# Promotion of sustainable employability

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**SUMMARY**

In 2011, the largest Dutch meat processing company developed and implemented a workers' health surveillance (WHS), aiming to promote sustained employability and health, and reduce sickness absence and early exit from the labor market of their (older) workers. The POSE program (Promotion Of Sustained Employability) includes elements from occupational and rehabilitation medicine. The contents were tailored to the needs and preferences of the meat processing workers. As little is known about the effectiveness of WHS in the meat processing industry, a research project was started. It included the following aims: 1) to provide an overview of existing occupational health interventions in the meat processing industry and describe their effectiveness on work-related outcomes, 2) to compare energetic workload and energetic capacity in meat processing workers, 3) to evaluate the POSE program on its implementation process, effectiveness, and cost-benefit from the employer's perspective, and 4) to investigate associations between work ability and indicators from the POSE program. **Chapter 1** introduces the topic of this thesis and presents the main objectives and the thesis outline.

In **chapter 2** a systematic review was described in which the effectiveness of occupational health interventions in the meat processing industry in upper-middle and high-income countries was investigated. The literature search was performed in PubMed, Embase and the Cochrane Library. Studies were included if they reported on interventions among workers in the meat processing industry and presented outcomes related to work or health. Studies were assessed on risk of bias and data were synthesized by intervention topic. A total of 1200 articles were retrieved which were possibly eligible for inclusion. Assessment on title, abstract and full-text led to a final inclusion of 13 articles reporting on two randomized controlled trials and nine non-randomized intervention studies. Studies were categorized into three topics: ergonomics programs, skin protection, and Q fever vaccination. All studies had high risk of bias. Based on four studies, there was limited evidence for workplace health and safety programs showing reductions in musculoskeletal injury severity, reduction of lost work days, and reduction of costs and claims for several musculoskeletal disorders. There was limited evidence for added rest breaks resulting in improved productivity at the end of a workday and in reductions of perceived discomfort in various body regions at the end of the workday. One study on skin protection showed reductions of eczema prevalence, although evidence was moderate. Based on four studies,

there was high quality evidence for 100% effectiveness of Q fever vaccination. No studies were identified that described a WHS program in the meat processing industry.

In **chapter 3** a study was described which was performed at the workplace. The objective of the study was to examine individual energetic workload during a workday and compare this with energetic capacity. Furthermore, differences in demographic and health-related characteristics between normally loaded and overloaded workers were examined. Forty-one workers who were 50 years or older and participated in the POSE program were included in this study. To quantify energetic workload, heart rate was monitored during one workday. To quantify energetic capacity from power output and heart rate, workers performed a sub-maximal bicycle test. Two strategies were used to compare energetic workload and capacity. For the first strategy, heart rate reserve (HRR) was calculated based on resting and maximum heart rate, and heart rate during work. HRR is in itself a comparison of workload and capacity. On average the workers performed work at 18% HRR. Based on the HRR, the maximum acceptable work time (MAWT) was calculated. Seven workers were qualified as overloaded because they exceeded MAWT. Overloaded workers did not differ from normally loaded workers, except in workload, which was significantly higher in overloaded workers (3.3 vs. 2.4 METs (Metabolic Equivalent of Task)). For the second strategy, heart rate index was calculated from resting and work heart rate and then converted to energetic workload. This was compared to energetic capacity. On average the workers used 33% of their energetic capacity to perform work. In conclusion it can be stated that energetic work capacity was sufficient to handle the workload for the majority of workers.

In **chapter 4** the contents of the POSE program were described together with the design of the evaluation study. The objectives of the evaluation study were to evaluate the POSE program on its implementation process, effectiveness on primary and secondary outcomes, and cost-benefit from the employer's perspective. The WHS consisted of four components: 1) online questionnaires on work ability and health, 2) biometric screening, 3) Functional Capacity Evaluation (FCE), and 4) a counseling session. The goals of the POSE program were to provide participants insight into their health and employability, to offer them opportunities to work on health and employability, and to keep them healthy at work. Based on the outcomes of the WHS program, participants were classified according to the risk of reduced health and employability. The risk profile indicated whether participants

needed referral to subsequent interventions. The evaluation study was conducted as a cluster randomized stepped wedge trial. Five meat processing factories were included in the trial. The POSE program was implemented stepwise, one factory at a time. Measurements were performed at each implementation and were followed up at six and 12 months after the last implementation. The primary outcome measures were work ability, productivity, and sickness absence. Secondary outcomes included health status, vitality, and psychosocial workload. To evaluate effectiveness of the POSE program, primary and secondary outcomes were analyzed over time. Subsequently, sickness absence and productivity data were used to conduct a cost-benefit analysis from the employer's perspective. The implementation of the POSE program was evaluated at process level, focusing on different process aspects. Furthermore, satisfaction with the POSE program was evaluated among employees and several stakeholders.

The process evaluation was described in **chapter 5**. The goal of this study was to evaluate the implementation of the POSE program at process level. Seven process aspects were evaluated: recruitment, reach, dose delivered, dose received, fidelity, satisfaction, and context. Nine months after participation in the POSE program, workers received an evaluation questionnaire. Furthermore, ten workers and six other stakeholders were interviewed, and POSE program data were used. Two different strategies were used to recruit workers for the POSE program: open invitation or automatic participation. Of the 986 employees that were eligible for participation in the POSE program, 305 participated. Average reach over factories was 53%. Of the POSE program components, 85-100% was delivered, and 66-100% was received by participants. FCE, counseling, and intervention adherence could not be evaluated on protocol fidelity. Fidelity to the other program components was 100%. The majority of participating workers (84%) was detected with risk factors for health loss or reduced employability. Overall, participants were satisfied with the total POSE program (mean score 7.6 (0-10)), although satisfaction varied between program components. Ninety-five percent of the participants would recommend the POSE program to colleagues. Several factors were identified that facilitated implementation. The POSE program was supported and advocated by upper management. Societal developments regarding sustainability and sustainable employability created awareness of managers and workers. There also were some factors that hindered implementation. Two included

factories were closed during the course of the study. Furthermore, at the start of the study the POSE program was new to the company. This caused some delay in implementation and insecurity about the follow-up process. The process evaluation showed that there were flaws in program implementation, among others the absence of targeted interventions following the POSE program. Deviation from the protocol is an indication of program failure and may affect program effectiveness.

In **chapter 6** the results of the effect analyses were presented. The goal was to evaluate the effectiveness of the POSE program on outcomes of sustainable employability. Data were collected from February 2012 until March 2015, by questionnaire, from the POSE program, and from company registries. Originally, workers from five factories were included in this study. Within the first year, two factories were closed down. To compensate for this drop-out, a second group from an already participating factory was introduced into the study. Divided over four groups, 305 workers participated in the POSE program. Before participation in the POSE program, workers were in the control condition, after participation they moved to the experimental condition. We found significantly negative effects on all primary outcomes. The odds for sickness absence were 40% higher in the experimental condition (OR=1.40; $p<0.01$). Work ability was slightly, but significantly lower in the experimental condition compared to the control condition (B=-0.63; p=0.01), but average work ability remained good for all workers. Odds for full productivity were 29% lower in the experimental group (OR=0.71; p=0.03). Almost all secondary outcomes (health, vitality, psychosocial workload) were similar in the control and experimental condition. Controlling for confounding factors (age, time, location) did not, or minimally, change the results. The cost-benefit analysis from the employer's perspective showed a significantly negative effect. The financial benefits amounted to €-2321 (95% CI: €-2830 to €-1836). Approximately 42% (€975) of the extra costs were caused by sickness absence, the other 58% (€1346) were caused by increased productivity loss. Based on the results it cannot be concluded that the POSE program (in its evaluated form) improved the evaluated outcomes within a one- to three-year period. To increase the chances for positive effects it is recommended to make interventions an integral part of the POSE program.

In **chapter 7** cross-sectional associations between work ability and a number of POSE program indicators were examined. For this purpose, data from 230 production workers

who participated in the POSE program were used. Personal characteristics, health habits and health-risk indicators, functional capacity, and work-related factors were used as independent variables. The Work Ability Index (WAI; score range 7-49; mean score 39.3), was used as dependent variable. For analysis, the WAI was dichotomized into poor-moderate and good-excellent work ability, using a cut-off score of 37. Sixty-three (27%) participants scored below cut-off. Four variables were significantly and independently associated with work ability. More need for recovery reduced the odds for good-excellent work ability (OR=0.56; p<0.01). Sufficient overhead work capacity increased the odds for good-excellent work ability by a factor four (OR=3.95; p<0.01). Age reduced the odds for good-excellent work ability by 6% per year (OR=0.94; p=0.02). Higher systolic blood pressure increased the odds for good-excellent work ability by 3% per mmHg (OR=1.03; p=0.03). The final model had an Area Under the Curve of 0.81 (95% CI: 0.75-0.86). The best combination of specificity and sensitivity led to an approximate value of 0.72 for both, indicating that 28% was falsely categorized as poor-moderate or good-excellent work ability based on this model. The presented model may provide directions for addressing work ability in meat processing workers.

In **chapter 8** the main results were integrated and interpreted. Previous research on WHS programs and workplace health promotion has shown inconsistent results. Publications on (effects of) a WHS program in the meat processing industry were lacking. POSE program effectiveness on primary, secondary, and financial outcomes could not be demonstrated. Reasons for absence of effects can be sought in the POSE program itself, but also in the context of the meat processing industry. The POSE program was not entirely carried out according to protocol. Furthermore, the economic situation influenced the entire Dutch meat processing industry. Within the specific company, several reorganizations took place. Fine-tuning and improvement of the POSE program may enhance future effects. Input for fine-tuning can possibly be derived from work ability and its associated POSE program indicators. The designs of the separate studies have several strengths and limitations. They are ethical, practical and methodological in nature. Strengths are the availability of the POSE program for all workers, the implementation of the program at the workplace itself, and the flexibility of the stepped wedge design. Other strengths were the use of objective measures in the workload assessment and the POSE program. Limitations apply to the use of a

stepped wedge design in a changing environment, and to the conclusion that can be based on the cross-sectional design used in the studies described in **chapter 3** and **7**. Other limitations concern the exclusion of temporary foreign workers in the studies, and the use of self-report measures. The findings and considerations in this thesis may provide directions for future research and practice. In conclusion it can be stated that this thesis contributes to the knowledge base of WHS programs in general, and of occupational health care in the meat processing industry in particular.