., Briggs, P.D., Cahalin, L.P., Myers, J., Kaminsky, L.A., Forman, D.E., Cipriano, G., Borghi-Silva, A. and Babu, A.S. (2013) Promoting Health and Wellness in the Workplace: A Unique Opportunity to Establish Primary and Extended Secondary Cardiovascular Risk Reduction Programs. *Mayo Clinic Proceedings*, **88**, 605-617.

[6] ENWHP (2007) Luxembourg Declaration on Workplace Health Promotion in the European Union.

[7] Kuoppala, J., Lamminpää, A. and Husman, P. (2008) Work Health Promotion, Job Well-Being, and Sickness Absences—A Systematic Review and Meta-Analysis. *Journal of Occupational and Environmental Medicine*, **50**, 1216-1227. https://doi.org/10.1097/JOM.0b013e31818dbf92

[8] Griffin, B.L., Hall, N. and Watson, N. (2005) Health at Work in Small and Medium Sized Enterprises: Issues of Engagement. *Health Education*, **105**, 126-141. https://doi.org/10.1108/09654280510584571

[9] Moser, M. and Karlqvist, L. (2004) Small and Medium Sized Enterprises: A Literature Review of Workplace Health Promotion. Arbetslivs Institutet, Stockholm.

[10] Vinberg, S., Gundersen, K.T., Nordenmark, M., Larsson, J. and Landstad, B.J. (2013) Entrepreneurs' Health—The Importance of Psychosocial Working Conditions and Individual Factors. *International Journal of Entrepreneurial Venturing*, **4**, 374-390. https://doi.org/10.1504/IJEV.2012.049829

[11] Pongen, I., Dhall, M. and Kapoor, S. (2016) Occupation, Physical Fitness and Adiposity Markers among Security Guards and Students of Delhi University. *Health*, **8**, 978-985. https://doi.org/10.4236/health.2016.810101

[12] Skakon, J., Nielsen, K., Borg, V. and Guzman, J. (2010) Are Leaders' Well-Being, Behaviours and Style Associated with the Affective Well-Being of Their Employees? A Systematic Review of Three Decades of Research. *Work & Stress*, **24**, 107-139. https://doi.org/10.1080/02678373.2010.495262

[13] Gram, B., Holtermann, A., Søgaard, K. and Sjøgaard, G. (2012) Effect of Individualized Worksite Exercise Training on Aerobic Capacity and Muscle Strength among Construction Workers—A Randomized Controlled Intervention Study. *Scandinavian Journal of Work, Environment & Health*, **38**, 467-475. https://doi.org/10.5271/sjweh.3260

[14] Breuker, G. (2001) Small, Healthy and Competitive: New Strategies for Improved Health in Small and Medium-Sized Enterprises. Report on the Current Status of Workplace Health Promotion in Small and Medium-Sized Enterprises (SMEs). Federal Association of Company Health Insurance Funds, Essen.

[15] Laing, S.S., Hannon, P.A., Talburt, A., Kimpe, S., Williams, B. and Harris, J.R. (2012) Increasing Evidence-Based Workplace Health Promotion Best Practices in Small and Low-Wage Companies, Mason County, Washington, 2009. *Preventing Chronic Disease*, **9**, Article ID: 110186.

[16] Eakin, J., Lamm, F. and Limborg, H.J. (2000) International Perspective on the Promotion of Health and Safety in Small Workplaces. In: Frick, K., Langaa-Jensen, P., Quinlan, M. and

Wilthagen, T., Eds., *Systematic Occupational Health and Safety Management*: *Perspectives on an International Development*, Elsevier Science Ltd., Oxford, 227-247.

[17] Huuskonen, M. (2002) Health and Safety in Small Enterprises: European Strategies for Managing Improvement. *Scandinavian Journal of Work*, *Environment & Health*, **28**, 361-362.

[18] Rongen, A., Robroek, S.J.W., van Lenthe, F.J. and Burdorf, A. (2013) Workplace Health Promotion: A Meta-Analysis of Effectiveness. *American Journal of Preventive Medicine*, **44**, 406-415. https://doi.org/10.1016/j.amepre.2012.12.007

[19] Soler, R.E., Leeks, K.D., Razi, Z., Hopkins, D.P., Griffith, M., Aten, A., Chattopadhyay, S.K., Smith, S.C., Habarta, N. and Goetzel, R.Z. (2010) A Systematic Review of Selected Interventions for Worksite Health Promotion: The Assessment of Health Risks with Feedback. *American Journal of Preventive Medicine*, **38**, S237-S262. https://doi.org/10.1016/j.amepre.2009.10.030

[20] Kahn, E.B., Ramsey, L.T., Brownson, R.C., Heath, G.W., Howze, E.H., Powell, K.E., Stone, E.J., Rajab, M.W. and Corso, P. (2002) The Effectiveness of Interventions to Increase Physical Activity: A Systematic Review. *American Journal of Preventive Medicine*, **22**, 73-107. https://doi.org/10.1016/S0749-3797(02)00434-8

[21] Abraham, C. and Graham-Rowe, E. (2009) Are Worksite Interventions Effective in Increasing Physical Activity? A Systematic Review and Meta-Analysis. *Health Psychology Review*, **3**, 108-144. https://doi.org/10.1080/17437190903151096

[22] Von Thiele Schwarz, U., Lindfors, P. and Lundberg, U. (2008) Health-Related Effects of Worksite Interventions Involving Physical Exercise and Reduced Workhours. *Scandinavian Journal of Work*, *Environment & Health*, **34**, 179-188. https://doi.org/10.5271/sjweh.1227

[23] Kelloway, E.K. and 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

[24] Theorell, T., Emdad, R., Arnetz, B. and Weingarten A.M. (2001) Employee Effects of an Educational Program for Managers at an Insurance Company. *Psychosomatic Medicine*, **63**, 724-733. https://doi.org/10.1097/00006842-200109000-00004

[25] Pronk, N.P. and Kottke, T.E. (2009) Physical Activity Promotion as a Strategic Corporate Priority to Improve Worker Health and Business Performance. *Preventive Medicine*, **49**, 316-321. https://doi.org/10.1016/j.ypmed.2009.06.025

[26] Torp, S., Eklund, L. and Thorpenberg, S. (2011) Research on Workplace Health Promotion in the Nordic Countries: A Literature Review, 1986-2008. *Global Health Promotion*, **18**, 15-22. https://doi.org/10.1177/1757975911412401

[27] Ekblom, B., Engström, L.M. and Ekblom, Ö. (2007) Secular Trends of Physical Fitness in Swedish Adults. *Scandinavian Journal of Medicine & Science in Sports*, **17**, 267-273.

[28] Pescatello, L.S. and American College of Sports Medicine (2014) ACSM's Guidelines for Exercise Testing and Prescription. 9th Edition, Wolters Kluwer/Lippincott Williams & Wilkins Health, Philadelphia, xxiv, 456 p.

[29] Setterlind, S. and Larsson, G. (1995) The Stress Profile: A Psychosocial Approach to Measuring Stress. *Stress & Health*, **11**, 85-92. https://doi.org/10.1002/smi.2460110116

[30] Noonan, V. and Dean, E. (2000) Submaximal Exercise Testing: Clinical Application and Interpretation. *Physical Therapy*, **80**, 782-807.

[31] Tagesson, S.K. and Kvist, J. (2007) Intra- and Interrater Reliability of the Establishment of One Repetition Maximum on Squat and Seated Knee Extension. *The Journal of Strength and Conditioning Research*, **21**, 801-807.

https://doi.org/10.1519/00124278-200708000-00025

[32] Heyward, V.H. (2010) Advanced Fitness Assessment and Exercise Prescription. 6th Edition, Human Kinetics, Champaign, xiii, 465 p.

[33] Abdul-Hameed, U., Rangra, P., Shareef, M.Y. and Hussain, M.E. (2012) Reliability of 1-Repetition Maximum Estimation for Upper and Lower Body Muscular Strength Measurement in Untrained Middle Aged Type 2 Diabetic Patients. *Asian Journal of Sports Medicine*, **3**, 267-273. https://doi.org/10.5812/asjsm.34549

[34] Faul, F., Erdfelder, E., Buchner, A. and Lang, A.-G. (2009) Statistical Power Analyses Using G*Power 3.1: Tests for Correlation and Regression Analyses. *Behavior Research Methods*, **41**, 1149-1160. https://doi.org/10.3758/BRM.41.4.1149

[35] Hansen, E., Landstad, B.J., Gundersen, K.T. and Vinberg, S. (2016) Leader-Based Workplace Health Interventions—A Before-After Study in Norwegian and Swedish Small-Scale Enterprises. *International Journal of Disability Management*, **11**, 1-14.

[36] Harding, J., Freak-Poli, R.L.A, Backholer, K. and Peeters, A. (2013) Change in Health- Related Quality of Life amongst Participants in a 4-Month Pedometer-Based Workplace Health Program. *Journal of Physical Activity and Health*, **10**, 533-543. https://doi.org/10.1123/jpah.10.4.533

[37] Jørgensen, M.B., Villadsen, E., Burr, H., Punnett, L. and Holtermann, A. (2016) Does Employee Participation in Workplace Health Promotion Depend on the Working Environment? A Cross-Sectional Study of Danish Workers. *BMJ Open*, **6**, Article ID: e010516. https://doi.org/10.1136/bmjopen-2015-010516

[38] Augustsson, H., von Thiele Schwarz, U., Stenfors-Hayes, T. and Hasson, H. (2015) Investigating Variations in Implementation Fidelity of an Organizational-Level Occupational Health Intervention. *International Journal of Behavioral Medicine*, **22**, 345-355. https://doi.org/10.1007/s12529-014-9420-8