The baby boom after the Second World War, longer life expectancies, and lower birth rates are leading to an ageing society. To overcome the consequences of an ageing society from both the societal and employer’s perspective, there is an urgent need for workers that are able to prolong their working life in good health. To enable workers to prolong their working life and increase their employability, it is important to maintain and promote their health and vitality. Healthy lifestyle choices, such as sufficient levels of physical activity, healthy dietary habits, and relaxation, lead to better health. Therefore, improving workers’ lifestyle can be considered as a promising way to positively affect their health and vitality, and may subsequently lead to increased employability. The Vital@Work study investigated the (cost-) effectiveness of a lifestyle intervention, which was aimed at improving older workers’ vitality.

Part I The starting point of the Vital@Work study
Chapter 2 concerned a cross-sectional study investigating the associations between aerobic capacity and two widely used measures of vitality. In 427 older workers participating in the Vital@Work study, aerobic capacity ($VO_{2\text{max}}$) was estimated at baseline using the 2-km walk test. Vitality was measured using both the UWES Vitality Scale and the RAND-36 Vitality Scale. This cross-sectional study showed that aerobic capacity was associated with a general measure of vitality (i.e. the RAND-36 Vitality Scale), but not with work-related vitality (i.e. the UWES Vitality Scale).

In chapter 3, we investigated our hypothesis that fit workers have higher work ability and are therefore at lower risk for sick leave and that this relationship differs between young and older workers. This was examined using a longitudinal dataset from a large Dutch company (i.e. Siemens Netherlands), consisting of 580 workers. A significant relationship was found between aerobic capacity and work ability, between aerobic capacity and sick leave, and between work ability and sick leave. Mediation analyses using linear and Cox regression
models showed that work ability mediated the relationship between aerobic capacity and sick leave. Age did not affect the relationships under study. From this longitudinal study it could be concluded that fit workers had better work ability, and both fit workers and workers with higher work ability were at lower risk of starting an episode of sick leave.

Part II Intervention development and study design
In chapter 4, the development of the Vital@Work intervention and the design of the Vital@Work study evaluating this intervention were described. The Vital@Work intervention was developed using the Intervention Mapping (IM) protocol. By doing so, the Vital@Work intervention was specifically tailored to the older workers’ needs and desires. The 6-month (i.e. 24 weeks) Vital@Work intervention contained a Vitality Exercise Programme (VEP) combined with three visits to a Personal Vitality Coach (PVC). The VEP consisted of a weekly guided yoga session, a weekly guided workout session, and a weekly unguided aerobic exercising, as well as the provision of free fruit at the guided group sessions. The PVC visits were aimed at goal setting, providing feedback, and problem solving. The intervention was evaluated using a Randomised Controlled Trial (RCT) (i.e. the Vital@Work study) among 730 older workers (i.e. 45 years and over) employed at two major academic hospitals in the Netherlands. Measurements took place at baseline, six, and 12-month follow-up. Outcome measures of the Vital@Work study were lifestyle behaviour (i.e. sports, vigorous physical activity, fruit intake), vitality, vitality-related outcomes (i.e. mental health, need for recovery, aerobic capacity), work-related outcomes (sick leave, work performance, work engagement), and costs (medical costs, absenteeism costs and sport activity costs).

Part III Intervention evaluation
Chapter 5 presented the results on the implementation and deliverance of the Vital@Work intervention by the intervention providers as well as the degree to which the intervention was used as planned by the intervention recipient (i.e. the process evaluation). The implementation, i.e. the dose delivered, of the yoga and workout sessions were 72.3% and 96.3% respectively. All PVC visits (100%) were offered. Furthermore, workers were positive about the intervention (yoga: 7.5; workout: 7.8; PVC: 6.9), and most workers attended the guided
group sessions (i.e. reach yoga: 70.6%; reach workout: 63.8%) and PVC visits (reach: 89.6%). When taken these three intervention components together, the reach was 52%. The degree to which the guided group sessions were attended (i.e. the dose received) was 10.4 sessions/24 weeks for the yoga and 11.1 sessions/24 weeks for the workout. The most frequently mentioned reason for not attending the guided yoga and workout group sessions was “lack of time”. The process evaluation also showed the important role of the proximity of the intervention locations to the workplace, and a match between workers’ regular working hours and the time schedule of the group sessions.

Chapter 6 described whether the Vital@Work intervention was successful in improving lifestyle outcomes (i.e. vigorous physical activity (VPA), sports, and fruit intake), and vitality-related outcomes (i.e. aerobic capacity and need for recovery after a day of work (NFR), and mental health). Workers who were randomised to the intervention group (n=367; control:n=363) received the Vital@Work intervention. Data on the outcome measures were collected at baseline (n=730) and at 6-month follow-up (n=575) using questionnaires (i.e. lifestyle, NFR and mental health), accelerometers (i.e. VPA), and 2-km walk tests (i.e. aerobic capacity). Directly after the 6-month intervention period positive effects were found on sports participation (β=40.4 min/week, 95%CI:13.0-67.7), fruit intake (β =2.7 pieces/week, 95% CI:0.07-4.7), and NFR (β=-3.5, 95%CI:-6.4- -0.54), but not on VPA, aerobic capacity, and mental health. Effects on sports participation and fruit intake were stronger for workers with a higher compliance to both the guided yoga (Sport:β=49.6 min/week, 95%CI:13.9-85.2; fruit:β=3.8 pieces/week, 95%CI:1.1-6.4) and workout (sport:β=72.9 min/week, 95%CI:36.1-109.8; fruit:β=4.0 pieces/week, 95%CI:1.1-6.4) group sessions, whereas the effect on NFR was only stronger for high workout compliers (β=-5.3, 95%CI:-9.3- -1.3).

In chapter 7, the effectiveness on the Vital@Work intervention on vitality and work-related outcomes (i.e. work engagement, productivity, sick leave) was described. Data on work-related vitality (UWES vitality scale), general vitality (RAND-36 vitality scale), work engagement (UWES), productivity (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. Neither at 6-month follow-up nor at 12-month follow-up effects were found on vitality, work engagement, productivity, and sick leave. Yoga and workout subgroup analyses showed favourable effect on work-related vitality ($\beta=0.14$, $95\%$CI: $0.04$-$0.28$) and general vitality ($\beta=2.9$, $95\%$CI: $0.02$-$5.9$) at 12-month follow-up among high yoga compliers. For high workout compliers this positive trend was also seen, but not statistically significant.

In Chapter 8, the cost-effectiveness and financial return of the Vital@Work intervention were described from the societal and employer’s perspective, respectively. Data on general vitality, work-related vitality, and need for recovery (NFR) were collected at baseline, six, and 12 months. Costs data were collected using 3-monthly retrospective questionnaires. Missing data were imputed using multiple imputation. For the cost-effectiveness analysis, all costs were taken into account irrespective of who pays for them (i.e., intervention, medical, absenteeism, presenteeism, and sports activity costs). The financial return was estimated using a return on investment analysis. This analysis was performed from the employer’s perspective (i.e. only costs relevant to the employer were considered, including intervention, absenteeism, and presenteeism costs). Based on the economic evaluation, it appeared that the Vital@Work intervention, which costs were €149 per worker, was neither cost-effective from the societal perspective, nor cost-beneficial from that of the employers.

In chapter 9, the results of this thesis were summarized and discussed. In addition, methodological considerations, the relevance of the findings recommendations for future research as well as practical implications of the findings were addressed. The overall conclusion is that the Vital@Work intervention consisting of yoga and aerobic exercising, the provision of free fruit, and individual coaching sessions was successful in improving sport activities and fruit intake, but did not result in overall improvements in vitality and work-related outcomes. Also, the intervention was neither cost-effective nor cost-beneficial. Therefore, it cannot be recommended to implement the Vital@Work intervention in its current form as a tool to improve older workers’ vitality. Several practical implications are given to possibly improve its effectiveness in the future.