Effectiveness on work-related outcomes

A worksite vitality intervention for older hospital workers to improve vitality, work engagement, work performance and sick leave: results of a randomised controlled trial.

Jorien E Strijk
Karin I Proper
Willem van Mechelen
Allard J van der Beek

Under revision
Background
A worksite vitality intervention aiming improved lifestyle behaviours could be an effective tool to keep older workers vital, and thereby prolong their labour participation. Therefore, this study evaluates the effectiveness of such an intervention on vitality, work engagement, work performance and sick leave.
Methods
Intervention group workers (n=367; control group: n=363) received a 6-month intervention containing weekly: guided yoga session; guided workout session; and aerobic exercising without face-to-face instruction, with provision of free fruit at all guided sessions. This all was combined with three coach visits. Data on work-related vitality (UWES vitality scale), general vitality (RAND-36 vitality scale), work engagement (UWES), work performance (single item scoring 0-10) and sick leave (yes/no past 3 months) were collected using questionnaires at baseline (n=730), and at six (n=575) and 12 months (n=500) follow-up. Effects were analysed according to the intention-to-treat principle with complete cases (n=500) and imputed data (n=730).

Results
There were no significant differences in vitality, work engagement, work performance, and sick leave between the intervention and control group workers after both six and 12 months follow-up. Yoga and workout subgroup analyses showed a 12-month favourable effect on work-related vitality ($\beta=0.14$, 95%CI: 0.04-0.28) and general vitality ($\beta=2.9$, 95%CI: 0.02-5.9) among high yoga compliers. For high workout compliers this positive trend was also seen, but not statistically significant.

Conclusions
Implementation of worksite yoga facilities could be a useful strategy to promote vitality-related work outcomes, but only if high compliance can be maximised.
Introduction
Over the next decades, challenges in work life will arise due to the expected structural labour shortage and the ageing workforce [1]. These challenges include the prevention of early retirements and demands for increased employability. Also, to increase labour participation it is important to maximise the contribution of older workers, because, by the year 2025, this group will be twice as large when compared to their younger counterparts [2,3]. An important contributor to early retirement and decreased employability is the health status of workers [4,5], which may decline with ageing due to lower physical capacity and higher prevalences of chronic diseases [6-8]. Thus, in order to face the upcoming challenges in work life, it is important to keep older workers vital and healthy.
A promising way to stimulate older workers' vitality is by worksite health promotion (WHP). Worksites are convenient settings to promote and maintain workers' health and vitality, as the majority of the adult population can be reached. In addition, employers can be important partners of the Dutch government when it comes to population-based health promotion [9]. Especially since investment in workers' health is expected to beneficially affect important outcomes from employers perspective. It concerns sick leave, work performance, workers' compensation, and company image [10-13].
Several reviews reported beneficial effects of WHP programmes on work-related outcomes, such as sick leave [14] and presenteeism [15]. Cancelliere et al (2011) showed that there is preliminary evidence that WHP programmes can positively affect presenteeism, which was defined as being present at work [15]. A meta-analysis of Kuoppala et al (2008) concluded that WHPs are valuable in terms of less sickness absence and that activities involving exercise and lifestyle are potentially effective on reducing sickness absence [14]. The latter is plausible as healthy lifestyle choices may contribute to a better health status [16-20] and thereby may improve work-related outcomes. Consequently, improving older workers' lifestyle can be considered a promising way to positively affect vitality and work-related outcomes, such as sick leave, work performance and work engagement.
In the Vital@Work study, it was hypothesised that a lifestyle intervention aiming at improving both mental and physical factors, could be a potentially effective tool to promote older workers' vitality [21]. The Vital@Work intervention showed to be effective on increasing older workers' sport activities and fruit intake [22].
Further, the intervention favourably affected work-related fatigue after a day working after six months [22]. Although healthy lifestyles and experiencing more energy after a day of work are important for both the employee and employer, the employer may also be interested in work-related outcomes such as vitality, work engagement, work performance, and sick leave. Considering the above, the objective of this study is to investigate the effectiveness of the Vital@Work intervention on vitality, work engagement, work performance and sick leave after both six and 12 months follow-up.

Methods
Study population and design
All workers aged 45 years and over from two academic hospitals in the Netherlands were invited to participate between April and October 2009. A worker was considered eligible when working at least 16 hours a week, giving written informed consent, and having no risk for developing adverse health effects when becoming physically active as assessed by the Physical Activity Readiness Questionnaire (PAR-Q) [23]. The Medical Ethics Committee of VU University Medical Center approved the study protocol. Details on the randomised controlled trial (RCT) design have been described extensively elsewhere [21]. The workers who consented to participate were, after baseline measurements, individually randomised to the intervention or control group using Random Allocation Software (Version 1.0, May 2004, Isfahan University of Medical Sciences, Iran). After randomisation, the research assistant notified each worker to which group he or she had been allocated, and did not reveal the group allocation to the investigator responsible for data analyses. Blinding of participants or intervention providers was impossible. The sample size calculation is described extensively elsewhere [21], but showed that 189 participants per group were needed at follow-up.

After randomisation, workers of both the intervention and control group received written information about a healthy lifestyle in general (i.e. diet, physical activity, and relaxation). Additionally, the intervention group received a 6-month lasting intervention consisting of a Vitality Exercise Programme (VEP) with provision of free fruit, and combined with three visits to a Personal Vitality Coach (PVC). The VEP consisted of a weekly 45-minute: 1) yoga session (i.e. relaxation exercises); 2) workout session (i.e. aerobic and resistance exercises); and 3)
unsupervised aerobic exercise session. Yoga was guided by a qualified yoga instructor and included relaxation exercises consisting of 1) relaxation and preparation postures for the hips, shoulders, neck, feet, and hands, 2) series of standing postures, forward bending postures and twists, and light back bending postures, and 3) total relaxation and meditation. Workout sessions were guided by certified fitness instructors and consisted of a warming-up followed by aerobic exercises, resistance training, and cooling-down. The intensity of the workout had to be 65-90% of the age-predicted maximum heart rate (HRmax) [24,25]. The resistance training was progressive in nature and provided stimulus to all major muscle groups. Besides the yoga and workout sessions, older workers were prescribed to perform weekly 45 minutes unsupervised vigorous physical activity (e.g. fitness, running, spinning) with a similar intensity as the guided workout sessions. At the guided group sessions of the VEP there was free provision of fruit.

The first PVC visit was at the start of the intervention, the follow-up visits were at 4-6 weeks and 10-12 weeks after the first visit. During the 30-minute PVC visits, five items were discussed, namely goal setting, confidence in achieving formulated goals, feedback on formulated goals, discussing barriers for formulated goals, and problem solving. At the first visit the items goal setting and confidence in achieving formulated goals were discussed. The other three items were discussed during the second and third visit. These visits were identical. During a 4-hour training session, the PVC protocol and accompanied materials, such as the coaching registration forms, were explained to the PVCs by the principal investigator.

Outcome measures
The outcome measures under study were vitality, work engagement, work performance and sick leave and were measured at baseline and at six and 12 months after baseline.

Vitality was measured by two questionnaires: 1) the RAND-36 vitality scale [26] was used to measure general vitality, and 2) the Utrecht Work Engagement Scale (UWES) vitality scale was used to measure work-related vitality [27]. The RAND-36 Vitality Scale consists of four questions that refer to the past four weeks: 1) “Did you feel full of pep?”, 2) “Did you have a lot of energy?”, 3) “Did you feel worn out?”, and 4) “Did you feel tired?”. The answers were rated
on a six-point scale from “all of the time” (1) to “none of the time” (6) [26]. The RAND-36 vitality score ranged from 0-100 points, calculated by (summing the points of each item– 4)/20 multiplied with 100. A higher score indicates better subjective vitality. The RAND-36 vitality score has shown to be sufficiently reliable and stable [26]. The UWES vitality scale consists of six questions that refer to high levels of energy, fitness, resilience, willingness to invest effort, not being easily fatigued, and persistence in the face of difficulties. The answers were rated on a 7-point scale from never (0) to daily (6). The mean score of the six items resulted in the UWES Vitality Score. A higher score indicates better work-related vitality. The UWES Vitality Scale has shown sufficient internal consistency [27].

Work performance was measured using a single item question from the WHO Health Work performance Questionnaire (WHO-HPQ) asking workers to report their overall work work performance on a 10-point scale from 0 to 10 over the past four weeks [28,29].

Information on sick leave (yes/no) was obtained from a single item question from the Work performance and DISease Questionnaire (PRODISQ) [30,31] asking the workers about whether they had an all cause sick leave absence episode during the past three months.

Several variables were checked for confounding or effect modification and were assessed using a questionnaire. These variables were age (years), gender (female/male), education (low=elementary school or less, medium=secondary education, and high=college/university), chronic disease status (yes/no), smoking (yes/no), intervention location (Amsterdam/Leiden), and marital status (having a partner yes/no).

**Statistical analysis**

Independent t-test for continuous variables and Pearson’s Chi-square tests for categorical and dichotomous variables were used to test differences in baseline and outcome measures between the intervention and control group and between completers and non-completers. The effectiveness of the intervention at six and 12 months was analysed using linear regression (continuous outcomes, i.e. vitality, work engagement, work performance) and logistic regression (dichotomous outcome, i.e. sick leave) analyses, adjusted for the baseline levels of these outcomes. In addition to sick leave analyses, log-transformed data were used to analyse effectiveness on sick leave days for those having at least one
sick leave episode during follow-up. All analyses were performed according to the intention-to-threat principle (ITT). As possible effects of missing participants should be considered [32,33], it is recommended to perform both complete cases analyses and sensitivity analyses with imputed data [34]. For the sensitivity analyses, all missing data on the outcome measure were imputed using multiple imputations (MI) based on Multivariate Imputation by Chained Equations (MICE) [35,36]. The MI procedure was performed in PASW (version 18.0, Chicago, IL, USA), in which 40 different data sets were generated. By using Rubin’s rules, PASW enabled to pool effects from these 40 data sets [37]. As adding potential confounders to crude models did not change intervention effects more than 10% and no effect modifiers were found, only crude effect estimates are presented in this paper.

Additional data analyses were performed to look for relationships between the compliance of workers to the guided yoga and workout group sessions. The compliance to the guided group sessions was defined based on the mean of the followed yoga and workout group sessions, which were 10.4 and 11.1 sessions per 24 weeks, respectively. Compliance categories defined were: 1) workers in the control group (n=363), 2) workers in the intervention group, who did not follow a guided session (yoga n=47; workout n=62), 2) low compliance: ≤ mean number of sessions (yoga n=95; workout n=89), and 3) high compliance: >mean number of sessions (yoga n=108; workout n=99). To test differences between these compliance groups, linear regression analyses were used with dummy variables for each compliance category, with the control group as reference category. Statistical analyses were performed using PASW (Version 18.0, Chicago, IL, USA).

**Results**

As presented in the study flow diagram (figure 1), a total of 730 workers completed the baseline questionnaire and were randomised to the intervention (n=367) or control group (n=363). Between October 2009 and September 2010, all follow-up measurements took place. In total, 500 workers completed the questionnaire 12 months after baseline, and were therefore used for complete cases analyses. In addition, sensitivity analyses with imputed data among the total study population (n=730) were performed. No adverse events of the intervention were reported by the participants. In table 1, baseline characteristics of the
study population are presented. No significant differences were found between study group in any of the variables or between completers and non-completers.

Table 2 shows the intervention effects on work-related (UWES vitality scale), general (RAND-36 vitality scale) vitality, work engagement, work performance and sick leave after six and 12-months follow-up, revealed from complete cases analyses. Work-related vitality, work engagement and work performance remained more or less stable in both the control and intervention group, resulting in no significant differences for these outcomes between study groups after six and 12 months. For general vitality, the same pattern was seen with no significant changes over time within and between groups (six months: $\beta=0.15$, 95%CI: -2.0 to 2.3; 12 months: $\beta=1.5$, 95%CI: -0.73 to 3.8). Nevertheless, at 12-month follow-up, the intervention group had improved their general vitality by 1.9 point versus 0.10 point among the workers in the control group (table 2).
Older workers invited to participate (n=3756)

Willing to participate (n=1101)

Excluded (n=371)
- Not meeting inclusion criteria (n=227)
- Declined to participate (n=101)
- Other reasons (n=43)

Randomised (n=730)

Excluded (n=371)
- Not meeting inclusion criteria (n=227)
- Declined to participate (n=101)
- Other reasons (n=43)

Willing to participate (n=1101)

Allocated to intervention (n=367)
- Started allocated intervention:
  PVC: n=329; workout: n=234; Yoga: n=259
- Mean attendance to intervention:
  PVC: 2.7 [range 1-3]; yoga & workout:
  10.4 & 11.1 sessions/24 weeks

Allocated to control (n=363)
- Received control (n=363)

Follow-up after 6 months

Lost to follow-up after baseline (n=74)

Reasons at 6 months: No time (n=19); no interest/motivation (n=6); Health problems (n=6); change of job (n=1); other (7); Unknown (n=35)

Lost to follow-up after baseline (n=81)

Reasons at 6 months: No time (n=6); no interest/motivation (n=4); Health problems (n=3); change of job (n=4); other (6); Unknown (n=58)

Follow-up after 12 months

Lost to follow-up after baseline (n=117)

Reasons at 12 months: No time (n=27); no interest/motivation (n=11); Health problems (n=8); change of job (n=1); other (n=24); Unknown (n=46)

Lost to follow-up after baseline (n=113)

Reasons at 12 months: No time (n=7); no interest/motivation (n=6); Health problems (n=6); change of job (n=5); other (28); Unknown (n=62)

Analysis

Analysed complete cases (n=250)
Analysed imputed data (n=367)

Analysed complete cases (n=250)
Analysed imputed data (n=363)
Table 2. Mean and standard deviation (SD) for complete cases and imputed data for missing values on vitality, work engagement, work performance and sick leave for the intervention and control group at baseline and after 6- and 12-months follow-up after baseline. The intervention effects are also presented.

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
<th>( \Delta )</th>
<th>( \beta_{6m} ) or OR( _6m )</th>
<th>95% CI</th>
<th>( \Delta )</th>
<th>( \beta_{12m} ) or OR( _12m )</th>
<th>95% CI</th>
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<tr>
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<td>0.90</td>
<td>4.96</td>
<td>0.84</td>
<td>4.99</td>
<td>0.83</td>
<td>0.06</td>
<td>0.04</td>
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<td>-0.14</td>
<td>0.09</td>
<td>0.07</td>
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<tr>
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<td>0.80</td>
<td>4.95</td>
<td>0.80</td>
<td>4.95</td>
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<td>68.9</td>
<td>16.5</td>
<td>69.5</td>
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<td>-2.3</td>
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<td>1.5</td>
</tr>
<tr>
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<td>69.6</td>
<td>16.0</td>
<td>68.9</td>
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<tr>
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<td>0.77</td>
<td>4.82</td>
<td>0.77</td>
<td>0.04</td>
<td>-0.01</td>
<td>-0.11</td>
<td>-0.09</td>
<td>0.07</td>
<td>0.07</td>
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<tr>
<td>C</td>
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<td>4.82</td>
<td>0.77</td>
<td>4.78</td>
<td>0.80</td>
<td>0.04</td>
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<tr>
<td>Work performance I</td>
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<td>0.78</td>
<td>78.4</td>
<td>0.76</td>
<td>77.4</td>
<td>0.95</td>
<td>-0.01</td>
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<td>0.81</td>
<td>7.78</td>
<td>0.97</td>
<td>-0.09</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Sick leave (%yes) I</td>
<td>25.6%</td>
<td>-</td>
<td>34.0%</td>
<td>-</td>
<td>21.2%</td>
<td>-</td>
<td>8.4%</td>
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<td>0.94</td>
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<td>-4.4%</td>
<td>1.3*</td>
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<tr>
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<td>26.0%</td>
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<td>27.2%</td>
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<td>17.2%</td>
<td>-</td>
<td>12.2%</td>
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</table>

Imputed data for missing values analyses (\( n=730; n_\text{control}=363, n_\text{intervention}=367 \))

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
<th>( \Delta )</th>
<th>( \beta_{6m} ) or OR( _6m )</th>
<th>95% CI</th>
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<th>( \beta_{12m} ) or OR( _12m )</th>
<th>95% CI</th>
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<td>-0.06</td>
<td>-0.13</td>
<td>0.12</td>
<td>0.08</td>
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<td>0.85</td>
<td>4.95</td>
<td>0.81</td>
<td>4.93</td>
<td>0.84</td>
<td>0.05</td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>Vitality – RAND-36 I</td>
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<td>68.9</td>
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<td>0.80</td>
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<td>0.06</td>
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<tr>
<td>Work performance I</td>
<td>79.2</td>
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<td>0.77</td>
<td>77.5</td>
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</tr>
<tr>
<td>Sick leave (%yes) I</td>
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<td>32.6%</td>
<td>-</td>
<td>20.4%</td>
<td>-</td>
<td>71%</td>
<td>1.3*</td>
<td>0.93</td>
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<tr>
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<td>18.2%</td>
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<td>8.8%</td>
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</tbody>
</table>

\( \beta_{6m} \) and \( \beta_{12m} \)= estimated intervention effect from linear regression analysis at 6- and 12-months follow-up, adjusted for baseline differences on the outcome measure; C=control group; I=intervention group; min/wk=minutes per week; n=number of older workers; OR6m and OR12m= estimated intervention effect from logistic regression analysis at 6- and 12-months follow-up, adjusted for baseline differences on the outcome measure; SD=standard deviation; 95% CI=95% confidence interval; \( \Delta \)=mean difference between baseline and follow-up measure directly after the intervention ended (i.e. 6 or 12 months); #=Odds ratio (OR); *p<0.05
Table 3 shows the relationships between yoga and workout group compliance and the two vitality measures. As for work-related vitality, there was a significant relationship for the high yoga compliance group ($\beta=0.14$, 95%CI: 0.04 to 0.28), but not for high workout compliance ($\beta=0.11$, 95%CI: -0.04 to 0.25) (table 3). For general vitality, there was also a significant relationship for the high compliance group with respect to yoga ($\beta=2.9$, 95%CI: 0.02 to 5.9), but not for the workout sessions ($\beta=2.3$, 95%CI: -0.67 to 5.3) (table 3). Hence, high yoga compliance resulted in significantly better general and work-related vitality.

Sensitivity analyses, with imputed data for missing values, showed similar significant findings when compared to the complete cases analyses. However, the effectiveness derived from the analyses with imputed data, were consistently smaller when compared to the complete cases (table 2 and 3).

**Table 3. Long term effectiveness (i.e. 12 months after baseline) for yoga and workout session compliance subgroups**

<table>
<thead>
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<th>Low compliance</th>
<th>High compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n_{yoga}=63$; $n_{workout}=79$</td>
<td>$n_{yoga}=110$; $n_{workout}=108$</td>
<td>$n_{yoga}=120$; $n_{workout}=106$</td>
</tr>
<tr>
<td>Vitality</td>
<td>Yoga</td>
<td>Workout</td>
<td>Yoga</td>
</tr>
<tr>
<td></td>
<td>$\beta$</td>
<td>95% CI</td>
<td>$\beta$</td>
</tr>
<tr>
<td>UWES</td>
<td>0.002</td>
<td>-0.19 – 0.19</td>
<td>0.02</td>
</tr>
<tr>
<td>RAND-36</td>
<td>Yoga</td>
<td>Workout</td>
<td>Yoga</td>
</tr>
<tr>
<td></td>
<td>1.9</td>
<td>-2.1 – 5.0</td>
<td>0.53</td>
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**Imputed data for missing values analyses**

<table>
<thead>
<tr>
<th>Group</th>
<th>No sessions</th>
<th>Low compliance</th>
<th>High compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n_{yoga}=108$; $n_{workout}=133$</td>
<td>$n_{yoga}=135$; $n_{workout}=126$</td>
<td>$n_{yoga}=124$; $n_{workout}=108$</td>
</tr>
<tr>
<td>Vitality</td>
<td>Yoga</td>
<td>Workout</td>
<td>Yoga</td>
</tr>
<tr>
<td></td>
<td>$\beta$</td>
<td>95% CI</td>
<td>$\beta$</td>
</tr>
<tr>
<td>UWES</td>
<td>0.06</td>
<td>-0.10 – 0.22</td>
<td>0.03</td>
</tr>
<tr>
<td>RAND-36</td>
<td>Yoga</td>
<td>Workout</td>
<td>Yoga</td>
</tr>
<tr>
<td></td>
<td>2.8</td>
<td>-0.86 – 6.5</td>
<td>0.32</td>
</tr>
</tbody>
</table>

$\beta$ = estimated intervention effect from linear regression analyses; $n$=number of older workers; 95% CI=95% confidence interval; *p<0.05
Discussion

No intervention effects were observed for vitality, work engagement, work performance or sick leave. However, the results of the present study showed that high yoga compliers significantly increased their work-related and general vitality.

The Vital@Work intervention consisted of two main components, namely aerobic exercises and yoga. WHP programmes consisting of aerobic exercises have shown positive results on sick leave and work performance [10,14,15]. Effects of worksite aerobic exercises on work engagement, work-related and general vitality have not been published before. Also the effectiveness of WHP programmes containing a yoga component on any of these work-related outcomes has not been published yet, nor the effectiveness of such WHP solely among older workers.

The lack of impact of the Vital@Work intervention on work-related and general vitality, work engagement, work performance, and sick leave may be due to the fact that we studied a relatively healthy group of workers. Healthier workers are more likely to stay in the workforce than those who are sick or physically unfit (i.e. healthy worker effect) [38]. This may be especially true for older hospital workers, as the majority of this population has to deal with higher physical workloads than an average Dutch worker. Support for this was found in the mean values of the main outcomes, which corresponded with the upper limit range of those measures (i.e. ceiling effect). Moreover, a recent study has shown that the UWES had difficulty in differentiating respondents with high work engagement [39], making it more difficult to distinguish small differences between study groups. This could also have been the case for work performance (i.e. WHO-HPQ) and general vitality (i.e. RAND-36).

This study showed effectiveness of high yoga compliance on vitality. Similarly, a RCT among 155 healthy seniors reported that in a six-month lasting yoga and exercise programme, yoga group sessions with high attendance rates (i.e.>75%) showed favourable outcomes on well-being, experienced energy levels, quality of life, perceived stress, anxiety, and fatigue, when compared to exercise group sessions [40]. Further, in general, yoga has shown to have effects on decreasing anxiety, depression, increasing feelings of well-being and quality of life [40-43]. As for our study, work-related vitality is a dimension
of work engagement, which can be seen as subjective well-being at work [44]. On the other hand, general vitality is a dimension of quality of life (i.e. RAND-36). Therefore, the observed effects of high yoga compliance on work-related vitality as a component of well-being at work and general vitality as a component of quality of life, as in our study, seems reasonable.

Some limitations of this study can be indicated. First, data were obtained solely from questionnaires. As a result, all data were self-reported, inducing a potential risk of bias due to socially desirable answers. Second, the external validity of the study may be questionable, as the intervention was specifically tailored to older hospital workers. Results may therefore not be generalisable to other worker populations. A last limitation may be the loss to follow-up rates found after 12-month (i.e. about 30%), which is a common problem among prevention studies [45]. The 12 month loss to follow-up rate may have induced selection bias [46]. However, there were neither dissimilarities at baseline between completers and non-completers nor the two study groups for all outcome measures, nor for any confounding factors. Also, sensitivity analyses with imputed data for missing values showed similar, but smaller estimated intervention effects compared to complete cases analyses. This is commonly seen with imputation data [34]. Although, this could indicate a potentially biased estimation obtained from complete cases, conclusions drawn from both complete cases and imputed data analyses were comparable. So, it seems that the loss to follow-up rate of our study did not result in selection bias.

There are also strengths worth mentioning. First, to our knowledge, this is the first study investigating the effectiveness of a worksite vitality intervention consisting of yoga and aerobic exercising on relevant work-related outcomes. This was also the first study investigating these outcomes specifically in older workers. Another strength is the follow-up of one year, making it possible to evaluate both short- and long-term effectiveness. Further strengths are the large study sample of 730 older workers causing sufficient statistical power, and the study design, i.e. a randomised controlled trial.

The key findings of our study are that a worksite intervention consisting of yoga and aerobic exercising, provision of free fruit, and individual coaching sessions did not result in improvements in work-related outcomes. Therefore, it cannot
be recommended to implement the current Vital@Work intervention as a tool to improve older workers’ vitality, work engagement, work performance or sick leave. Future research should focus on identifying further relevant factors that may lead to improvements in vitality and work engagement. Given the upcoming labour shortage, it is important to identify these factors to keep older workers as active members of the workforce. Further, as high yoga compliance showed effects on both work-related and general vitality, this deserves to be explored further in future research. For instance, it would be interesting to investigate other possible positive effects of worksite yoga interventions on work-related outcomes related to employability, such as job performance or job satisfaction. As only high yoga compliance showed positive effects, it is important to find effective means to stimulate compliance. Therefore, impeding factors for participation should be investigated in more detail. Also, due to the supposed healthy worker and ceiling effects, it would be interesting to investigate effectiveness of yoga and aerobic exercising among a more diverse population with respect to vitality and work engagement, for instance, workers with higher risks in terms of sick leave, work performance or disability pension.

**Conclusion**

As the workforce is rapidly ageing, effective tools are necessary to promote healthy labour participation of older workers. The results of this study showed no effects on vitality, work engagement, work performance and sick leave, but did show that high compliance to guided yoga sessions, favourably affected vitality. Implementation of worksite yoga facilities could be a useful strategy to promote vitality-related work outcomes, but only if high compliance can be maximised.
Reference List


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