SUSTAINABLE EMPLOYABILITY & PARTICIPATION IN HEALTH PROMOTION PROGRAMS

Anne Rongen

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GENERAL INTRODUCTION

BACKGROUND

The Western population ages as a result of fewer births and an increase in life expectancy. Therefore, many Western countries have developed policies to increase labor force participation such as raising the statutory retirement age. In the Netherlands, the age at which people may retire will gradually increase from 65 years of age in 2012 to 67 in 2023. As a consequence, the workforce will become relatively older which brings about a higher prevalence of health problems such as chronic diseases and functional limitations (e.g. musculoskeletal, sight).[1] Of persons aged 55 to 65 in the Netherlands, 64% suffers from at least one chronic disease and 17% has at least one limitation. Having a poor health (i.e. self-perceived, chronic diseases, functional limitations) decreases ones work productivity and increases the risk on leaving the workforce prematurely, which leads to high costs for organizations.[2-5] Important risk factors for chronic diseases are smoking and an unhealthy weight status, caused by an imbalance between physical activity and nutrition.[6] In the Netherlands, the percentage of persons with overweight or obesity has increased by 14% to 41% during the last 20 years.[1] Furthermore, only 58% is currently sufficiently physical active, less than 10% of the adults eat the daily-recommended amount of 200 grams of fruits and 200 grams of vegetables[7], and 23% smokes.[1] An unhealthy behavior is an even greater concern among the lower educated.[8, 9]

Determinants of sustainable employability

Sustainable employability is defined as employees having the opportunities, capabilities and conditions to work productively with maintenance of their health throughout their working life.[10] There is no single measure for sustainable employability, therefore numerous proxies are used in research such as work ability – persons' balance between resources and work demands[11] – productivity at work, (lack of) sickness absence, and labor force participation.

Sustainable employability is a broad concept, influenced by many factors at the individual level such as demographics (e.g. educational attainment), health, health behavior, work-related characteristics, and work engagement (i.e. "a positive, fulfilling work-related state of mind characterized by vigor, dedication, and absorption"[12]). Lower educated employees have a greater risk of productivity loss and premature displacement from the labor force.[13-16] In addition, poor health, overweight and obesity, and unhealthy behaviors (e.g. lack of physical activity, smoking) negatively influence employees' sustainable employability.[17-22] Furthermore, psychosocial work-related characteristics such as high work demands, lack of job control, lack of support, an imbalance between efforts and rewards, as well as strenuous physical work conditions have a negative effect on employees' ability to remain working productively in good health.[20, 22-27] Sustainable employability is better among employees with a higher work engagement.[28, 29]

Besides the independent influence of these factors on sustainable employability, they are also interrelated. Lower educated employees more often have a poorer health status, unhealthy behaviors, and unfavorable work-related characteristics.[14, 30] Improving these factors may counterbalance the negative effect of low educational attainment on sustainable employability.[31] Furthermore, productivity loss is greater among employees with a poor health status, high work stress, and low work ability who also have a low job control.[32-34] Moreover, employees with a high work engagement more often have favorable work-related characteristics.[35-37] However, there is discussion as to how work engagement fits in the causal pathway between work-related characteristics and sustainable employability.[29, 38]

Workplace health promotion

Workplaces are a promising setting for improving employees' health because people spent a great amount of time at work and intervention implementers have the opportunity to reach a large population at once.[39] Furthermore, employees predominantly have a positive attitude towards health promotion at work; 87% thinks it is a good idea that the employer tries to improve employee health.[40] Ample workplace health promotion programs have been developed to improve employees' health behavior. Systematic reviews concluded that these programs might lead to positive changes regarding physical activity, healthy eating, and weight status.[41-46] Moreover, health promotion programs at the workplace can be a profitable investment for organizations. Implementing workplace health promotion programs may lead to positive changes with regard to work ability, productivity at work, and sickness absence.[47-51] Moreover, a meta-analysis reported that by every dollar spent on health promotion programs at the workplace, medical costs can be reduced by 3.72 dollars and absenteeism costs by 2.73 dollars.[52] However, there is great heterogeneity in the effectiveness of workplace health promotion programs. These variations may be explained by the differences between workplace health promotion programs in type of program (e.g. counselling or educational), how the program is delivered (e.g. individual or group), the duration, and target population (e.g. gender, age).[53] So, insight into the influence of differences in study, population, and intervention characteristics on workplace health promotion program effectiveness may broaden our view on what contributes to effective workplace health promotion programs. Furthermore, this information is important for making assumptions about the generalizability of the workplace health promotion programs.

Participation in health promotion programs among employees

Research on how well interventions are implemented is growing, but still less often conducted than effectiveness studies.[54-56] Of all the published effectiveness studies of workplace health promotion programs, only 7% has also published a process evaluation.[56] These types of studies provide valuable additional information on the implementation, for example regarding program participation and their determinants. This insight is important since participation in workplace health promotion is usually below 50% which jeopardizes the effectiveness, lowers the cost-effectiveness, and questions the generalizability of the results.[57, 58] Workplace health promotion program participation has been found to vary by demographics and type of program; female employees are more inclined to participate in workplace health promotion programs and higher participation is more likely when it concerns a multicomponent program and is offered during paid time.[57-59] However, there is inconclusive evidence whether employees who could benefit most from these programs (i.e. those with unhealthy behaviors or poor health) are also those who participate more often.[58, 60-66] A limitation of these studies is that they evaluate participation with regard to a specific program within a specific predetermined group. When others (e.g. organizations, health professionals) implement these programs they might implement them differently than during the effectiveness study and the population may differ in composition. It is therefore of great importance to study what influences participation among employees in companies that already provide a range of health promotion programs.

Multiple factors that influence participation in workplace health promotion programs have been mentioned. Lack of motivation or time, already feeling healthy, low expectations of the personal benefits of the program, or factors related to the work situation are often reported by employees to impede participation.[60, 61, 63, 67, 68] Willingness to change ones' behavior, attractiveness of the program, a program at a convenient time and place, and a fun atmosphere are mentioned to facilitate participation.[69, 70] Furthermore, among patients, treatment adherence is better among those who believe to be in control over their own health (i.e. internal health locus of control[71]).[72] However, the degree to which these factors actually influence participation in health promotion programs among employees is seldom studied.[57] A disagreement between what the employees need and prefer with regard to health promotion programs and what is provided to them by their employer might also withhold employees from participating. Previous studies observed that employees are interested in a variety of programs: fitness center, yoga classes, stretching programs at the desk, nutrition seminars, and personalized dietary recipes.[70, 73, 74] Unfortunately, these studies do not provide sufficient information whether these programs will increase participation.

OBJECTIVES OF THIS THESIS

The aim is to gain insight in how sustainable employability can be promoted by investigating the determinants of sustainable employability, the effects of interventions, and the factors that influence participation in health promotion programs among employees.

The primary objectives of this thesis are:

1. To identify individual, health behavior, and work-related determinants of sustainable employability, expressed by self-perceived health, work ability, sickness absence, and labor force participation.
2. To estimate the differential effectiveness of workplace health promotion programs on self-perceived health, productivity at work, work ability, and sickness absence by population, study, and intervention characteristics, and methodological quality.
3. To study the influence of barriers and facilitators for participation in health promotion programs among employees.

Datasets used in this thesis

The analyses in this thesis are based on three datasets. First, data collected by the European study 'Nurses Early Exit' study (NEXT study) were used to investigate reasons for premature departure of nurses from health care institutions.[75] In this study information was collected through questionnaires: a baseline questionnaire, a twelve-month follow-up questionnaire for nursing staff still employed by the same health care institution, and a questionnaire which was sent during the twelve-month follow-up to the nursing staff who had left the health care institution. Complete data were gathered for 9,972 nurses and nursing aids from eight European countries. Second, data collected by Statistics Netherlands in the survey 'the Permanent Survey of Living Conditions (POLS) between 1999 and 2002 was used.[76] These data were matched to data on main source of income provided by Sociaal Statistisch Bestand (social statistical database). Complete data were collected for 14,708 employees aged between 18 and 64. Third, a six-month longitudinal study was conducted among employees of two organizations in the Netherlands; a plastic manufacturer and a paint manufacturer. Questionnaires were sent out at baseline and six-month follow-up to 2,155 employees of which 1,128 (52%) completed the baseline questionnaire and of those, 748 (66%) also filled in the follow-up questionnaire and gave their informed consent for the use of their data for scientific research. At baseline, questions were asked about self-perceived health, health behavior, work-related characteristics, work engagement, work ability, health locus of control, needs and preferences for health promotion programs, barriers and facilitators for participation in health promotion programs, and intention to participate in a health promotion program. At follow-up, questions were asked regarding self-perceived

health, work ability, and actual participation in a health promotion program during the follow-up period.

OUTLINE OF THIS THESIS

The first part of this thesis encompasses chapters two to four and addresses the first objective; to identify determinants of sustainable employability. Chapter two and three focus on leaving paid employment. Based on a longitudinal study among nursing staff in Europe (data source 1), chapter two investigates the interaction between work ability and work-related characteristics on leaving the organization or profession. In chapter three insights will be gained into the influence of self-perceived health, health behavior, and work-related characteristics on the relation between educational level and leaving the labor force (data source 2). Chapter four studies the influence of health behaviors, work-related characteristics, and work engagement on self-perceived health, work ability, and sickness absence (data source 3).

The second part of this thesis (chapter five) addresses the second objective; to estimate the effectiveness of workplace health promotion programs. A systematic review and meta-analysis on the effectiveness of workplace health promotion programs aimed at a healthy behavior is presented. Furthermore, it provides insight into how the methodological quality of the intervention study and population, study, and intervention characteristics affect the effectiveness of workplace health promotion programs.

The third part of this thesis encompasses chapters six to eight and addresses the third objective; to study factors that influence health promotion program participation among employees. Chapters six and seven focus on the barriers, facilitators, and preferences of employees concerning health promotion programs and how these may influence employees' intention towards participation in a health promotion program and actual participation (data source 3). In chapter eight the influence of employees' health beliefs on participation in health promotion programs is investigated (data source 3).

This thesis concludes with chapter nine. In this chapter the findings presented in this thesis are summarized and discussed.

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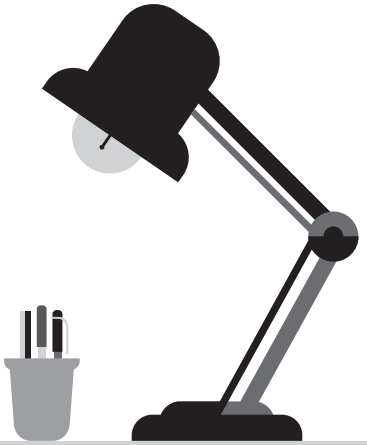
PART ONE

DETERMINANTS OF SUSTAINABLE EMPLOYABILITY

/02



INFLUENCE OF WORK–RELATED CHARACTERISTICS AND WORK ABILITY ON CHANGING EMPLOYER OR LEAVING THE PROFESSION AMONG NURSING STAFF

Journal of Nursing Management 2014;22(8):1065–1075

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ABSTRACT

Aim: To investigate how work-related characteristics and work ability influence nursing staffs decisions to change employer or leave the profession.

Background: Previous cross-sectional studies have indicated that decreased work ability and unfavourable work-related characteristics are important determinants for the intention to leave the profession among nursing staff.

Methods: A one-year longitudinal study, using data from the European Nurses' Early Exit Study, was performed. The study population consisted of 9,927 (66%) members of the eligible nursing staff of which 345 left their current employer. Work-related characteristics, work ability and employment status were assessed by questionnaires.

Results: Nursing staff with a low work ability were more likely to either change employer or leave the profession. Among nursing staff with a low work ability the risk of changing employer increased significantly with unfavourable work-related characteristics. However, among nursing staff with a good work ability the risk on changing employer barely changed with unfavourable work-related characteristics.

Conclusion: The negative effects of decreased work ability on changing employer and leaving the profession are partly counterbalanced by favourable psychological and physical work-related characteristics.

Implications for nursing management: Managers should implement strategies that focus on promoting the work ability of nursing staff in combination with improving work-related characteristics in order to prevent unnecessary changes of job.

INTRODUCTION

Nursing shortage caused by an ageing workforce and nursing staff leaving the profession early is a major problem within the health-care sector.[1-3] This shortage also has a negative effect on the quality of care provided[2, 4], and is associated with high costs owing to replacement of personnel and loss in productivity.[5] Therefore, a better understanding is required of why nursing staff leave their current institution to work for another health-care institution or leave the profession entirely.[6]

Literature review

Work ability, work-related characteristics and employment

In recent years the concept of work ability has received growing interest in exploring the relation between the work situation and intention to leave the nursing profession.[7, 8] Work ability refers to the self-perceived degree to which a worker, given his or her health, is physically and mentally able to cope with the mental and physical demands of his or her job. In recent years, promoting work ability has been considered a key factor in prolonging a productive working life.[9]

Work ability has been found to predict early exit from paid employment[8, 10, 11] and long-term sickness absence.[11] For nursing staff, a decreased work ability is found to be strongly associated with the intention to leave the ward and the organization.[6] Several studies have shown that a decreased work ability is related to numerous work-related characteristics: high work demands, lack of job control, effort-reward imbalance, and high physical work demands.[12-14] Moreover, these work-related characteristics also play a significant role in early exit from paid employment in a wide range of occupations.[15] Previous studies show that unfavourable work-related characteristics are related to nursing staff leaving nursing care.[16, 17] Furthermore, research has shown that nurses with a decreased work ability who had experienced high support by their colleagues reported a lower intention to leave the current ward.[6]

Theoretical models

The work-related characteristics described above are constructs incorporated into two important models in occupational health psychology: the Job-Demand-Control-Support model (JDCS) and the Effort-Reward Imbalance model (ERI). The JDCS model is developed by Karasek (1979) and later extended by Johnson et al. (1989), and focuses on the relation between job demands, perceived control at work, and social support.[18-20] The construct of job demands refers to the workload perceived by the worker, perceived control in timing and planning of one's work activities, and social support experienced from colleagues and supervisors.[19] The ERI model was developed by Siegrist (1996), and

emphasizes that there should be a balance between what an employee gives (effort) and receives (reward).[21, 22] Here, efforts refer to the demanding aspects of the work environment, while rewards include self-perceived financial rewards, rewards in esteem, and rewards related to promotion prospects and job security.[22] Whereas the JCDS focuses on job demands, the ERI puts its emphasis on rewards.[23]

Purpose of research

It has been proposed by Chen et al. (2008) and by Hayes et al. (2011) that there is a need for investigating the determinants of actual turnover in a job instead of intention to leave.[24, 25] The relationship between work-related characteristics, actual turnover, and the retention of nursing staff is still poorly understood.[2] Furthermore, it is unclear how work-related characteristics, work ability and leaving the profession are interrelated. Poor psychosocial work factors may be important determinants for exiting the profession, especially among nursing staff with a decreased work ability. This study aims: 1) to determine the role of decreased work ability and poor work-related characteristics in changing employer and leaving the profession, and 2) to investigate interactions between work-related characteristics and work ability and their influence on changing employer and leaving the profession.

METHODS

Study population

The study population consists of participants in the Nurses' Early Exit Study (NEXT-Study). The NEXT-Study is a one-year longitudinal study aimed at investigating premature departure (i.e. leaving before the statutory retirement age) of nurses from health care institutions. Nursing staff of different qualification levels (registered nursing in non-managerial and managerial positions and nursing aids) were eligible to participate. Data were collected in 10 European countries (Belgium, Finland, France, Germany, UK, Italy, the Netherlands, Norway, Poland, and Slovakia) between February 2002 and June 2005.[26]

Methodology

Data were collected by questionnaires. The baseline questionnaire (Q0) was sent out between October 2002 and June 2003 to members of the nursing staff within 623 participating health care institutions.[26] In the subsequent year, those who had left the institution were asked to fill out a questionnaire (Qex) investigating reasons for leaving. Members of the nursing staff who stayed in the institution received a follow-up questionnaire (Q12) after 12 months. Qex and Q12 were sent to all members of the nursing

staff, except those from UK and Norway. A detailed description of the study design and responses per country have been published previously.[26]

Sample of this study

The population selected for the current study were members of the nursing staff who 1) filled out Q0 and Q12 or Q0 and Qex, 2) completed the work ability index questionnaire at baseline, and 3) were aged 30 years or older. Nursing staff younger than 30 years were excluded from the analyses because of the high prevalence of leaving their institution for family or education purposes, irrespectively of the work characteristics or their work ability. Nursing staff who left the institution owing to retirement (n=42) were also excluded. Eligible members of the nursing staff came from Belgium, Denmark, Finland, France, Italy, the Netherlands, Poland, and Slovakia. In total, 34,587 (56%) individuals from these countries responded to Q0. Of these, 15,099 (44%) also responded to either the Q12 (n=14,347) or Qex (n=752). Within this group, 9927 (66%) met the inclusion criteria of having a complete work ability index and an age of 30 years or older. In this study population, 9,582 persons were still working in the same institution 12 months later, and 345 persons had left the institution. A detailed description of the responses per country has been published previously.[26]

Instruments

Information regarding the core concepts of this study (i.e. work ability, psychological and physical work-related characteristics, and individual characteristics) were collected in Q0. Work status was assessed by means of information from Q12 and Qex. These questionnaires were translated for each country by means of the translation-back-translation methodology.[27]

Changing health-care institution or leaving the profession

Nursing staff leaving their institution were asked what their current employment status was and if they had a new job, whether this new job was within nursing. Based on these questions nursing staff leaving their institution were divided into two groups: 1) nursing staff that changed employer within the profession, and 2) nursing staff that left the profession. The first group consisted solely of nursing staff who switched health-care institution, but who remained working as a nurse or nursing aid. The second group consisted of nursing staff that had started a new job outside the profession, those who were out of paid employment and were looking for a new job, and those who were out of paid employment but were not seeking a new job. Due to the data collection protocol, it was not possible to define change of job within the same institution.

Work ability

Work ability assesses the self-perceived capability to fulfil the mental and physical demands of the job and is measured by the short version of the Work Ability Index (WAI), which has been shown to be a valid and reliable instrument.[9, 28] The WAI consists of an assessment of the physical and mental demands of an individual in relation to his or her work and is used across a large array of occupations and economic activities.[14] It consists of nine questions and comprises of seven dimensions: general work ability, work ability in relation to physical and mental demands, diagnosed diseases, impairment caused by illness, absence through sickness, prognoses of work ability, and psychological resources. The WAI is derived as the sum of the rating on these seven dimensions. The range of the summative index is 7-49 and categorizes work ability into poor (7-27), moderate (28-36), good (37-43), or excellent (44-49). A decreased work ability was defined as a WAI score lower than 37 (poor and moderate).[28]

Psychosocial work-related characteristics

Psychosocial work-related characteristics included concepts incorporated by the JDCS model (job control, work demands, social support) and the ERI model (effort, rewards). Job control refers to a person's ability to control timing and planning of his or her work activities and was measured with eight items, including four items derived from the Copenhagen Psychosocial Questionnaire (COPSOQ), and four modified items based on the Swedish version of the Demand-Control questionnaire.[29, 30] Questions were asked about the influence on what work tasks to fulfil, work pace, whether the work requires taking initiative, and whether the work was varied (Cronbach's alpha, 0.74). Work demands refer to the work load perceived by the worker and was measured by three items derived from the COPSOQ, including questions about whether the nurse had to work very fast, and whether he/she has enough time to complete the tasks assigned (Cronbach's alpha, 0.66).[29] Social support refers to the extent to which employees feel supported at work by colleagues and supervisor and is measured by eight items on social support from colleagues and supervisor (Cronbach's alpha, 0.80).[31] For all items a five-point scale was used with the following ratings: 'to a very small extent', 'not very much', 'somewhat', 'to some extent', and 'to a large extent'. Sum scores were calculated for all constructs and the lowest quartile was defined as an unfavourable work-related characteristic.

Efforts and rewards were measured by means of the ERI questionnaire by Siegrist (1996).[21] Efforts refers to the demanding aspects of the work environment while rewards includes self-perceived financial reward, reward in esteem, and reward related to promotion prospects and job security gained by the job.[22] The questionnaire consists of six items measuring 'efforts' (Cronbach's alpha, 0.78) and 11 items measuring 'rewards' (Cronbach's alpha, 0.88). For all items a five-point scale was used with the following ratings: 'no', 'yes and this distresses me not al all', 'yes and this distresses me moderately',

'yes and this distresses me considerably', and 'yes and this distresses me very much'. Sum scores were calculated per construct. A sum score within the highest quartile (efforts) or lowest quartile (rewards) was defined as an unfavourable work-related characteristic.

Physical work-related characteristics

Physical work-related characteristics were measured using a questionnaire specifically developed for the NEXT-Study consisting of typical nursing activities.[32] Its content validity was measured multiple times by experts and indicated a high internal consistency of the scale with Cronbach's alpha values ranging from 0.79 to 0.91.[32, 33] Three dimensions were formed: 1) five items related to manual patient handling activities (bedding and positioning, transferring and carrying, lifting, pushing, and mobilizing patients) (Cronbach's alpha, 0.86), 2) three items related to activities involving personal care of patients (clothing patients, helping with feeding patients, and making beds) (Cronbach's alpha, 0.77), and 3) one item related to awkward postures. For all items a four-point scale was used with ratings: '0-1 times a day', '2-5 times a day', '6-10 times a day', 'more than 10 times a day'. Sum scores were calculated for all constructs and the highest quartile was defined as an unfavourable work-related characteristic.

Individual characteristics

Individual characteristics included gender, age, and educational level. Age was categorized into 30-39 years, 40-49 years, and 50-64 years. Educational level was dichotomized into low to intermediate educational level (nursing staff without training, assistant old people's nurses, and nursing aids/assistant paediatric nurses) and high educational level (qualified nurses, specialist nurses, old people's nurses, paediatric nurses, and midwifes).

Data analysis

Descriptive statistics were used for general characteristics of the study population. Logistic regression analyses were used to evaluate determinants of the dependent variables 'changing employer within the profession' and 'leaving the profession'. In univariate regression analyses individual, psychosocial and physical work-related characteristics, and work ability were independent variables. The odds ratio (OR) was estimated as the measure of association with a corresponding 95% confidence interval (95% CI). Variables with a $p < 0.20$ were considered for inclusion in the multivariate analysis. Subsequently, a backward selection procedure was used to retain variables with a statistically significant association ($p < 0.05$) in the multivariate model.

The Relative Risk due to Interaction (RERI) was calculated to characterize the potential interaction between decreased work ability and poor work-related characteristics on both outcome measures.[34] Interactions were estimated for the work-related characteristics with a $p < 0.20$ in the univariate regression analyses. An interaction was considered

to be present when the combined association of both factors (decreased work ability and unfavourable work-related characteristics) was larger than the sum of the independent associations. Interaction terms were defined by product terms of dichotomized conditions, resulting in four exposure conditions, with a combination of good work ability and favourable work-related characteristics as the reference group. The RERI was calculated with the following formula: RERI = RR(Decreased WAI and unfavourable work-related characteristics) – RR(Decreased WAI and favourable work-related characteristics) – RR(Good work ability and unfavourable work-related characteristics) + 1[35], where RR stands for relative risk. In order to calculate the RERI from logistic regression analyses, we assumed that the OR could be used as a fair approximation of the RR. The interaction term was considered to be statistically significant when the value zero was outside the 95% CI.[36]

All analyses were carried out using the Statistical Package for Social Sciences PASW (Predictive Analysis SoftWare) version 17.0.2 for Windows (SPSS Inc, Chicago, IL, USA).

RESULTS

Demographics of the study population

The study participants were mainly female (88.7%), and ranged in age from 30 to 64 years with a mean of 42.1 (SD = 0.32) years. Within 12 months of the baseline measurement, 3.6% of the respondents left their current employer; of these, 60.0% had found a new job within the profession. Nursing staff leaving the profession more often reported a decreased work ability (37.0%) in comparison with nursing staff who remained employed at their employer (24.2%) or changed employer within the profession (28.5%) (see Table 1). Nursing staff leaving the profession experienced more often poor work-related characteristics compared with colleagues who left their employer but remained employed as a nurse or nursing aid, or still worked for the same employer one year later (see Table 1).

All psychosocial and physical work-related characteristics, except social support and manual patient handling, were correlated. Correlations ranged from Spearman rank coefficient of $\theta = 0.04$ for patient care activities and social support to $\theta = 0.75$ for manual patient handling activities and patient care activities. Nursing staff engaged in physical work activities were more likely to report unfavourable work-related characteristics.

Determinants of changing employer and leaving the profession

Reduced work ability was associated with changing employer within the profession (OR = 1.39, 95%CI: 1.01-1.93) and leaving the profession (OR = 1.71, 95%CI: 1.18-2.47) (see Table 2). Women were more likely to leave the profession than men (OR = 3.10,

Table 1: Individual characteristics, work-related characteristics and work ability among 9,927 members of nursing staff in Europe at entry in a longitudinal study with one year follow-up.

	Remained in current institution n = 9,582		Changed employer within the profession n = 207		Left the profession n = 138	
	n	%	n	%	n	%
Demographics						
Age						
30-39	3895	40.7	103	49.8	67	48.6
40-49	3748	39.1	76	36.7	37	26.8
50-64	1939	20.2	28	13.5	34	24.6
Female worker	8484	88.6	187	90.8	133	96.4
Higher education	7613	82.5	182	90.1	98	71.5
Psychosocial work characteristics						
Low job control	2305	24.3	58	28.2	39	28.5
High work demands	3610	37.7	86	41.7	61	44.5
Low social support	2758	28.8	66	32.0	47	34.3
High efforts	2873	30.0	73	36.0	49	36.3
Low rewards	2258	25.2	47	26.9	29	27.6
Physical work characteristics						
Frequent manual patient handling activities	2680	30.7	71	36.2	42	32.3
Frequent patient care activities	2325	26.7	58	29.9	34	26.0
Frequent awkward postures	3061	34.8	80	41.5	53	40.5
Work ability						
Poor/moderate	2320	24.2	59	28.5	51	37.0

95%CI: 1.26-7.61), and nursing staff with a higher educational level were more likely to change employer within the profession (OR = 2.07, 95%CI: 1.24-3.48) (see Table 2). The analysis stratified by educational level yielded a stronger association between all physical work-related characteristics and both exit pathways for nursing aids compared to registered nurses (data not shown).

Unfavourable psychosocial work-related characteristics and frequently working in awkward postures were statistically significantly associated with a poor or moderate work ability, with associations ranging from OR = 1.16 (95%CI: 1.03-1.31) for high work demands to OR = 2.17 (95%CI: 1.91-2.46) for high efforts. Among the seven dimensions of the work ability index, only being impaired at work due to illness was statistically significantly associated with leaving the profession (OR = 1.81, 95%CI: 1.26-2.78).

Table 2: Univariate and multivariate relations of individual characteristics, work-related characteristics and work ability with changing job within health care (n = 9,789) and leaving the health care sector (n = 9,720).

	Changed employer within the profession (n = 207)				Leaving the profession (n = 138)			
	Univariate n = 9,789		Multivariate n = 9,789		Univariate n = 9,720		Multivariate n = 9,720	
	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI
Demographics								
Age								
30-39	1.30[a]	0.97-1.76	1.18	0.86-1.62	1.74*	1.16-2.61	1.83*	1.20-2.78
40-49 (ref)	1.00		1.00		1.00		1.00	
50-64	0.71[a]	0.46-1.10	0.65	0.41-1.05	1.78*	1.11-2.84	1.56	0.94-2.58
Female worker	1.27	0.79-2.05			3.43*	1.40-8.40	3.10*	1.26-7.61
Higher education	1.93*	1.21-3.07	2.07*	1.24-3.48	1.17	0.72-1.87		
Psychosocial work characteristics								
Low job control	1.22[a]	0.90-1.66			1.24	0.85-1.81		
High work demands	1.18	0.89-1.56			1.32[a]	0.94-1.85		
Low social support	1.15	0.85-1.54			1.27[a]	0.89-1.81		
High efforts	1.29[a]	0.96-1.72			1.31[a]	0.92-1.86		
Low rewards	1.09	0.78-1.53			1.13	0.74-1.74		
Physical work characteristics								
Frequent manual patient handling activities	1.28[a]	0.96-1.72			1.08	0.75-1.56		
Frequent patient care activities	1.17	0.86-1.60			0.96	0.65-1.43		
Frequent awkward postures	1.32[a]	0.99-1.77			1.27[a]	0.89-1.81		
Work ability								
Poor work ability	1.25[a]	0.92-1.69	1.39*	1.01-1.93	1.84*	1.30-2.60	1.71*	1.18-2.47

95%CI, 95% confidence interval; OR, odds ratio.

[a] p <0.20, considered for inclusion in multivariable analysis.

* p <0.05

Interaction between work ability and work-related characteristics

For changing employer within the profession, the interaction effects of a decreased work ability and high efforts (RERI = 0.94, 95%CI: 0.16-1.73), frequent manual patient handling activities (RERI = 1.14, 95%CI: 0.24-2.05), and frequently being in awkward postures (RERI = 1.70, 95%CI: 0.92-2.49) were statistically significantly stronger than the single effects (see Table 3). Among nursing staff with decreased work ability, the occurrence of high efforts increased the risk of changing employer within the profession by 93.6%, frequently performing manual patient handling activities by 115.3%, and frequently working in awkward postures increased the risk by 253.3%. For nursing staff with good or excellent work ability, the occurrence of high efforts or frequently perform-

Table 3: Interactions between the influence of work ability and work-related characteristics on changing employer within the profession.

	Stay (n)	Change (n)	OR	95%CI	RERI	95%CI
Model 1: Work ability and Efforts[1]						
Good work ability & Low efforts	5426	110	1.00			
Good work ability & High effort	1752	34	0.97	0.65-1.44		
Decreased work ability & Low efforts	1164	20	0.94	0.58-1.52		
Decreased work ability & High efforts	1121	39	1.82*	1.25-2.65	0.94*	0.16-1.73
Model 2: Work ability and Manual patient handling activities[1]						
Good work ability & Not frequent manual patient handling activities	4702	99	1.00			
Good work ability & Frequent manual patient handling activities	1898	39	0.99	0.68-1.44		
Decreased work ability & Not frequent manual patient handling activities	1354	26	0.98	0.63-1.54		
Decreased work ability & Frequent manual patient handling activities	782	32	2.11*	1.40-3.19	1.14*	0.24-2.05
Model 3: Work ability and Awkward postures[1]						
Good work ability & Not frequent awkward postures	4586	99	1.00			
Good Work ability & Frequent awkward postures	2054	37	0.83	0.56-1.22		
Decreased work ability & Not frequent awkward postures	1137	14	0.60	0.33-1.07		
Decreased work ability & Frequent awkward postures	1007	43	2.12*	1.47-2.49	1.70*	0.92-2.49

95%CI, 95% confidence interval; OR, odds ratio; RERI, relative risk due to interaction.
Data adjusted for gender, age and educational level
[1] Data incomplete on work-related characteristics
* $p < 0.05$

ing manual patient handling activities hardly changed the risk of changing employer within the profession. The potential interaction between decreased work ability and low job control (RERI = 0.23, 95%CI: -2.13-2.59) on changing employer within the profession was not statistically significant.

For leaving the profession, the interaction effect of a decreased work ability and frequently having to work in awkward postures was not statistically significant (RERI = 1.02, 95%CI: -0.04-2.09) (see Table 4). Among nursing staff with a decreased work ability, frequently working in awkward postures increased the likelihood of leaving the profession by 90.0%. The interactions between a decreased work ability and high efforts (RERI = 0.31, 95%CI: -0.89-1.50), low social support (RERI = 0.38, 95%CI: -0.86-1.63), and

Table 4: Interactions between the influence of work ability and work-related characteristics on leaving the profession.

	Stay (n)	Leave (n)	OR	95%CI	RERI	95%CI
Model 1: Work ability and Awkward postures[1]						
Good work ability & Not frequent awkward postures	4586	59	1.00			
Good work ability & Frequent awkward postures	2054	26	0.96	0.60-1.55		
Decreased work ability & Not frequent awkward postures	1137	19	1.10	0.62-1.96		
Decreased work ability & Frequent awkward postures	1007	27	2.09*	1.30-3.35	1.02	-0.04-2.09

95%CI, 95% confidence interval; OR, odds ratio; RERI, relative risk due to interaction.
Data adjusted for gender, age and educational level
[1] Data incomplete on work-related characteristics
* $p < 0.05$

high demands (RERI = 0.36, 95%CI: -0.85-1.57) were not statistically significant. The presence of these unfavourable work-related characteristics among nursing staff with a decreased work ability increased the probability of leaving the profession by 24.0% for high efforts, 32.3% for high work demands, and 35.2% for low social support. Among nursing staff with good or excellent work ability these work-related characteristics increased the likelihood of leaving the profession by 9.0%, 18.0%, and 17.0%, respectively.

DISCUSSION

Nursing staff with a decreased work ability were more likely to change employer within the profession or to leave the profession altogether. Considerable interactions were observed whereby nursing staff with decreased work ability, and high efforts, manual patient handling activities, or working in awkward postures had an increased likelihood of changing employer within the profession. Employee retention in health care can be counterbalanced by addressing nursing staffs' work ability as well as their psychosocial and physical work-related characteristics.

A strength of this study is the use of actual turnover behaviour of nursing staff between institutions within the profession rather than using intention to leave. Intention to leave the current profession is frequently used as a proxy for actual job change because it is supposed to precede actual leaving[37, 38] and to be the final result after first switching ward and organization.[39] In a cross-sectional analysis of the NEXT-Study decreased work ability was associated with the intention to leave nursing.[40] This is corroborated in this longitudinal study whereby decreased work ability predicted both change of employer

within the profession as well as leaving the profession. This relationship between work ability and changing institution within the profession became stronger when age and education were taken into account. Previous studies have also reported that younger nursing staff and those with a higher education were more likely to leave their employer[2, 41]: both can be the result of the search of career advancement by these nurses.[2]

Previously, it was found that the first dimension of the WAI, general work ability, could be used as a simple indicator for a more comprehensive measurement of work ability.[42] However, in our study, this first dimension was not statistically significantly associated with changing employer within the profession or leaving the profession. We observed that only the fourth dimension, being impaired in executing work tasks because of illnesses, was associated with leaving the profession. Alavinia and colleagues (2009) have also reported the importance of this dimension in relation with productivity loss.[10] Even when employees returned in the same type of job, their productivity was likely to be reduced.[43]

In agreement with previous studies, a relation was found between physical and psychosocial work-related characteristics and work ability.[12, 14, 44] In a review, Hayes et al. (2006) have proposed that both the JDCS-model[18, 20] and ERI-model[22] incorporate psychosocial characteristics of work that may adversely contribute to turnover among nursing staff.[2] Lavoie-Tremblay et al. (2008) reported that among newly registered nurses, lack of social support and effort/reward imbalance were associated with the intention to leave the current employer.[45] Moreover, an effort/reward imbalance, high psychological work demands, and elevated job strain were found to be associated with intention to leave the nursing profession.[45] Stordeur & D'hoore (2007) have shown that hospitals with a low turnover were also the hospitals where nursing staff had a better work ability, less effort/rewards imbalance, and a lower exposure to physically demanding tasks.[46] In the current study, physical and psychosocial work-related characteristics showed modest and non-significant associations with both pathways of leaving the former health-care institution. Chen et al. (2008) suggested that among registered nurses actual leaving might be more influenced by the external labour market than by intention to leave the institution.[24] However, the combination of decreased work ability and poor work characteristics increase the likelihood of changing employer or leaving the profession with a maximum of 253%, while among nursing staff with good or excellent work ability these work-related characteristics hardly had an effect on the likelihood of leaving the current health-care institution. Hence, nursing staff with decreased work ability seem more susceptible to potential consequences of strenuous work characteristics. It might be expected that the negative effects of decreased work ability on job retention can be partly counterbalanced by improving work characteristics.

Limitations of the study

A strength of this study is the longitudinal design. However, the relatively short time-span between the baseline and follow-up measurement for leaving the employer or the profession is a limitation. Selecting the appropriate time interval is always a complicated decision when performing a longitudinal study.[47, 48] A longer follow-up period with repeated measurements would be needed to provide more specific information about the stability of the reported associations.[49, 50] Secondly, because of the small numbers country-specific or stratified analyses were not feasible. Adjustment for country did not affect the results presented in the current study. Some countries participating in the baseline questionnaire could not provide follow-up information for members of the nursing staff that left, and therefore could not be included in the analyses. The nursing staff group leaving the profession was very heterogeneous, with nurses seeking a new career, taking a time out for taking care of the home situation or participating in educational programmes. Given this fact, nursing staff might re-enter the profession in the future when, for example, their children were older or when their education was completed. Moreover, because of the data collection protocol it was not possible to define a change of job within the same health-care institution. This could have led to an underestimation of the members of the nursing staff leaving their current position. Finally, all measurements were based on self-reports that could have caused reporting bias on baseline work-related characteristics and work ability

CONCLUSION

This study showed that decreased work ability is an important determinant of changing institution within the nursing profession and of leaving the nursing profession within one year. Policies focussing on employee retention in health care, as a key challenge in most organisations today, must address the negative effects of a decreased work ability by improvements in both the psychosocial and physical work-related characteristics.

Implications for nursing management

Work ability was found to predict nursing staff leaving the current organization and the profession entirely. Therefore, health-care management should focus on improving and maintaining a good work ability. Furthermore, because of the potential buffer effect of favourable psychosocial and physical work-related characteristics, preventive interventions should also be focused on the promotion of a favourable psychosocial and physical work environment. In particular, efforts experienced by the nursing staff should be addressed as well as the physical aspects of their job.

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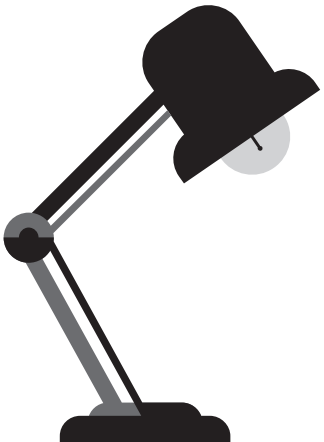

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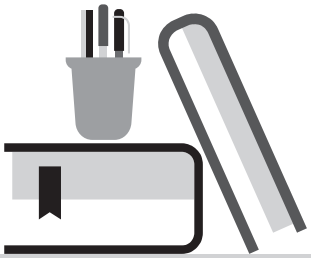
EDUCATIONAL INEQUALITIES IN EXIT FROM PAID EMPLOYMENT AMONG DUTCH WORKERS:THE INFLUENCE OF HEALTH, LIFESTYLE AND WORK



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ABSTRACT

Background: Individuals with lower socioeconomic status are at increased risk of involuntary exit from paid employment. To give sound advice for primary prevention in the workforce, insight is needed into the role of mediating factors between socioeconomic status and labour force participation. Therefore, it is aimed to investigate the influence of health status, lifestyle-related factors and work characteristics on educational differences in exit from paid employment.

Methods:14,708 Dutch employees participated in a ten-year follow-up study during 1999-2008. At baseline, education, self-perceived health, lifestyle (smoking, alcohol, sports, BMI) and psychosocial (demands, control, rewards) and physical work characteristics were measured by questionnaire. Employment status was ascertained monthly based on tax records. The relation between education, health, lifestyle, work-characteristics and exit from paid employment due to disability benefits, unemployment, early retirement and economic inactivity was investigated by competing risks regression analyses. The mediating effects of these factors on educational differences in exit from paid employment were tested using a stepwise approach.

Results: Lower educated workers were more likely to exit paid employment due to disability benefits (HR:1.84), unemployment (HR:1.74), and economic inactivity (HR:1.53) but not due to early retirement (HR:0.92). Poor or moderate health, an unhealthy lifestyle, and unfavourable work characteristics were associated with disability benefits and unemployment, and an unhealthy lifestyle with economic inactivity. Educational differences in disability benefits were explained for 48% by health, 38% by lifestyle, and 15% by work characteristics. For economic inactivity and unemployment, up to 17% and 25% of the educational differences could be explained, particularly by lifestyle-related factors.

Conclusions: There are educational differences in exit from paid employment, which are partly mediated by health, lifestyle and work characteristics, particularly for disability benefits. Health promotion and improving working conditions are important measures to maintain a productive workforce, particularly among workers with a low education.

INTRODUCTION

Individuals with lower socioeconomic status are at increased risk of involuntary exit from paid employment.[1-6] Premature exit from paid employment might deteriorate the health of the former workers[7], contributing to widening socioeconomic health inequalities. There are also large socioeconomic inequalities in determinants of labour force participation, i.e. health status, lifestyle, and psychosocial and physical work characteristics.[8] However, the contribution of these factors to socioeconomic differences in labour force participation is largely unknown. To give sound advice for primary prevention in the workforce, insight is needed into the role of mediating factors between socioeconomic status and labour force participation.

A recent meta-analysis showed that poor health is an important barrier for maintaining paid employment.[9] Particularly workers with a lower socioeconomic status, defined by low educational level, occupational class or income, are at increased risk for health-based selection out of employment.[2,4] Important modifiable determinants of sustainable employability include lifestyle-related factors and work characteristics. It is well-known that individuals with a lower socioeconomic status are more likely to have an unhealthy lifestyle and a poorer quality of work, i.e. unfavourable psychosocial and physical work demands[8,10], which are risk factors for premature exit from paid employment, particularly a lack of physical activity and low job control.[3,11,12] However, the relative importance of health problems, lifestyle-related factors and work characteristics differs between more involuntary (i.e. disability benefits, unemployment) and more voluntary (i.e. early retirement, economic inactivity) exit routes from paid employment.[3,4] Most studies focus on a single exit route or on multiple routes as completely independent events. However, this might result in biased estimates, asking for novel models taking into account competing risks between exit routes.[13]

Studies investigating the contribution of health, lifestyle-related factors and work characteristics in socioeconomic differences in labour force participation are mainly restricted to sickness absence[14-17] and exit from paid employment through disability benefits.[18,19] These studies report that preventing ill health might help to reduce socioeconomic inequalities in disability benefits.[19] However, there is a lack of insight to what extent these factors explain the relation between socioeconomic status and the competing routes of exit from paid employment, such as disability benefits and unemployment.

The objective of this study is to get insight into effects of health, lifestyle-related factors, and work characteristics on the relation between educational level and exit from paid employment. Therefore, we investigate whether educational differences in exit from paid employment are mediated by health status, lifestyle-related factors, and work characteristics. We hypothesize that the contributions of these factors differ per path-

way of exit from paid employment, and that particularly health, and to a lesser extent lifestyle-related factors and work characteristics, contribute to educational inequalities in exit from paid employment.

MATERIALS AND METHODS

Design and study population

The study population was based on an annual national survey "Permanent Survey on Living Conditions" (POLS) carried out among a random sample of the non-institutionalised individuals in the Netherlands by Statistics Netherlands in the period 1999-2002.[20] The yearly response to the POLS survey is approximately 60-65%. In total, 39,220 persons responded to the survey between 1999 and 2002. The POLS data were enriched by Statistics Netherlands with information on the main income components, i.e. social benefits, pensions and gross wages, derived from Dutch tax registers and stored in a social statistical database (SSB). Subsequently, the POLS-data were longitudinally matched with the SSB- for each subsequent month during a ten year follow up period (1999-2008). For the purpose of this study, 14,708 individuals (93,960 person-years) aged between 18-64 years who were in paid employment for at least 12 hours per week in the Netherlands at the time of the health survey and filled out questions on health, lifestyle and work, were selected. In the Netherlands there are no possibilities to officially retire before the age of 50 and the statutory retirement age was 65 years. Therefore, the study population in the analyses on early retirement was restricted to individuals aged 50-64 years (n=2,922). A passive informed consent procedure was used in which participants were informed about the linkage of their questionnaire information with register data.

The used data are stored in the Social Statistical Database of Statistics Netherlands, The Hague, the Netherlands. Interested researchers may submit requests for remote access data-analysis to cvb@cbs.nl.

Exit from paid employment

Information on the income components was derived from the Dutch tax register as provided by Statistics Netherlands. Employment status was divided into five mutually exclusive categories: employment, disability benefits, unemployment, early retirement, and economically inactive. Employed individuals had their main source of income through paid employment. In the Netherlands, individuals who are partially or fully incapable of working after two years of illness may be eligible to receive a disability benefit. The degree of the disability is determined by the loss of earnings due to illness relative to the earning before. Only when there is a reduction of income greater than 35%, disability benefits will be granted (www.government.nl). In this study, exit from

paid employment through disability benefits is defined as receiving benefits for at least 50% of their personal income. Unemployed persons received unemployment benefits or social security benefits. In the Netherlands individuals receive unemployment benefits in case of loss of paid employment, with a maximum of 38 months. After this period the corresponding household may receive a social security benefit in case the disposable (household) income is below the legislative threshold (www.government.nl). Early retired individuals received a (pre-)pension as their main income before they reached the age of 65 years. Economically inactive individuals had no personal income and did not receive any benefits. These individuals may have left paid employment voluntarily or may belong to a household whose disposable income is above the critical threshold for social security benefits.

Socio-demographics

Individual characteristics included age, sex, educational level, and marital status. The highest level of education was coded according to the 1997 International Standard Classification of Education (ISCED-97) and categorized into low (pre-primary, primary and lower secondary), intermediate (upper secondary) and high (post-secondary) education. Marital status was used to categorize individuals into those who were living with a spouse or partner in the same household and those living alone.

Health and lifestyle-related factors

Self-perceived health status was assessed by a single question asking individuals to rate their overall health on a five-point scale.[21] The answer categories were dichotomized into 'very poor, poor, or moderate' and 'good or very good'. Body mass index (BMI) was calculated based on self-reported height in meters and weight in kilograms and categorized into underweight (<18.5kg/m^2), normal weight (18.5-<25kg/m^2), overweight (≥25–<30kg/m^2), and obese (≥30kg/m^2). Participation in sports was measured by asking how many hours on how many days per week the individuals engage in sports. Those individuals who reported to participate less than one hour per week were considered to have a lack of sports participation. Individuals answering the single-item question "Do you ever smoke?" with 'yes' were considered smokers. Alcohol intake was assessed by asking how many glasses of alcoholic beverages one drinks per week. Heavy alcohol intake was defined as drinking >14 glasses (women) and >21 glasses (men).

Work characteristics

Psychosocial workload was measured by work demands, job control, and rewards. Work demands were measured by using two items (Cronbach's alpha:0.76) concerning working at a high pace, and working under time pressure. A three-point scale was used with ratings 'regularly', 'sometimes', and 'no'. A sum score was calculated and workers with a

sum score in the lowest quartile were regarded as having high work demands. Job control was assessed using five items (Cronbach's alpha:0.66) concerning workers' influence on their work regarding the work pace, execution of their work, order of tasks, interruption when needed, and finding solutions. The three answer categories were 'regularly', 'sometimes', and 'no'. A sum score was calculated and workers with a sum score in the lowest quartile were regarded as having low job control. Rewards were assessed by a single item asking to whether the worker was satisfied with the salary. Workers answering the question with 'no' were regarded as having low rewards.

Physical work demands were measured using three items (Cronbach's alpha:0.84) concerning physically demanding work in general, activities such as heavy lifting, pulling or pushing, or use of heavy machinery, and work that makes the worker sweat or out of breath. A three-point scale was used with ratings 'regularly', 'sometimes', and 'no'. A sum score was calculated and workers with a sum score in the lowest quartile were regarded as having high physical work demands.

Statistical analysis

Descriptive statistics were used to present exit from paid employment stratified by educational level. The rate of exit is presented as number of exit events per 1000 person-years.

Associations between education and health, lifestyle and work characteristics at baseline were analysed using logistic regression analyses, adjusting for sex, age, and marital status. Thereafter, the effects of education, poor health, unhealthy lifestyle and unfavourable work characteristics on exit from paid employment during the 10 year follow-up period were analysed using competing risks regression analyses based on Fine and Gray's proportional subhazards model[13], adjusting for sex, age, and marital status. The likelihood of the occurrence of an event was estimated, taking into account the likelihood that another event may prevent the occurrence of the event of interest. Each pathway of exit from paid employment (e.g. disability benefits) was subsequently included as the event of interest, whereas the other pathways out of the labour force were included in the analyses as competing events. An individual was censored at the moment the individual reached the retirement age, died, left the country, started with education, or at the end of the follow-up period. A hazard ratio (HR) greater than one indicates an increased likelihood of exit from paid employment.

The mediating effect of health, lifestyle and work characteristics on the association between education and labour force participation was assessed using a step-approach.[22] The first three steps of the mediation analysis (Step A-C in Figure 1) are described in the previous paragraph. In the final step (step C'), the effect of the mediators on the relation between education and exit from the labour force was assessed by adjusting for the explanatory factors that were statistically significantly associated with both education and at least one of the pathways of exit from paid employment. The percentage change

in hazard ratios after adjustment for the explanatory factors was calculated by: (HR base model)-(HR adjusted model)/[(HR base model)-1], in which the base model contains education, adjusted for sex, age, and marital status.

All statistical analyses were carried out with STATA version 12.

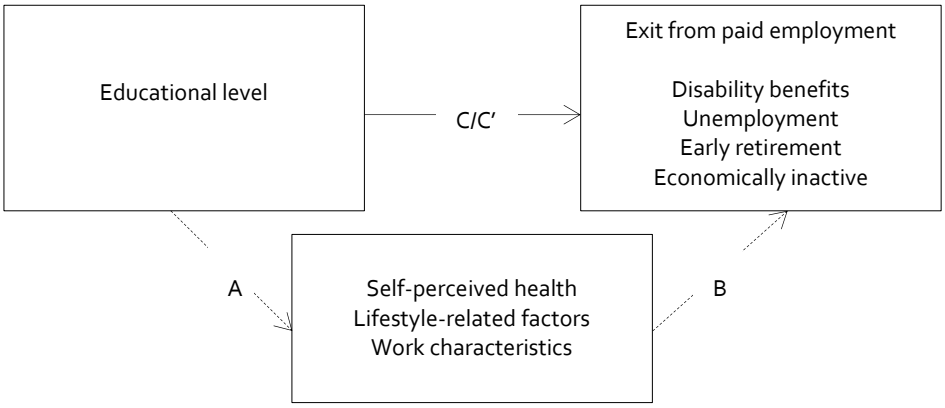

Figure 1: Hypothesized model of the mediating effects of self-perceived health status, lifestyle-related factors and work characteristics on the relation between educational level and exit from paid employment.

RESULTS

The majority of the respondents was male (58.8%) and the mean age was 39.0 years (SD: 10.6). Exit from paid employment was most prevalent among workers with a low educational level (Table 1). Becoming economically inactive was the most prevalent pathway of exit from paid employment (25.41 per 1000 person years), followed by unemployment (13.48 per 1000 person years), early retirement (10.24 per 1000 person years), and disability benefits (4.25 per 1000 person years).

Educational inequalities in health, lifestyle and work characteristics

Lower educated workers were more than twice as likely to have a less than good self-perceived health compared with workers having a high education (OR: 2.08, 95%CI: 1.81-2.37). Table 2 further shows educational inequalities in lifestyle and psychosocial and physical work characteristics, indicating a higher occurrence of an unhealthy lifestyle and –except for job demands– unfavourable work characteristics among lower and intermediate educated workers than higher educated workers.

Determinants of exit from paid employment

Lower educated workers had a higher risk of disability benefits (HR: 1.84, 95%CI: 1.40-2.42), unemployment (HR: 1.74, 95%CI: 1.49-2.03), and economic inactivity (HR: 1.53,

Table 1: Labour force exit through different pathways stratified by educational level (n=14708).

	Disability benefits		Unemployment		Early retirement[1]		Economic inactivity	
	n	%	n	%	n	%	n	%
Low education (n=3509)	138	3.9	396	11.3	287	8.2	635	18.1
Moderate education (n=7208)	167	2.3	565	7.8	383	5.3	1172	16.3
High education (n=3991)	83	2.1	270	6.8	265	6.6	514	12.9
Total population (n=14708)	388	2.6	1231	8.4	935	6.4	2321	15.8

[1] For early retirement only persons who were 50 years or older were selected (N=2922)

Table 2: Health status, lifestyle-related factors and work characteristics stratified by educational level among employed individuals (n=14708) in the Netherlands at baseline.

		Low education (n=3509)		Moderate education (n=7208)		High education (n=3991)	
		%	OR (95%CI)	%	OR (95%CI)	%	OR (95%CI)
Health status	Poor/moderate	19.4	**2.08 (1.81-2.37)**	11.7	**1.21 (1.06-1.37)**	10.3	1.00
Lifestyle-related factors							
Smoking		52.2	**2.73 (2.48-3.01)**	40.0	**1.63 (1.50-1.77)**	29.3	1.00
Heavy alcohol intake		12.3	**1.35 (1.17-1.57)**	10.2	**1.17 (1.02-1.34)**	9.1	1.00
<1h/week sports		62.0	**3.08 (2.80-3.38)**	46.1	**1.67 (1.54-1.81)**	34.5	1.00
BMI	Underweight	1.9	**1.89 (1.31-2.72)**	1.6	1.05 (0.76-1.45)	1.4	1.00
	Normal weight	47.7	1.00	57.9	1.00	62.0	1.00
	Overweight	38.3	**1.52 (1.37-1.68)**	33.1	**1.26 (1.15-1.37)**	31.5	1.00
	Obese	12.1	**2.97 (2.48-3.55)**	7.5	**1.71 (1.44-2.02)**	5.1	1.00
Work characteristics							
Job demands	High	22.1	**0.46 (0.42-0.51)**	26.7	**0.61 (0.56-0.67)**	38.0	1.00
Job control	Low	43.4	**3.06 (2.76-3.39)**	32.0	**1.66 (1.51-1.81)**	21.4	1.00
Rewards	Low	19.0	**1.33 (1.18-1.50)**	18.4	**1.20 (1.08-1.34)**	15.6	1.00
Physical job demands	High	43.2	**9.68 (8.44-11.11)**	29.8	**5.31 (4.66-6.04)**	7.4	1.00

Adjusted for sex, age, and marital status, ORs in bold represent statistically significant associations (p<0.05)

95%CI: 1.36-1.71). Educational level was not statistically significantly related with early retirement. Workers with poor or moderate self-perceived health were more likely to exit through disability benefits (HR: 6.45, 95%CI: 5.26-7.90) and unemployment (HR: 1.76, 95%CI: 1.53-2.02), but were not at increased risk of early retirement (HR: 0.97, 95%CI: 0.82-1.14) and economic inactivity (HR: 0.88, 95%CI: 0.78-1.00) (Table 3).

Smoking, lack of sports participation, and being underweight were related to disability benefits, unemployment and economic inactivity. Those workers reporting an unhealthy lifestyle had no increased risk of early retirement (Table 3).

Low job control and low rewards, as well as high physical job demands were risk factors for disability benefits. Low job control was also related with unemployment and early retirement. None of the work characteristics was statistically significantly related to early retirement and economic inactivity (Table 3).

Table 3: Competing risks analyses on the influence of health, lifestyle-related factors and work characteristics at baseline among employed persons on the likelihood of exit from work during a follow-up period of 10 years (n=14708).

		Disability benefits (n=388/14708)	Unemployment (n=1231/14708)	Early retirement (n=922/2922)[1]	Economic inactivity (n=2321/14708)
		HR (95%CI)	HR (95%CI)	HR (95%CI)	HR (95%CI)
Education	High	1.00	1.00	1.00	1.00
	Moderate	1.16 (0.89-1.51)	1.15 (0.99-1.33)	0.94 (0.80-1.10)	**1.20 (1.08-1.33)**
	Low	**1.84 (1.40-2.42)**	**1.74 (1.49-2.03)**	0.92 (0.78-1.09)	**1.53 (1.36-1.71)**
Health status	Poor/Moderate	**6.45 (5.26-7.90)**	**1.76 (1.53-2.02)**	0.97 (0.82-1.14)	0.88 (0.78-1.00)
Lifestyle-related factors					
Smoking		**1.42 (1.16-1.74)**	**1.48 (1.32-1.66)**	**0.77 (0.67-0.89)**	**1.30 (1.20-1.42)**
Heavy alcohol intake		0.85 (0.60-1.19)	1.12 (0.94-1.34)	0.99 (0.82-1.20)	1.06 (0.92-1.21)
<1h/week sports		**1.64 (1.34-2.01)**	**1.21 (1.08-1.35)**	0.90 (0.79-1.03)	**1.12 (1.03-1.22)**
BMI	Underweight	**2.40 (1.31-4.41)**	1.42 (0.98-2.07)	1.18 (0.51-2.72)	**1.49 (1.16-1.91)**
	Normal weight	1.00	1.00	1.00	1.00
	Overweight	**1.44 (1.15-1.79)**	0.97 (0.85-1.11)	1.09 (0.95-1.25)	0.92 (0.84-1.02)
	Obese	1.22 (0.85-1.74)	1.22 (1.00-1.49)	1.11 (0.90-1.38)	1.01 (0.86-1.18)
Work characteristics					
Job demands	High	0.91 (0.73-1.14)	**0.84 (0.74-0.95)**	1.06 (0.92-1.22)	0.96 (0.87-1.05)
Job control	Low	**1.34 (1.08-1.65)**	**1.20 (1.07-1.36)**	1.15 (1.00-1.32)	1.04 (0.95-1.13)
Rewards	Low	**1.51 (1.19-1.91)**	1.14 (0.99-1.31)	0.90 (0.75-1.08)	1.09 (0.98-1.21)
Physical job demands	High	**1.36 (1.10-1.69)**	1.01 (0.89-1.15)	1.01 (0.87-1.17)	1.08 (0.98-1.18)

Adjusted for sex, age, and marital status. HRs in bold represent statistically significant associations ($p<0.05$)
[1] For early retirement only persons who were 50 years or older were selected.

Mediating effect of health, lifestyle and work characteristics

The mediation analysis is restricted to disability benefits, unemployment and economic inactivity (step C in Figure 1; Table 1), because education was only related with these exit routes. Education was associated with all potential mediators (step A; Table 2). Only

heavy alcohol intake and high work demands were not found to be risk factors of the exit pathways (step B; Table 3), and therefore not included in the mediation analysis. Table 4 shows the results of the final step of the mediation analysis (step C'). Self-perceived health status partly mediated the relation between low education and disability benefits (48%) and unemployment (12%), but did not mediate the relation between education and economic inactivity. Lifestyle also partly explained educational differences in exit from paid employment (low education: 17%-38%, moderate education: 15%-56%). Work characteristics were only of influence on the relation between education and disability benefits (low education: 15%, moderate education: 31%). The contribution of specific lifestyle-related factors and work characteristics differed per pathway, as shown in Appendix A. Adjustment for the combination of health, lifestyle and work characteristics attenuated the relation between low educational level and disability benefits with 69% (HR: 1.26, 95%CI: 0.92-1.74), unemployment with 25% (HR: 1.56, 95%CI: 1.32-1.84), and economic inactivity with 13% (HR: 1.46, 95%CI: 1.29-1.66).

Table 4: Mediating effects of self-perceived health status, lifestyle-related factors and work characteristics on the relation between educational level and exit from the labour force among employed persons during a follow-up period of 10 years (n=14708).

		Disability benefits (n=388/14708)		Unemployment (n=1231/14708)		Economic inactivity (n=2321/14708)	
		HR (95%CI)	%	HR (95%CI)	%	HR (95%CI)	%
Education	Low	**1.84 (1.40-2.42)**		**1.75 (1.50-2.05)**		**1.53 (1.36-1.71)**	
	Moderate	1.16 (0.89-1.51)		**1.16 (1.00-1.34)**		**1.20 (1.08-1.33)**	
	High	1.00		1.00		1.00	
Education + Self-perceived health	Low	**1.44 (1.09-1.90)**	-48	**1.66 (1.42-1.94)**	-12	**1.55 (1.38-1.74)**	4
	Moderate	1.10 (0.84-1.43)	-38	1.14 (0.98-1.31)	-13	**1.20 (1.08-1.33)**	0
	High	1.00		1.00		1.00	
Education + Lifestyle-related factors[1]	Low	**1.52 (1.14-2.02)**	-38	**1.56 (1.33-1.84)**	-25	**1.44 (1.27-1.62)**	-17
	Moderate	1.07 (0.82-1.39)	-56	1.10 (0.95-1.27)	-38	**1.17 (1.05-1.30)**	-15
	High	1.00		1.00		1.00	
Education + Work characteristics[2]	Low	**1.71 (1.27-2.31)**	-15	**1.77 (1.51-2.08)**	3	**1.53 (1.35-1.73)**	0
	Moderate	1.11 (0.85-1.46)	-31	**1.17 (1.01-1.36)**	6	**1.20 (1.08-1.34)**	0
	High	1.00		1.00		1.00	
Education + Health + Lifestyle + Work	Low	1.26 (0.92-1.74)	-69	**1.56 (1.32-1.84)**	-25	**1.46 (1.29-1.66)**	-13
	Moderate	1.02 (0.77-1.34)	-88	1.12 (0.97-1.30)	-25	**1.18 (1.06-1.31)**	-10
	High	1.00		1.00		1.00	

Adjusted for sex, age, marital status. HRs in bold represent statistically significant associations. [1] smoking, lack of sports participation, BMI, [2] low job control, low rewards, high physical job demands.
%: percentage change in the HRs expressing the relation between educational level and labour force exit after additional adjustment for health, lifestyle-related factors and work characteristics

DISCUSSION

Lower educated workers were more likely to exit paid employment due to disability benefits, unemployment, and economic inactivity, but not due to early retirement. Furthermore, workers with poor or moderate health, unhealthy lifestyle, and unfavourable work characteristics were more likely to exit paid employment prematurely, particularly due to disability benefits and unemployment. Self-perceived health, lifestyle-related factors and to a lesser extent work characteristics contributed to the educational inequalities in disability benefits. Lifestyle-related factors also partly mediated the relation between education and unemployment and economic inactivity.

The finding that lower educated workers were more likely to be displaced from the labour force is in line with other studies which mainly focused on the socioeconomic gradient in disability benefits.[10, 18, 23-25] The current study showed that a low education is not only a risk factor for disability benefits, but also for unemployment and economic inactivity. The importance of health, lifestyle and work characteristics on leaving the labour force differed per pathway, but particularly influenced the risk of disability benefits.

A meta-analysis showed the importance of health in labour force participation; poor health is a risk factor for disability benefits (RR: 3.61), unemployment (RR: 1.44), and early retirement (RR: 1.27).[9] Our results corroborate that disability benefits and unemployment are health-driven exit pathways, but the relation between self-perceived health and early retirement was not corroborated. Two possible explanations may be considered. First, early retirement is a voluntary exit route in which other mechanisms may be operating. Particularly financial considerations and social factors are contributing factors to the decision to retire.[26, 27] These factors may differ across countries and time periods, depending also on generosity of institutional arrangements with regard to early retirement. Second, the choice for the competing risk approach over the classical survival analysis may have influenced our findings. This can be illustrated by comparing our findings with those from a recent study –using the same data– investigating health inequalities in exit from paid employment.[4] Findings with regard to the influence of health on disability benefits and unemployment were comparable. However, there is a discrepancy regarding the role of health in early retirement. The effect of poor or moderate health using Cox proportional hazards analysis (HR: 1.22) was not corroborated when using competing risks analysis (HR: 0.97). This difference is not surprising, since disability benefits and unemployment are events that typically occur before early retirement. This illustrates the need to take these competing risks into account.

Previous studies reported the importance of lifestyle and work characteristics in receiving disability benefits.[10, 18, 23, 24, 28] The current study also showed that lifestyle, in particular smoking, a lack of sports participation, and being underweight were risk factors for exiting the labour force, except through early retirement. Unfavourable work

characteristics increased the risk of disability benefits, but contributed less to the other exit pathways. Only lack of job control was a risk factor for unemployment. The influence of high job demands differs from the other work characteristics, showing a lower risk of unemployment. This finding is in line with other studies, showing that high job demands are typically reported in higher socioeconomic positions.[10, 18]

It was hypothesized that health status, lifestyle-related factors, and work characteristics play a role in the mechanisms through which education affects exit from paid employment. For disability benefits, health (48%), lifestyle (38%) and to a lesser extent work characteristics (15%) played a role in educational inequalities. Educational inequalities in unemployment (25%) and economic inactivity (17%) were also most strongly influenced by lifestyle-related factors. In contrast, work characteristics did not play a role in explaining educational inequalities in unemployment and economic inactivity. These results are in contrast with other studies concluding that improvements in physical working conditions would reduce socioeconomic inequalities in disability benefits[18] and sickness absence[29] to a larger extent than improvements in lifestyle factors. These differences may be due to different measures of socioeconomic status as well as inclusion of different determinants and outcomes in the analysis. Additional analyses showed that, although lower educated workers were more likely to be exposed to physically demanding work, this factor was associated with disability benefits among higher educated workers (HR: 2.26, 95%CI: 1.24-4.12), but not among lower educated workers (HR: 0.78, 95%CI: 0.55-1.11). Other factors (e.g. health) played a more important role in disability benefits among lower educated individuals.

Our results indicate that particularly health promoting interventions are of importance to attenuate educational inequalities in exit from paid employment. Effective interventions aimed at promoting working conditions are also of importance for maintaining a productive workforce, but less likely to decrease educational inequalities. Since interventions may widen as well as reduce socioeconomic inequalities[30, 31], attention needs to be paid to whether the interventions are tailored to lower educated workers.

Strengths of this study are the long follow-up period and the use of register data as a source of labour status instead of self-reported labour status, providing reliable information regarding the month of employment transition. Another strength is the use of competing risks regression analyses.

There are some limitations in this study. The study was conducted among a random sample of Dutch workers. Due to the potential influence of welfare regimes on determinants of exit from paid employment, the results cannot directly be generalized to other countries. The annual non-response of the POLS survey was 35–40%, and persons with a low socioeconomic status may be underrepresented. Another limitation concerns the time-varying nature of the studied determinants. Therefore, the influence of changes in determinants on changes in labour force participation could not be investigated. Our

analyses were not stratified by sex, since we observed comparable results. Both in male and female workers self-perceived health (M/F: 48%), lifestyle (M: 31%, F: 48%) and work characteristics (M: 24%, F: 11%) contributed to the educational inequalities in disability benefits, and lifestyle partly mediated the relation between a low educational level and unemployment (M: 14%, F: 35%) and economic inactivity (M: 23%, F: 12%).

Lower educated workers are at increased risk of exit from paid employment. Self-perceived less than good health, unhealthy lifestyle-related factors and unfavourable physical and psychosocial work characteristics are related to early exit from paid employment and partly explain educational inequalities in exit from paid employment, particularly through disability benefits. Health promotion in combination with improving working conditions is of importance to maintain a productive workforce, particularly among those with a low education.

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Appendix A: Mediating effects of self-perceived health status, lifestyle-related factors and work characteristics on the relation between educational level and exit from the labour force among employed persons during a follow-up period of 10 years (n=14708)

		Disability benefits (n=388/14708)		Unemployment (n=1231/14708)		Economic inactivity (n=2321/14708)	
		HR (95%CI)	%	HR (95%CI)	%	HR (95%CI)	%
Education	Low	**1.84 (1.40-2.42)**		**1.75 (1.50-2.05)**		**1.53 (1.36-1.71)**	
	Moderate	1.16 (0.89-1.51)		**1.16 (1.00-1.34)**		**1.20 (1.08-1.33)**	
	High	1.00		1.00		1.00	
Education adj. for smoking	Low	**1.73 (1.31-2.28)**	-13	**1.61 (1.37-1.88)**	-19	**1.44 (1.28-1.62)**	-17
	Moderate	1.13 (0.87-1.47)	-19	1.11 (0.96-1.28)	-31	**1.17 (1.05-1.30)**	-15
	High	1.00		1.00		1.00	
Education adj. for sports	Low	**1.64 (1.24-2.17)**	-24	**1.69 (1.44-1.98)**	-8	**1.50 (1.33-1.69)**	-6
	Moderate	1.10 (0.85-1.43)	-38	1.13 (0.98-1.31)	-19	**1.19 (1.07-1.32)**	-5
	High	1.00		1.00		1.00	
Education adj. for BMI	Low	**1.78 (1.35-2.35)**	-7	**1.73 (1.48-2.02)**	-3	**1.53 (1.36-1.72)**	0
	Moderate	1.15 (0.88-1.49)	-6	1.15 (0.99-1.33)	-6	**1.20 (1.09-1.34)**	0
	High	1.00		1.00		1.00	
Education adj. for job control	Low	**1.76 (1.33-2.33)**	-10	**1.70 (1.45-1.98)**	-7	**1.53 (1.36-1.72)**	0
	Moderate	1.14 (0.88-1.49)	-13	1.14 (0.98-1.32)	-13	**1.20 (1.08-1.33)**	0
	High	1.00		1.00		1.00	
Education adj. for rewards	Low	**1.83 (1.39-2.42)**	-1	**1.74 (1.49-2.03)**	-1	**1.51 (1.35-1.70)**	-4
	Moderate	1.15 (0.88-1.50)	-6	1.15 (1.00-1.33)	-6	**1.19 (1.08-1.33)**	-5
	High	1.00		1.00		1.00	
Education adj. for physical job demands	Low	**1.72 (1.28-2.32)**	-14	**1.81 (1.54-2.12)**	8	**1.53 (1.36-1.73)**	0
	Moderate	1.12 (0.85-1.46)	-25	**1.18 (1.01-1.36)**	13	**1.20 (1.08-1.34)**	0
	High	1.00		1.00		1.00	

Adjusted for demographic confounders: age, sex, marital status. HRs in bold represent statistically significant associations.

HR: Hazard ratios, 95%CI: 95% confidence interval. %: percentage change in the HRs expressing the relation between educational level and labour force exit after additional adjustment for specific lifestyle-related factors and work characteristics.

/04

THE CONTRIBUTION OF WORK ENGAGEMENT TO SELF-PERCEIVED HEALTH, WORK ABILITY, AND SICKNESS ABSENCE BEYOND HEALTH BEHAVIORS AND WORK-RELATED FACTORS

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ABSTRACT

Objective: To investigate whether work engagement influences self-perceived health, work ability, and sickness absence beyond health behaviors and work-related characteristics.

Methods: Employees of two organizations participated in a six-month longitudinal study (n=733). Using questionnaires, information was collected on health behaviors, work-related characteristics, and work engagement at baseline, and self-perceived health, work ability, and sickness absence at six-month follow-up. Associations between baseline and follow-up variables were studied using multivariate and multinomial logistic regression analyses and changes in R^2 were calculated.

Results: Low work engagement was related with low work ability (OR: 3.68, 95%CI: 2.15-6.30) and long-term sickness absence (OR: 1.84, 95%CI: 1.04-3.27). Work engagement increased the explained variance in work ability and sickness absence with 4.1% and 0.5%, respectively.

Conclusion: Work engagement contributes to work ability beyond known health behaviors and work-related characteristics.

INTRODUCTION

The rapidly ageing workforce forces employers and policymakers to think about how to keep the workforce healthy and productive. Several studies indicate that unhealthy behaviors and unfavorable work-related characteristics affect sustainable employability. In research, sustainable employability is often operationalized by measuring health status, work ability – defined as the balance between employees' resources and work demands[1] –, sickness absence, and premature exit from the labor force. These studies revealed that obese employees, those with insufficient vigorous physical activity, and smokers are at increased risk of ill health, poor or moderate work ability, and sickness absence.[2-8] Furthermore, high work demands, low skill discretion, low decision authority, and physically demanding jobs seem to be associated with ill health, a decreased work ability, sickness absence, and a higher risk of premature labor force exit.[2, 3, 6, 9-13]

Work engagement, defined as "a positive, fulfilling work-related state of mind that is characterized by vigor, dedication, and absorption", has emerged in the field of occupational psychology as a potentially important independent risk factor for ill health and a low work ability.[14-16] Engaged employees have "high levels of energy, are enthusiastic about their work and are often fully immersed in their job so that time appears to fly by".[17] These employees are also more likely to experience their working conditions positively, to have a higher work productivity, and to have less sickness absence.[18-22]

Research on how work engagement influences sustainable employability is scarce, and evidence on the explanatory contribution of work engagement for sustainable employability beyond health behaviors and work-related characteristics is lacking.[14, 23] This insight may increase our knowledge on how to maintain a healthy and productive workforce. This study aimed at investigating (1) the influence of work engagement, health behaviors, and work-related characteristics on self-perceived health status, work ability, and sickness absence, and (2) whether work engagement contributes to explaining self-perceived health status, work ability, and sickness absence beyond employees' health behaviors and work-related characteristics.

METHODS

Study population

The population of this longitudinal study consisted of employees of a plastic manufacturer (organization 1, n=874) and a paint manufacturer (organization 2, n=1281).

Between 2010 and 2012, all employees were invited by e-mail to fill in two online questionnaires: a baseline questionnaire and a follow-up questionnaire six months later.

For this study, we included all employees who completed both the baseline and follow-up questionnaires.

Of the 2155 employees invited, 1128 (52%) completed the baseline questionnaire. Of this group, 761 (68%) also completed the follow-up questionnaire after six months and 748 employees (98%) provided informed consent. Four employees were excluded due to implausible or missing data on height, weight or physical activity, and 11 employees because they missed information on self-perceived health at follow-up. The final study sample comprised 733 employees (organization 1, n=268; organization 2, n= 465).

Informed consent was requested at the start of the questionnaire. The Medical Ethical Committee of the University declared that the Medical Research Involving Human Subjects Act did not apply to the current study and the committee had no objection to the execution of this study.

Data collection

Health behaviors, work-related characteristics, and work engagement were assessed at baseline. Self-perceived health, work ability, and sickness absence were questioned at six-month follow-up.

Self-perceived health

At six-month follow-up, self-perceived health was measured using the first question of the Short Form-12 (SF-12) questionnaire ("Overall, how would you rate your health during the past 4 weeks?"). The five possible answers were dichotomized into 'poor or fair' and 'good, very good or excellent'.[24]

Work ability

Work ability assesses the self-perceived capability to fulfil the mental and physical demands of the job and was measured at six-month follow-up using the short version of the Work Ability Index (WAI). The WAI consists of nine questions and consists of seven dimensions: general work ability, work ability in relation to physical and mental demands, diagnosed diseases, impairment due to illness, sickness absence, prognoses of work ability, and psychological resources. The WAI is derived as the sum of the rating on these seven dimensions. The range of the summative index is 7 to 49 and categorizes work ability into poor (7-27), moderate (28-36), good (37-43), or excellent (44-49). A decreased work ability was defined as a WAI score lower than 37 (poor and moderate).[1]

Sickness absence

At six-month follow-up, sickness absence was determined using the fifth dimension of the WAI ("How many whole days have you been off work because of a health problem (disease, health care, or for examination) during the past year?"). Employees were asked

to indicate this on a five-point ordinal scale. Sickness absence was classified into three categories: no sickness absence, short-term sickness absence (1-9 days), and long-term sickness absence (10 or more days).[1]

Work engagement

Work engagement was measured using the nine-item Utrecht Work Engagement Scale (UWES) (Cronbach's α = 0.94) and comprised the following three dimensions: vigor, absorption, and dedication. Each dimension was assessed using three statements (Cronbach's α = 0.89, 0.87, and 0.95, respectively).[16] Per statement, an employee had to rate the degree to which one had ever felt the feeling stated. Answer possibilities ranged on a six-point scale from never to always. Sum scores were calculated for work engagement and the three dimensions separately. The lowest quartile was defined as a low work engagement, low vigor, low absorption, and low dedication.

Psychosocial work-related characteristics

Using an abbreviated version of a validated Dutch questionnaire about psychosocial job demands and job stress based on the Job-Demand-Control model of Karasek, the following three psychosocial work-related characteristics were measured: decision authority (five items, Cronbach's α = 0.83), skill discretion (three items, Cronbach's α = 0.75), and work demands (five items, Cronbach's α = 0.83).[25, 26] Questions on decision authority were related to influence on planning of tasks and work pace. Skill discretion related to creativity, varied work, and required skills and abilities. Work demands related to excessive work and insufficient time to complete the work. All questions were answered on a four-point scale ('never', 'sometimes', 'often', and 'always'). A standardized sum score was calculated for each characteristic separately, and the adverse quartile was defined as an unfavorable work-related characteristic.

Physical work-related characteristics

Physical work-related characteristics concerned the regular presence of working in awkward postures and lifting heavy loads (more than 25 kg). The four possible answers were dichotomized into 'seldom or never, now and then' and 'quite a lot, a lot' with the latter classified as high exposure.[27]

Health behaviors

Body Mass Index (BMI = weight/height^2) was calculated on the basis of self-reported height in meters and weight in kilograms and categorized into normal weight (BMI < 25 kg/m^2), overweight (25 ≤ BMI < 30 kg/m^2), and obesity (BMI ≥ 30 kg/m^2).

Fruit and vegetable intake was measured using a slightly adapted version of the Dutch Food Frequency Questionnaire.[28] The six-item questionnaire asked about the monthly

intake of different fruits (four items: tangerines, citrus fruits, other fruit, fruit juice) and vegetables (two items: raw and cooked vegetables). Dichotomization was based on the Dutch guidelines for healthy nutrition, which states that one needs to consume 200 g of fruit and 200 g vegetables daily. Employees who ate at least 400 grams of fruit and vegetables per day were considered those meeting the guidelines.

Physical activity was measured by first asking employees about the number of days a week they participated in sports and second, how many minutes on average were spent on sports per occasion. Someone participated sufficiently in sports when he or she participated is sports for at least 20 minutes on at least three occasions per week.

Smoking was assessed using a single-item question: "Do you smoke?". Answer possibilities were: 'yes', 'now and then', and 'no'. Employees answering the question with 'yes' or 'now and then' were defined as being a 'current smoker'.

Individual characteristics

The following individual characteristics were assessed: age, gender, and educational level. Age was categorized into three age groups: 18 to 39 years, 40 to 49 years, and 50 to 65 years. Educational level was determined by asking the employees about their highest level of education, which was then categorized into three categories: low (primary school, lower and intermediate secondary schooling, or lower vocational training), intermediate (higher secondary schooling or intermediate vocational schooling), and high (higher vocational training or university).

Data analysis

Descriptive statistics were used to report on the characteristics of the study population. The Spearman rank coefficient was used for studying the correlations between the measured variables. Factors associated with loss to follow-up were studied using logistic regression analysis.

Logistic regression analyses, adjusted for age, gender, educational level, and organization, were used to study associations between the independent variables health behavior, work-related characteristics, and work engagement and self-perceived health and work ability. Multinomial logistic regression analyses, adjusted for age, gender, educational level, and organization, were used to examine the associations between the independent variables and short and long-term sickness absence. Thereafter, all health behaviors and work-related characteristics associated with the outcome measure at $p<0.20$ were entered into one model simultaneously (i.e. enter method) while also controlling for potential confounders (i.e. age, gender, educational level, organization). In addition, the latter analysis was repeated, now also work engagement was included as an independent variable. The change in the Nagelkerke R^2 was calculated to assess the contribution of work engagement besides health behaviors and work-related

characteristics to the explained variance in outcome measures. Chi-square tests on the goodness-of-fit were performed to examine whether the contribution of work engagement statistically significantly improved the models.

The odds ratio (OR) was estimated as measure of association with a corresponding 95% confidence interval (95% CI). All analyses were carried out using the IBM SPSS Statistics version 20 for Windows (SPSS Inc, Chicago, IL, USA).

RESULTS

Description of the study population

The study population consisted of 733 employees with a mean age of 45.0 years (SD: 9.2) and a mean work ability of 42.2 (SD: 4.2). Further details are presented in Table 1.

The psychosocial work-related characteristics 'decision authority' and 'skill discretion' were moderately correlated (Spearman's rho: 0.34) and both also moderately correlated with work engagement (Spearman's rho: 0.31 and 0.45, respectively). Furthermore, there was a moderate correlation between work ability and self-perceived health (Spearman's rho: 0.46) (Appendix 1).

The percentage of employees aged 50 years or older was higher in the group who completed both questionnaires than in the group who only completed the baseline questionnaire (34% versus 26%), but gender and educational level distribution were similar. Employees lost to follow-up did not differ from those completing both questionnaires with regard to their work engagement, health behaviors, and psychosocial work-related characteristics at baseline. Nevertheless, the percentage of employees reporting unfavorable physical work-related characteristics was higher among the employees lost to follow-up (lifting heavy loads: 6% vs 3%; awkward postures: 9% vs 5%) (data not shown).

Health behaviors and work-related characteristics

Insufficient sports participation was statistically significantly related with a less than good self-perceived health (OR: 4.30, 95%CI: 1.31-14.14), a less than good work ability (OR: 2.50, 95%CI: 1.15-5.44), and long-term sickness absence (OR: 2.59, 95%CI: 1.13-5.93) at six-month follow-up. Obesity was statistically significantly related with long-term sickness absence (OR: 2.44, 95%CI: 1.12-5.35) at six-month follow-up. All other health behaviors showed no relations with the outcome measures. Work-related characteristics were only related with work ability. High work demands (OR: 2.23, 95%CI: 1.24-3.99) and low skill discretion (OR: 2.19, 95%CI: 1.23-3.90) statistically significantly predicted a less than good work ability at six-month follow-up (Table 2).

Table 1: The characteristics of the study population (n=733).

	n = 733	%
Baseline		
Individual characteristics		
Age		
18-39	209	28.5
40-49	269	36.7
50-65	255	34.8
Male	542	73.9
Educational level		
Low	145	19.8
Intermediate	201	27.4
High	387	52.8
Health behaviors		
Body Mass Index		
Normal weight (BMI < 25 kg/m^2)	350	47.7
Overweight (BMI 25-30 kg/m^2)	298	40.7
Obese (BMI 30kg/m^2 and higher)	85	11.6
Insufficient sports participation (less than 3 days a week 20 min)	563	76.8
Insufficient fruit and vegetable intake (less than 400 grams a day)	485	66.2
Current smoker	138	18.8
Work-related characteristics		
High work demands	189	25.8
Low decision authority	210	28.6
Low skill discretion	159	21.7
Awkward postures	39	5.3
Lifting heavy loads (≥25kg)	26	3.5
Work engagement		
Low work engagement	186	25.4
Six-month follow-up		
Health		
Less than good self-perceived health	42	5.7
Work ability		
Less than good work ability	65	8.9
Sickness absence		
1-9 days	320	43.7
10 or more days	67	9.1

Work engagement

A low level of work engagement statistically significantly predicted a less than good work ability (OR: 3.68, 95%CI: 2.15-6.30) and long-term sickness absence (OR: 1.84, 95%CI: 1.04-3.27) at six-month follow-up (Table 2). Concerning the three dimensions of work engagement, only low vigor was statistically significantly related with all three outcome measures: less than good self-perceived health (OR: 2.66, 95% CI: 1.40-5.05), less than good work ability (OR: 4.84, 95% CI: 2.78-8.43), and short-term sickness absence (OR: 1.58, 95% CI: 1.12-2.25). Scoring unfavorably on absorption (OR: 2.33, 95%CI: 1.37-3.97) or dedication (OR: 3.05, 95%CI: 1.79-5.21) was only statistically significantly related with a less than good work ability at six-month follow-up (Appendix 2).

When employees' health behavior and work-related characteristics were taken into account, work engagement was still statistically significantly related with work ability (OR: 3.51, 95% CI: 1.85-6.68), but not with self-perceived health (OR: 1.70, 95% CI: 0.87-3.31) and sickness absence (short OR: 1.26, 95% CI: 0.83-1.91; long OR: 1.76, 95% CI: 0.89-3.46) at six-month follow-up. The explained variance after including also work engagement

Table 2: Adjusted association between health behaviors, work-related characteristics, and work engagement and self-perceived health, work ability, and sickness absence at six-month follow-up among employees (n=733).

	Less than good self-perceived health (n=42)	Less than good work ability (n=65)	1-9 sickness absence days (n=320)	10 or more sickness absence days (n=67)
	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)
Health behaviors				
Body Mass Index				
Normal weight	1.00	1.00	1.00	1.00
Overweight	1.25 (0.59-2.63)	0.93 (0.51-1.70)	0.96 (0.68-1.35)	1.83 (0.97-3.45)†
Obese	2.41 (0.99-5.84)†	1.12 (0.51-2.46)	0.60 (0.34-1.04)†	2.44 (1.12-5.35)*
Insufficient sports participation	4.30 (1.31-14.14)*	2.50 (1.15-5.44)*	0.83 (0.58-1.19)	2.59 (1.13-5.93)*
Insufficient fruit and vegetable intake	0.90 (0.46-1.73)	0.95 (0.54-1.65)	0.73 (0.52-1.01)†	0.79 (0.45-1.39)
Current smoker	1.29 (0.62-2.71)	0.89 (0.47-1.70)	1.17 (0.78-1.76)	0.92 (0.46-1.85)
Work-related characteristics				
High work demands	1.44 (0.71-2.95)	2.23 (1.24-3.99)*	1.00 (0.70-1.44)	1.14 (0.62-2.13)
Low decision authority	0.79 (0.38-1.61)	1.60 (0.93-2.76)†	1.38 (0.97-1.96)†	0.94 (0.51-1.73)
Low skill discretion	0.96 (0.45-2.06)	2.19 (1.23-3.90)*	1.35 (0.92-1.99)†	1.53 (0.81-2.88)†
Awkward postures	1.31 (0.42-4.07)	2.07 (0.91-4.75)†	0.70 (0.33-1.51)	2.18 (0.87-5.46)†
Lifting heavy loads	1.49 (0.41-5.45)	2.00 (0.76-5.25)†	0.96 (0.38-2.40)	2.34 (0.77-7.17)†
Work engagement				
Low work engagement	1.66 (0.86-3.21)†	3.68 (2.15-6.30)*	1.36 (0.95-1.95)†	1.84 (1.04-3.27)*

* statistically significant at p<0.05, † statistically significant at p < 0.20 and included in fully adjusted models.
Note: all analyses are adjusted for age, gender, educational level, and organization

increased by 0.8% (7.0 to 7.8%) for self-perceived health, 4.1% (16.5% to 20.6%) for work ability, and 0.5% (10.2% to 10.7%) for sickness absence. The relative improvement of the models was 11% for self-perceived health, 25% for work ability, and 5% for sickness absence. Adding work engagement into the models improved the overall goodness-of-fit statistically significant of the models for work ability ($p<0.001$) and sickness absence ($p<0.001$) but not for self-perceived health ($p=0.13$).

DISCUSSION

Self-perceived health and sickness absence were most strongly predicted by health behaviors, whereas work ability was mostly predicted by work-related characteristics. Work engagement was related to work ability and long-term sickness absence. Taking into account employees' work engagement besides health behaviors and work-related characteristics improved the explained variance in work ability at six-month follow-up.

Influence of health behaviors and work-related characteristics

Employees insufficiently engaging in sports were over four times more likely to report a poor to moderate health status at six-month follow-up. Previous cross-sectional studies also reported the importance of this health behavior for maintaining a good health status.[4, 11, 29] In this study, none of the work-related characteristics influenced employees' perception of their health status, in contrast to previous studies that found associations between high job demands and low job control and ill health.[11, 29, 30] Nevertheless, when a distiction was made between mental and physical health status, unfavorable work-related characteristics were only associated with employees' mental health status.[4] In this study only a limited number of employees (n=42) reported a less than good self-perceived health which might have led to finding no significant associations.

As self-perceived health, reporting long-term sickness absence was also predicted by unhealthy behavior and not by any work-related characteristic. Obese employees and those not engaging sufficiently in sports were more likely to report long-term sickness absence, which was also concluded by previous studies.[2, 3, 7, 31] Regarding work-related characteristics, previous studies have identified unfavorable psychosocial work-related characteristics and physically strenuous working conditions as risk factors for sickness absence.[6, 13, 32] Although not statistically significant, the effect estimates of awkward postures and lifting heavy loads point into the same direction with ORs more than two.

Unfavorable work-related characteristics did predict a poor to moderate work ability. In line with the results of a systematic review, high work demands and low skill discretion were associated with a less than good work ability.[5] A lack of sports participation

was also related to less than good work ability, showing the multifactorial character of work ability.

Work engagement

In contrast to previous research, this study showed no significant association between a low work engagement and ill health.[33] Nevertheless, employees reporting low on the vigor dimension of work engagement were more likely to have a poor to moderate health status. The finding might be explained by the similarity between how the vigor component of work engagement and self-perceived health are defined. Nevertheless, we found a low correlation between vigor and self-perceived health (Spearman's rho: 0.13). Thus, the vigor component partly predicts employees' health status.

Our finding that employees with a low work engagement were more likely to report long-term sickness absence (i.e. 10 or more days) is in line with previous research.[21] In this study, information on cumulative sickness absence days was collected. Long-term sickness absence could be driven by either the frequency or duration of sickness absence. Previous studies have shown that work engagement more strongly predicted the frequency of sickness absence than the duration.[21] It is hypothesized that being absent from work due to illness for a longer period is often involuntary and caused by serious illness and not by unfavorable work-related characteristics. Reporting sick from work frequently is assumed to be "voluntary absence" and the result of a lack of motivation.[21] Of the dimensions of work engagement, a low vigor was most strongly related to sickness absence. Previous studies found that the exhaustion dimension of burnout – which could be considered as the opposite of the vigor dimension of work engagement – significantly predicted sickness absence.[31, 34]

Employees with a low work engagement were more likely to have a less than good work ability. This finding confirms previous studies.[14, 35] Of the three dimensions of work engagement, the vigor dimension had the strongest association with work ability. Employees who felt vigorous at work had a five times higher likelihood of reporting a good work ability. It could be argued that the concepts of work engagement and work ability are closely related. Nevertheless, the correlation between both was low (Spearman's rho: 0.22).

The contribution of work engagement

Reason for conducting this study was to investigate whether work engagement improved the explained variance in self-perceived health, work ability, and sickness absence beyond known health behaviors and work-related characteristics. Our findings showed that work engagement improved the explained variance in work ability and sickness absence. Known health behaviors and work-related characteristics explained only 10% of the variance of sickness absence among the employees. Including work

engagement into the models led to a relatively 5% increase in the total explained variance. Possibly including other factors such as having health problems or factors related to the organization might improve the explained variance in sickness absence.[32, 36] In contrast, adding work engagement improved the explained variance in work ability by 4%, a relative improvement of 25% in the total explained variance. The 4% added explained variance is greater than the 1% found by Airila and colleagues (2012).[14] This difference might be due to the fact that they included work ability at baseline in the model, which answers the question whether a change in work ability is predicted by work engagement.

Our aim was to investigate whether work engagement is a determinant of self-perceived health, work ability, and sickness absence. As said above, an alternative, and different, question is whether a *change* in these outcomes is predicted by work engagement. In our study, self-perceived health, work ability, and sickness absence were also measured at baseline. To investigate how the results might differ, we performed additional analyses in which we also adjusted for the baseline value of the outcome measure besides demographics, health behaviors, and work-related characteristics. Work engagement in these analyses statistically significantly predicted a *change* in work ability (OR: 2.75, 95%CI: 1.28-5.91). Association between work engagement and changes in self-perceived health (OR: 1.01, 95%CI: 0.46-2.24) and sickness absence (short-term: OR: 1.09, 95%CI: 0.69-1.71; long-term: OR: 1.51, 95%CI: 0.71-3.14) were not statistically significant.

Intervention implications

A recent meta-analysis concluded that workplace health promotion programs aiming to increase health, work ability, or sickness absence by improving health behavior have modest effects.[37] On the basis of this study, health promotion programs at the workplace may potentially have more impact by also promoting work engagement.[38] Recently, two randomized controlled trials have been conducted aiming to increase *inter alia* work engagement as a measure of sustainable employability. Oude Hengel and colleagues (2012) implemented an intervention involving reducing physical load, increase awareness of the importance of taking breaks, and increasing empowerment. Strijk and colleagues (2013) tried to improve work engagement by improving physical activity and fruit intake.[39, 40] Nevertheless, both intervention studies found no significant effects on work engagement demonstrating that more research is needed to investigate what positively changes employees' work engagement and how this can be targeted by interventions. Perhaps, work engagement can better de addressed by improving psychosocial work-related characteristics.[38]

Limitations

The strength of this study is the longitudinal design. Nevertheless, the relative short follow-up period might be a limitation. Sickness absence was measured over the past year, whereas the follow-up period was a half-year; therefore, it might be that sickness absence days were taken before the baseline measurement. Furthermore, sickness absence was operationalized by one of the dimensions of the WAI; therefore, the results for work ability and sickness absence are not completely independent although the correlation was low (Spearman's rho: 0.26). The study population was rather healthy with only few employees doing physically demanding work as compared to previous studies.[11, 41] Therefore, we need to be cautious to generalize our results to other populations. The relative small sample size limited the statistical power and made it impossible to stratify the analysis by, for example, organization or gender. Because it was an online survey, employees with limited Internet access might not have participated, and selective participation based on health might have occurred. Nevertheless, concerning loss to follow-up, there were no difference between the respondents and those lost to follow-up with regard to demographics, health behaviors, psychosocial work-related characteristics, self-perceived health, and internet access at home or work. Furthermore, a review on workplace health promotion program participation concluded that there is no evidence that healthier employees are more likely to participate.[42]

CONCLUSION

Employees with a low work engagement were more likely to report a low work ability and long-term sickness absence. Ill health and long-term sickness absence among employees was most strongly predicted by poor health behaviors, whereas a low work ability among employees was mostly determined by experiencing unfavorable work-related characteristics. Work engagement contributes to work ability beyond health behaviors and work-related characteristics among employees at follow-up. These findings give direction for future policy or interventions of companies aiming to promote sustainable employability.

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Appendix 1: Spearman correlations between all study variables (n=733).

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	Gender	1.00																		
2	Age	-.22	1.00																	
3	Education	.09	-.18	1.00																
4	Weight	.18	-.15	.24	1.00															
5	Sports participation	-.03	-.04	-.01	.09	1.00														
6	Nutrition	.10	.03	-.00	.14	.07	1.00													
7	Smoking	-.00	.06	.22	.05	.10	.06	1.00												
8	Work demands	.02	-.04	-.15	-.03	.01	.03	-.05	1.00											
9	Decision authority	-.01	.00	.28	.01	-.03	-.04	.08	.06	1.00										
10	Skill discretion	-.10	.10	.08	-.04	-.03	.01	-.01	-.09	.34	1.00									
11	Awkward postures	.07	-.03	.25	.08	-.03	.02	.06	-.00	.18	.10	1.00								
12	Lifting heavy loads	.10	.01	.21	.03	-.02	-.00	.06	-.03	.12	.06	.42	1.00							
13	Work engagement	-.00	.03	-.13	.04	-.05	-.03	.02	-.06	-.31	-.45	-.17	-.14	1.00						
14	Vigor	.03	.00	-.12	.00	-.05	-.07	-.04	.00	-.30	-.34	-.12	-.09	.72	1.00					
15	Dedication	.01	.00	-10	.09	.01	-.00	0.2	.05	-.37	-.47	-.15	-.13	.78	.57	1.00				
16	Absorption	-.00	.12	-.10	.05	-.03	-.02	.05	.06	-.18	-.35	-.14	-.11	.67	.46	.55	1.00			
17	Self-perceived health	.00	.00	-.09	-.08	-.09	.01	-.05	-.02	-.01	-.01	-.05	-.05	.07	.13	.02	.01	1.00		
18	Work ability	.03	-.00	.19	.05	.08	.00	.03	.06	.14	.12	.14	.12	-.22	-.25	-.18	-.13	-.46	1.00	
19	Sickness absence	.09	-.06	-.11	-.03	-.02	.07	-.05	.02	-.09	-.09	-.05	-.06	.10	.11	.07	.07	.23	-.26	1.00

PA: physical activity

Appendix 2: Adjusted associations between the three dimensions of work engagement (i.e. vigor, absorption, and dedication) and self-perceived health, work ability, and sickness absence at six-month follow-up among employees (n=733).

	Self-perceived health	Work ability	Short-term sickness absence	Long-term sickness absence
	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)
Low vigor	2.66 (1.40-5.05)*	4.84 (2.78-8.43)*	1.58 (1.12-2.25)*	1.60 (0.90-2.83)†
Low absorption	0.98 (0.51-1.90)	2.33 (1.37-3.97)*	1.30 (0.94-1.81)†	1.45 (0.84-2.51)†
Low dedication	1.08 (0.55-2.11)	3.05 (1.79-5.21)*	1.27 (0.91-1.79)†	1.44 (0.82-2.54)

* statistically significant at $p < 0.05$, † statistically significant at $p < 0.20$
All analyses were adjusted for age, gender, educational level, and organization.

PART TWO

EFFECTIVENESS OF WORKPLACE HEALTH PROMOTION PROGRAMS

/05

WORKPLACE HEALTH PROMOTION: A META-ANALYSIS OF EFFECTIVENESS

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ABSTRACT

Context: An unhealthy lifestyle may contribute to ill health, absence due to sickness, productivity loss at work, and reduced ability to work. Workplace health promotion programs (WHPPs) aim to improve lifestyle and consequently improve health, work ability, and work productivity. However, systematic reviews on intervention studies have reported small effects, and the overall evaluation of effectiveness of WHPPs is hampered by a large heterogeneity in interventions and study populations. This systematic review aims to investigate the influence of population, study and intervention characteristics, and study quality on the effectiveness of workplace health promotion programs

Evidence acquisition: A systematic literature search was conducted identifying RCTs, published before June 2012, evaluating the effect of a WHPP aimed at smoking cessation, physical activity, healthy nutrition, and/or obesity on self-perceived health, work absence due to sickness, work productivity, or work ability. Studies were included in the meta-analyses if quantitative information was present to calculate an effect size (ES). A meta-analysis, stratified meta-analyses, and meta-regression analyses were performed in spring 2012 using Comprehensive Meta-analysis software 2.0 and PAWS 17.0.2.

Evidence synthesis: In 18 studies describing 21 interventions the overall effect of a WHPP was small (ES: 0.24, 95%CI: 0.14–0.34). The effectiveness of a WHPP was larger in younger populations, in interventions with weekly contacts, and in studies in which the control group received no health promotion. A 2.6-fold lower effectiveness was observed for studies performing an intention-to-treat analysis and a 1.7-fold lower effectiveness for studies controlling for confounders. Studies of poor methodological quality reported a 2.9-fold higher effect size of the WHPP.

Conclusions: The effectiveness of a WHPP is partly determined by intervention characteristics and statistical analysis. High-quality RCTs reported lower effect sizes. It is of paramount importance to determine the effectiveness of WHPPs in RCTs of high quality.

CONTEXT

An unhealthy lifestyle is one of the major risk factors for chronic diseases in developed countries.[1] Additionally, for employees, unhealthy lifestyle behaviors and obesity might lead to negative effects related to work.[2] Research has shown that unhealthy employees and those with an unhealthy lifestyle are less productive at work, have a decreased work ability, and take more sick days.[3-7]

The workplace is considered to be a fruitful setting for public health promotion because of the presence of natural social networks, the possibility of reaching a large population, and the amount of time people spend at work.[8, 9] This had led to the development and evaluation of numerous WHPPs in the past decades. Reviews have concluded that WHPPs can improve overall health[9], increase physical activity[10, 11], lead to small improvements in weight status[12], and have potential positive effects on dietary behavior.[13, 14] In addition to this, other systematic reviews have indicated that WHPPs may decrease work absence due to sickness[11, 15, 16] and increase work ability.[16] Moreover, two recent reviews showed promising effects of WHPPs on work productivity.[17, 18]

Still, the effects of WHPPs found by systematic reviews tend to be small, and there is large heterogeneity in the effects of the included studies.[19] Reviews on potential effectiveness of workplace health promotion programs often address the question whether programs lead to improvements in lifestyle behaviors[10-14] and, to a lesser extent, in more distal outcomes such as work productivity and sick days. These systematic reviews seldom provide evidence how characteristics of the study population, features of design and methods of the study, and program content influence the observed changes in lifestyle behavior.

Insight into the role of these determinants of effectiveness is important for generalizability of findings across different settings and populations and for facilitating appropriate implementation of WHPPs in specific situations. This systematic review evaluates 1) the effectiveness of WHPPs aimed at a healthy lifestyle on self-perceived health, work absence due to sickness, productivity at work, and work ability, and 2) the influence of population characteristics, study characteristics, intervention content, and methodological quality on the effectiveness of these WHPPs aimed at a healthy lifestyle.

EVIDENCE ACQUISITION

Identification of the studies

Relevant articles were identified by means of a computerized search in the bibliographical databases PubMed, Embase and Web of Science up until November 2011 with an update up to June 2012. The search terms were related to (1) workplace; (2) health

promotion program; (3) lifestyle: physical activity, nutrition, and smoking; (4) outcome: work ability, productivity, sickness absence, self-perceived health; and (5) RCT. In June 2012 an additional search was performed including the search terms perceived health and self-perceived health. The detailed search strategy per bibliographical database is presented in appendix 1.

In order to be included, the articles had to meet the following criteria: (1) describe a primary preventive WHPP aimed at physical activity, healthy nutrition, weight loss, or smoking cessation; (2) evaluate the effects of the WHPP on self-perceived health, productivity at work, sickness absence, or work ability (3) evaluate the intervention in an RCT; (4) present a detailed description of the study, population and intervention characteristics, and outcome measures; and (5) be written in English. Additionally, to be included in the meta-analysis, information was required on either pre- and post-levels, levels of change per intervention and control group, or differences between the intervention and control group with corresponding 95% confidence intervals or SDs.

Selection

The literature search resulted in 3668 unique titles. The titles and abstracts were reviewed and full text articles were obtained from potentially eligible titles. In case of doubt, a discussion was held among the authors. Figure 1 shows a flow chart for the inclusion trajectory of the articles.

Based on title, 3424 of 3668 (93%) articles were excluded. Most titles (n=3055, 89%) were excluded because the study was not on a primary preventive WHPP. During subsequent analysis of the abstract, 197 (81%) of 244 abstracts were discarded mainly because information was not provided on self-perceived health, productivity at work, work absence due to sickness, or work ability (n=92, 47%), or because they did not describe a primary preventive WHPP (n=66, 34%). The remaining 47 (19%) articles were retrieved for full review, of which 29 were excluded. Ten (34%) were excluded because the study design was not an RCT, and four (14%) gave no information on the outcome measure of interest. Another four (14%) studies evaluated the same sample and intervention as in other included studies; three (10%) studies lacked information to calculate the effect size; two (7%) studies did not evaluate a primary preventive WHPP; and two (7%) others did not focus on lifestyle. Finally, 18 publications met the inclusion criteria.

Data extraction

Using a data extraction form, information was collected on the characteristics of the population (e.g. gender, age); study (e.g. randomization procedure, response); intervention content (e.g. frequency, type); and outcome measures (self-perceived health, sickness absence, productivity at work, and/or work ability). For each outcome measure of interest, either pre- and post-levels, levels of change per intervention and control group,

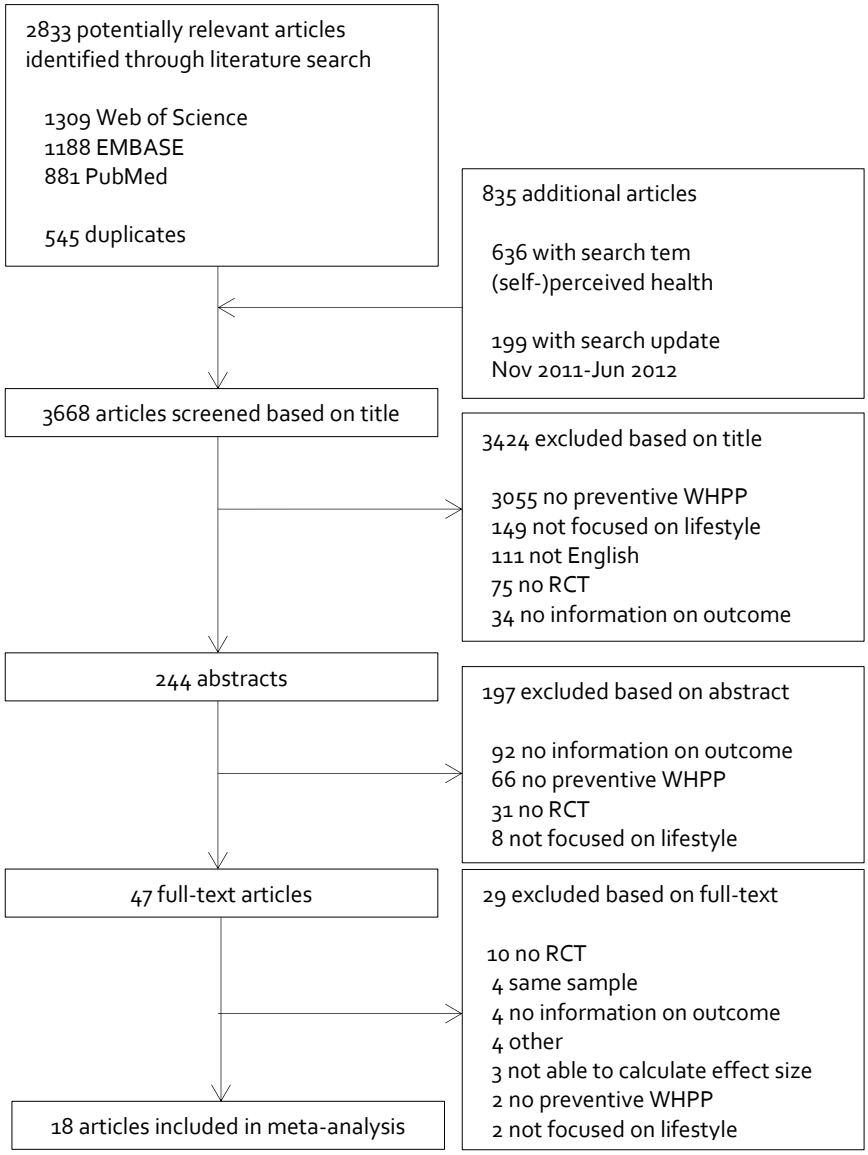

Figure 1: Flow chart for the inclusion trajectory.

or differences between the intervention and control group were retrieved. Together with the corresponding 95% confidence intervals or SDs, effect sizes were estimated. Two authors performed the data extraction. In case of doubt, data were discussed until agreement was reached.

Methodological quality assessment

Assessment was performed using a predefined nine-item checklist based on the guidelines in Cochrane Collaboration's tool for assessing the risk of bias[20] and the checklist used by Verweij and colleagues (Appendix 2).[21] Items A and B relate to selection bias; C and D to performance bias; E and F to attrition bias; and G, H and I to detection bias. Publications were scored as positive when the quality criterion was met (1 point), negative when the quality criterion was not met (0 points); or as unclear when the publication provided insufficient information to judge (0 points). In case of multiple outcomes or multiple interventions, publications could receive 0.5 points on criteria item B (similarity at baseline on outcome variable) and/or item H (data-collection method) when the criterion was met for one intervention group or outcome measure. Finally, all articles received a methodological quality score based on the summation of positive scored items: excellent (8 -9 points); good (4.5 – 7.5 points); fair (3 – 4); or poor (0 – 2.5) (Appendix 3).

Definition of population, study and intervention characteristics

Definitions of population and intervention characteristics were based on the data reported in the studies included. If the study consisted of 67% or more women, it was stated that this study was performed among 'mostly females'. Study populations with a mean age of 40 years or higher were considered to be an 'older' population. The assessment of whether a predominantly (>67%) white or blue-collar study population was included was based on information provided by the studies on blue/white collar information, types of jobs and/or the industry. The response was stated to be low when this was less than the median participation of 34% as reported in a recent systematic review.[22]

Whether an intention-to-treat analysis was performed was assessed according to the three criteria described by Hollis and colleagues[23]: deviations from random allocation, missing outcomes, and false inclusion. Interventions with at least weekly contacts were considered to be 'frequent'. The content of the intervention was divided into exercise, educational, and/or counseling components. Exercise was defined as interventions that included a physical activity component in which the participants needed to be physical active. Educational interventions were defined as programs that were restricted to providing information on the targeted lifestyle to the individual or group. In counseling interventions, a participant was able to direct personal questions to a health counselor for advice or the program was built on individual counseling sessions.

Data-analysis

For each outcome measure of interest, a generic effect size (ES) was estimated, based on the original data in the article, by the computer program Comprehensive Meta-Analysis software version 2.0 (CMA).[24] Thereafter, information on population, study and interven-

tion characteristics as well as the outcome measure studied was entered. Studies evaluating the effect of the WHPP on multiple outcome measures were entered separately for each outcome measure; the same method was applied when two interventions were studied within the same publication.

First, five meta-analyses were conducted using random-effects models. An overall meta-analysis was performed pooling all publications, independent of the outcome measure. Subsequently, for each independent outcome measure (self-perceived health, sickness absence, productivity at work, work ability), a separate meta-analysis was conducted.

Second, stratified meta-analyses were performed on the population, study, and intervention characteristics as well as on methodological quality. An ES of around 0.2 is considered to represent a small effect, around 0.5 a medium effect, and around 0.8 or higher a large effect.[25] A statistically significant difference was considered to be found when the ES of one condition was not included in the 95% CI of the corresponding opposite condition.

Third, meta-regression analyses were performed. Data on ES and corresponding SEs calculated by CMA and on the independent variables were entered into Statistical Package for Social Sciences PASW, version 17.0.2 for Windows, for analyses. Meta-regression analyses were carried out studying the difference in effect size by population, study, and intervention characteristics adjusted for the methodological quality (good/excellent, poor/fair). Studies were weighted by the inverse of the SE of the effect size.

EVIDENCE SYNTHESIS

Eighteen studies evaluated the effect of a workplace health promotion program (WHPP) either on self-perceived health (n=8)[26-33]; sickness absence (n=12)[28, 29, 33-42]; work productivity (n=4)[30, 31, 41, 43]; or work ability (n=2).[32, 33] The study populations ranged in size from 40 to 860, and reflected a wide range of workplace settings (Table 1). The majority of the studies were from northern European countries (n=11/18). The content of the WHPPs was diverse, with 11 studies aimed at improving physical activity, four at weight status, and four at a combination of lifestyle factors. Moreover, three studies evaluated two interventions.[30, 34, 43]

Meta-analysis

The pooled effect of WHPPs was, independent of the outcome measure, statistically significant with an effect size of 0.24 (95%CI: 0.14 – 0.34). In the analyses stratified by outcome, comparable effects of the WHPPs were found for self-perceived health (ES:

Table 1: Population characteristics, study characteristics and intervention content of the included WHPPs.

Study	Industry	Focus program	Program content	Duration and contacts	Participation[a]	Loss to follow-up[b]	Metho dolo-gical quality	Outcome measure	Effect size[c]
Atlantis et al. 2004[26] Australia	Casino	Physical activity	Multifaceted: physical activity group, health education seminars, health counseling sessions	24 weeks; 3 physiological data collection + 5 counselling sessions	2% (73/3800)	40% (29/73)	3	Health (SF-36)	0.58 (-0.03-1.19)
Robroek et al. 2012[27] The Netherlands	Health care, Commercial services, Executive branch government	Nutrition and physical activity	Web-based tailored program aimed at lifestyle: tailored advice, online self-monitoring, contact health professionals	2 years; monthly e-mail during first year. 2 health checks	7% (924/12.895)	40% (366/924)	5	Health (single item)	0.15 (-0.28-0.57)
Brox et al. 2005[28] Norway	Nursing home	Physical activity	Group fitness program. Classes regarding physical activity, nutrition and stress management.	6 months; 26 contact moments	54% (119/220)	18% (22/119)	5	Health (single item) Sickness absence (# days)	0.00 (-0.44-0.44) 0.16 (-0.20-0.53)
Tveito et al. 2009[29] Norway	Nursing home	Physical activity and lifestyle	Physical exercise (1), health information/stress management sessions (2)	9 months; (1) 3x p/w (2) 1x p/w for 4 months	65% (40/62)	28% (11/40)	4.5	Health (SF-36) Sickness absence (# days)	0.57 (-0.06-1.20) 0.03 (-0.59-0.65)
Eriksen et al. 2002[34] Norway	Post services	Physical activity	Group aerobic dancing program (1), 3-component health program: physical exercise, information lifestyle, examination worksite (2)	12 weeks; (1) 24 contact moments (2) + 12 session + 2 examinations	55% (860/1558)	30% (232/860)	5	Sickness absence (rate)	1: 0.16 (-0.02-0.34) 2: 0.17 (-0.02-0.35)

Table 1: Population characteristics, study characteristics and intervention content of the included WHPPs. (continued)

Study	Industry	Focus program	Program content	Duration and contacts	Participation[a]	Loss to follow-up[b]	Metho dolo-gical quality	Outcome measure	Effect size[c]
Gerdle et al. 1995[35] Sweden	Home care services	Physical activity	Group physical exercise program.	1 year; 2x p/w	60% (97/160)	21% (20/97)	4	Sickness absence (# days)	0.14 (-0.32-0.59)
Groeneveld et al. 2011[36] The Netherlands	Construction	Weight	Health goal setting in counseling sessions focused on overweight/ obesity.	6 months; 7 sessions	14% (573/4058)	27% (154/573)	5	Sickness absence (# days)	0.04 (-0.13-0.20)
Jeffrey et al. 1993[37] USA	Mixture	Weight	Incentive induced, on site goal-setting classes aimed at weight loss.	2 years with 4 enrol moments; 11x p/2w	21% (32/154 sites)	n/a	2	Sickness absence (# days)	0.69 (0.58-0.81)
Kerr & Vos 1993[38] The Netherlands	Bank	Physical activity	A tailored on-site fitness program.	1-2x p/w, duration unknown	n/a	18%	3.5	Sickness absence (# days)	0.17 (-0.15-0.49)
Proper et al. 2004[39] The Netherlands	Municipal services	Physical activity	Counseling sessions focused on physical activity and nutrition.	9 months, 7 sessions	30% (299/600)	4% (13/299)	6	Sickness absence (rate)	0.13 (-0.12-0.38)
Zavanela et al. 2012[42] Brasil	Bus company	Physical activity	Resistance training program	24 weeks; week 0-8 3x p/w, week 9-24 4x p/w	n/a Started: 132	27% (36-132)	3	Sickness absence (rate)	0.66 (0.25-1.07)

Table 1: Population characteristics, study characteristics and intervention content of the included WHPPs. (continued)

Study	Industry	Focus program	Program content	Duration and contacts	Participation[a]	Loss to follow-up[b]	Metho dolo-gical quality	Outcome measure	Effect size[c]
Terry et al. 2011[43] USA	Airline Health care	Lifestyle	Seminars and campaigns on (1) lifestyle and improving environment, (2) consumerism of health resources. Additional risk group coaching sessions (1+2).	18 months, # sessions n/a. Additional 13 (1), 7 (2) sessions	39% (631/1628)	49% (311/631)	4	Productivity (single item)	1: 0.05 (-0.21-0.31) 2: 0.14 (-0.15-0.43)
Puig-Ribera et al. 2008[30] Spain	University	Physical activity	2 pedometer based walking exercise programs: outside (1) or at work (2).	9 weeks; 9 emails + 3 measurement moments	12% (79/671)	11% (9/79)	4	Health (single item) Productivity (WLQ-Output demand)	1: 0.53 (-0.08-1.13) 2: 0.28 (-0.28-0.83) 1: 0.95 (0.33-1.57) 2: 1.33 (0.73-1.94)
Block et al. 2008[31] USA	Health insurance	Nutrition and physical activity	Web-based program: health risk assessment; email with tips, feedback, goal-setting; personal health page.	4 months; 25 contact moments by email	8% (787/9733)	30% (238/787)	5.5	Health (SF-8) Productivity (2 items)	0.25 (0.11-0.39) 0.21 (0.03-0.40)
von Thiele Schwarz et al. 2008[32] Sweden	Dentistry	Physical activity	Employee own choice of medium-to-high physical exercise program.	6 months; 1 introductory sessions + 3 measurement moments	99% (195/197)	9% (18/195)	3	Health (single item) Work ability (single item)	0.10 (-0.27-0.47) 0.41 (0.04-0.78)

Table 1: Population characteristics, study characteristics and intervention content of the included WHPPs. (continued)

Study	Industry	Focus program	Program content	Duration and contacts	Participation[a]	Loss to follow-up[b]	Metho dolo-gical quality	Outcome measure	Effect size[c]
Reijonsaaire et al. 2012[41] Finland	Insurance	Physical activity	Web-based program focused on physical activity: monitoring by accelerometer, counseling at distance	12 months; 3 measurement moments	49% (544/1116)	36% (193/544)	5.5	Sickness absence (# days)	0.00 (-0.17-0.17)
								Productivity (QQ instrument)	0.05 (-0.12-0.22)
Morgan et al. 2012[40] Australia	Aluminum industry	Weight	Crew-incentive based weight loss program with information sessions and website usage	14 weeks; 1 session and biweekly updates	9% (110/1200)	18% (20/110)	4.5	Sickness absence (# days)	0.52 (0.14-0.91)
								Productivity (WLQ – output demand)	0.23 (-0.15-0.61)
Nurminen et al. 2002[33] Finland	Laundry service	Physical activity	Counseling sessions aimed at physical activity	8 months; 26 sessions	80% (260/325)	9% (28/260)	5.5	Health (single item)	0.16 (-0.08-0.41)
								Sickness absence (# days)	0.06 (-0.18-0.31)
								Work ability (Work Ability Index)	0.10 (-0.14-0.35)

p/w = per week
SF-36 = Short-form 36
WLQ = Work Limitations Questionnaire
[a] Participation level: employees starting with the intervention divided by number of employees invited/targeted.
[b] Loss to follow-up: employees completing the intervention divided by the number of employees starting with the intervention.
[c] Effect size: standard mean difference with 95% confidence interval (95% CI). NA: not able to calculate based on data presented.

0.23, 95%CI: 0.13 – 0.33); sickness absence (ES: 0.21, 95%CI: 0.03 – 0.38); productivity at work (ES: 0.29, 95%CI: 0.08 – 0.51); and work ability (ES: 0.23; 95%CI: -0.07 – 0.52).

Methodological quality

Eight of the 18 studies were quantified as having a poor or fair methodological quality (Table 1). In 14 studies, the participants were not blinded to the treatment arm (intervention or control group), and in 12 studies, the compliance with the intervention was considered to be low (n=6) or could not be assessed according to the information available (n=6) (Appendix 3).

Table 2: Stratified meta-analyses for methodological quality for the pooled outcome measures and after stratification by outcome.

	Good/Excellent quality		Poor/Fair quality	
	n_o (n_s)[a]	Effect size (95%CI)	n_o (n_s)	Effect size (95%CI)
Overall	18 (10)	0.14 (0.08 – 0.19)	13 (8)	0.41 (0.20 – 0.62)*
Health	5 (5)	0.22 (0.10 – 0.33)	4 (3)	0.29 (0.04 – 0.54)
Sickness absence	9 (8)	0.11 (0.03 – 0.18)	4 (4)	0.37 (-0.01 – 0.75)*
Productivity	3 (3)	0.14 (0.02 – 0.26)	4 (2)	0.54 (0.04 – 1.05)*
Work ability	1 (1)	0.10 (-0.14 – 0.35)	1 (1)	0.41 (0.04 – 0.78)*

[a] n_o (n_s): number of observations, number of studies
* Statistically significant difference; the effect size is outside the 95% confidence interval of the other effect size.

Table 3: Stratified meta-analyses for methodological quality criteria on the nine quality criteria.

	Meeting the criteria		Not meeting the criteria	
	n_o (n_s)[a]	Effect size (95%CI)	n_o (n_s)	Effect size (95%CI)
Randomization correctly and clearly described	19 (9)	0.17 (0.09 – 0.26)	12 (9)	0.29 (0.06 – 0.50)*
Similarity groups at baseline on outcome	21 (13)	0.22 (0.12 – 0.31)	10 (8)	0.21 (0.01 – 0.42)
Blinding participants to intervention	8 (4)	0.34 (0.09 – 0.58)	23 (15)	0.21 (0.10 – 0.32)*
Compliance to the intervention	7 (6)	0.20 (0.06 – 0.34)	24 (12)	0.25 (0.13 – 0.38)
Low loss to follow up	24 (13)	0.22 (0.14 – 0.30)	7 (5)	0.22 (-0.06 – 0.52)
Intention-to-treat analysis	14 (7)	0.14 (0.08 – 0.19)	17 (11)	0.36 (0.18 – 0.54)*
Controlled for confounders	18 (11)	0.20 (0.08 – 0.32)	13 (7)	0.33 (0.13 – 0.53)*
Objective data-collection	9 (9)	0.16 (0.02 – 0.30)	22 (14)	0.27 (0.15 – 0.39)
Long follow-up	19 (12)	0.15 (0.02 – 0.29)	12 (7)	0.37 (0.23 – 0.51)*

[a] n_o (n_s): number of observations, number of studies
* Statistically significant difference; the effect size is outside the 95% confidence interval of the other effect size.

Studies with a poor or fair methodological quality found a 2.9-fold higher effect of their WHPP than those studies with a good or excellent methodological quality (ES: 0.41, 95% CI: 0.20-0.62 versus ES: 0.14, 95% CI: 0.08-0.19). When the analysis was stratified per outcome variable, studies with a low methodological quality found a greater effect on sickness absence, productivity at work, and work ability (Table 2).

Table 3 shows the influence of methodological-quality criteria on the reported effect size. The studies with a poor methodological quality found a statistically significantly larger effect size of the WHPP with regard to four quality criteria (unclear randomization, no intention-to-treat analysis, not controlled for confounders, and short follow-up). Studies that blinded their participants to the intervention found a larger effect than when participants knew to which group they belonged.

Population characteristics

Studies including mostly white collar workers found a larger effect of their WHPP, as did those studies evaluating their WHPP among a population with a mean age lower than 40 years of age. When adjusted for the methodological quality of the study, the differences in effect sizes for age decreased but remained statistically significant. The difference in effect size for occupation attenuated to nonsignificance after controlling for methodological quality. The distribution of gender in the study population had no influence on the effect of the WHPP (Table 4).

Study characteristics

The WHPPs showed smaller effects when the participants in the control group received some kind of intervention. The effect size was found to be 3.8 times larger when participation in the study was low. When adjusted for the methodological quality, the differences in effect size were smaller but remained statistically significant (Table 4). Randomizing at either the group level or the individual level did not influence the effect of the WHPP.

Intervention characteristics

The WHPPs were more effective when there were at least weekly contacts; this effect remained significant when adjusted for methodological quality. Interventions including a counseling component with participants receiving personal advice were found to be less effective. However, after adjusting for methodological quality, the effect size attenuated to nonsignificance. The presence of an exercise or educational component did not influence the effect of the WHPP (Table 4).

Table 4: Stratified meta-analyses and difference in effect size of WHPPs for population, study and intervention characteristics.

	Effect size		Difference in ES
	n_o (n_s)[a]	Std diff in means (95%CI)[b]	Beta (95%CI)[c]
Population characteristics			
Gender			
≥ 67% female	18 (8)	0.21 (0.11 – 0.32)	-0.04 (-0.09 – 0.01)
< 67% female (ref)	12 (9)	0.26 (0.08 – 0.44)	
Age			
≥ 40 years	21 (12)	0.13 (0.08 – 0.18)*	-0.17 (-0.23 - -0.17)*
< 40 years (ref)	9 (5)	0.48 (0.23 – 0.73)	
Occupation			
≥ 67% white collar	13 (7)	0.33 (0.15 – 0.52)*	0.03 (-0.03 – 0.08)
< 67% white collar (ref)	18 (11)	0.15 (0.08 – 0.22)	
Study characteristics			
Randomization			
Cluster	13 (8)	0.25 (0.11 – 0.39)	0.08 (0.03 - 0.13)*
Individual (ref)	18 (10)	0.21 (0.09 – 0.33)	
Control group			
Minimal intervention	10 (6)	0.07 (0.00 – 0.14)*	-0.13 (-0.18 - -0.07)*
No intervention (ref)	21 (12)	0.34 (0.21 – 0.47)	
Participation			
High	16 (8)	0.10 (0.04 – 0.17)*	-0.17 (-0.22 – -0.13)*
Low (ref)	14 (9)	0.38 (0.20 – 0.55)	
Intervention characteristics			
Frequency			
Often	15 (9)	0.36 (0.18 – 0.53)*	0.10 (0.05 – 0.15)*
Not often (ref)	16 (0)	0.11 (0.05 – 0.17)	
Intervention			
Group	8 (5)	0.22 (-0.04 – 0.48)	0.01 (-0.05 – 0.07)
Individual (ref)	23 (13)	0.21 (0.12 – 0.30)	
Exercise component			
Yes	19 (10)	0.25 (0.14 – 0.37)	-0.05 (-0.10 – 0.07)
No (ref)	12 (8)	0.20 (0.04 – 0.37)	
Education component			
Yes	16 (10)	0.27 (0.13 – 0.41)	0.06 (0.01 – 0.11)*
No (ref)	15 (9)	0.19 (0.07 – 0.30)	
Counseling component			
Yes	13 (9)	0.13 (0.07 – 0.19)*	-0.01 (-0.07 – 0.05)
No (ref)	16 (9)	0.35 (0.17 – 0.53)	

[a] n_o (n_s): number of observations, number of studies

[b] Std. diff in means: standardized differences in means

[c] Difference in effect size (standard differences in means) controlled for the methodological quality of the study.

* Statistically significant difference; the effect size of one is not included in the 95% confidence interval of the other.

DISCUSSION

The overall effectiveness of WHPPs was small across all work-related outcome measures: self-perceived health, sickness absence, productivity at work, work ability. This study is the first to show meta-analytically that effectiveness of a workplace health promotion programs depends on the study population, the intervention content, and the methodological quality of the study. This study also demonstrates the relative importance of these factors for the effectiveness. Studies performed among younger populations were more effective. The effectiveness was larger in programs with weekly contacts or when the control group received no intervention. Studies found a smaller effect when they analyzed according to intention-to-treat or controlled for confounders. Studies with a low methodological quality reported a 2.9-fold higher effect of their WHPP.

Overall, a small effect size of 0.24 was found. Across the outcome measures, all related to the concept of sustainable employability; small effects of WHPPs were found for self-perceived health (ES: 0.23); sickness absence (ES: 0.21); productivity at work (ES: 0.29); and work ability (ES: 0.23). These findings are in accordance with previous systematic reviews.[9, 11, 15, 16] The method of data-collection in most studies was based on self-reports (Appendix 3), and thus common method bias could be present that may result in an overestimation of the effect.[44]

The effectiveness of the WHPPs included differed by study populations, study designs, and interventions. The current meta-analysis showed that WHPPs are more effective in populations containing predominantly white-collar and younger individuals. WHPPs might be better tailored to these specific groups. However, adjustment for the methodological quality attenuated the estimated difference in effect size for occupation, which might be due to the WHPP implemented. Poor-quality studies with a predominantly white-collar population all incorporated a counseling component, while none of the poor-quality studies with a blue and white-collar population investigated a WHPP with a counseling component. This meta-analysis has shown that WHPPs with a counseling component are less effective.

Two study characteristics were found to be related to effectiveness. The effects were smaller when the control group received a minimal intervention, possibly resulting in insufficient contrast between the two groups. In addition, the effect of the WHPP was four times higher when initial participation was low. This observation might be due to selection bias, whereby highly motivated participants were self-selected into the program. This observation may guide health professionals towards better WHPPs by stimulating through company-wide informational activities the motivation among employees to improve their health and subsequently by targeting the WHPP resources to those workers with sufficient motivation to change their behavior.

Programs with at least weekly contacts were almost four times more effective. This shows that in general a higher intensity that keeps participants actively involved leads to better results. Six of eight of the WHPPs with such regular contacts were interventions in which participants enrolled in an exercise program with an instructor, and it might be that the regular encouragement from instructors gave rise to these greater effects. However, interventions including an exercise component in comparison to all other studies (exercise component in addition to counseling or education or not including an exercise component) showed no difference. Future research could be aimed at identifying whether the relation between intervention effectiveness and the frequency of contact moments is evident regardless of the nature of the intervention components. Further, interventions with a counseling component reported a lower effectiveness, but this effect attenuated to nonsignificance when the methodological quality of the studies was taken into account. Studies with a counseling component (n=9) were more often of good quality (7 out of 9) than studies without such a counseling component (3 out of 9).

This meta-analysis has clearly shown that many components other than the intervention itself may account for the effectiveness of WHPPs. This questions the generalizability and the comparability of WHPPs. To extend knowledge of the potential effect of the heterogeneity in systematic reviews, there is a need to focus on both the effectiveness as well as on the underlying factors, which could be achieved by applying stratified analysis in future meta-analyses.

For policymakers, the results of this meta-analysis are relevant because it shows that WHPPs might influence sustainable employability because of their positive effects on health, productivity at work, work absence due to sickness, and work ability. However, the results also show that attention should be paid to the specific target populations (e.g. age groups) and the content of the offered interventions (e.g. high frequency of contact moments). This information may also guide intervention developers how one can ensure that the intervention will meet the demands and interests of the study population. Additionally, it would be interesting to test whether WHPPs with frequent contact moments (once a week) have a higher return on investment than WHPPs with less frequent contact moments (once a month).

In the current meta-analysis, studies that used intention-to-treat analyses and that adjusted the analyses for potential confounders found a lower effect. This is to be expected: intention-to-treat is a more conservative analysis that will reduce the observed effect size. Further, when controlled for potential confounders, part of the effectiveness will be explained by these factors. The well-known CONSORT statement on reporting RCTs advises intention-to-treat analysis as the preferred analysis strategy and also recommends adjustment for important prognostic variables.[45]

During the current meta-analysis, judging whether an intention-to-treat analysis was performed was sometimes difficult because authors do not always present sufficient

details on how missing data were handled (e.g. by multiple imputations or a change score of zero). Another item on the above-mentioned CONSORT statements' checklist is a description of how randomization was performed.[45] This criterion was not always met by the studies included (n=8), making the distinction not solely based on whether te criterion was met but also on whether it was well described.

A surprising observation in this meta-analysis is that methodologically poor studies reported an average effect size 2.9 times larger than good-quality studies. The larger effect size in low-quality studies is in line with other studies in different research fields.[46, 47] Analyses stratified by outcome showed the same result for sickness absence, work productivity, and work ability. This might indicate publication bias; poor quality studies get more frequently published while they show a great effect. This strengthens the need for methodologically strong studies, which are considered to provide a less-biased estimate and will therefore be closer to the observed effectiveness once implemented in the 'real world'.

Limitations

There are some limitations to this study. First, studies that had evaluated the effect of the WHPP on various outcome variables or that had evaluated more than one intervention were entered multiple times into the model. Performing a multilevel meta-analysis was regarded as undesirable because of the low number of studies included. Further, the correlation between the effect sizes of the studies evaluating the intervention on multiple outcomes was low (Spearman's rho: 0.35), thereby limiting the need to perform a multilevel meta-analysis.

Second, publication bias could have been an issue with this systematic review. The inverse relationship between study quality and effect size may point at such bias, as explained above. However, most RCTs included in this meta-analysis did not find a statistically significant effect on the outcome of interest, which makes publication bias less likely. Moreover, the funnel plot (Appendix 4) showed that only three of the 28 effect sizes fall outside the funnel plot boundaries. Further, most studies with high precision found smaller effects or even a null association, making publication bias in the pooled estimates less likely.

Third, it might be that articles were missed. However, a sensitive search strategy was used (Appendix 1), leading to a high number of potentially relevant titles. Because of this extensive search, many titles were excluded, mostly because studies were not evaluating a WHPP.

Fourth, the effect sizes observed in the WHPPs were small, which may partly be due to the more distal outcome variables used in this systematic review. However, other systematic reviews investigating the effectiveness of WHPPs on proximal outcomes, such as health behaviors, have also reported small effects.[9 11]

CONCLUSION

The effectiveness of workplace health promotion programs in intervention studies depends not only on type and content of the intervention implemented but also on study population, study characteristics, and methodological quality. WHPPs showed to be more effective among a younger population, which hampers generalizability. Further, interventions with weekly contacts were more effective, emphasizing the need for intensive WHPPs. Researchers performing meta-analysis are advised to get insight into both the effectiveness and factors underlying the effectiveness of WHPPs. A striking observation was that RCTs of poor quality reported a statistically higher effectiveness than RCTs of good quality. Therefore, to judge correctly the effectiveness of WHPPs, it is important to determine this only in good-quality RCTs.

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Appendix 1: Search strategy.

EMBASE

(('health promotion'/exp OR 'health behavior'/de OR 'occupational health'/exp OR 'life style':ab,ti OR lifestyle:ab,ti OR intervent*:ab,ti OR promotion*:ab,ti OR prevent*:ab,ti OR program*:ab,ti) AND ('physical fitness'/exp OR 'exercise'/exp OR 'motor activity'/exp OR 'sport'/exp OR fitness*:ab,ti OR exercis*:ab,ti OR sport*:ab,ti OR 'physical activity'/exp OR (physical NEAR/3 activ*):ab,ti OR diet*:de,ab,ti OR nutrition*:de,ab,ti OR food:ab,ti OR 'weight loss'/exp OR obes*:ab,ti OR overweight:ab,ti OR 'over weight':ab,ti OR bmi:ab,ti OR fat:ab,ti OR fruit*:ab,ti OR vegetable*:ab,ti OR smoking:ab,ti OR tobacco:ab,ti OR cigar*:ab,ti) AND (manpower:de,ab,ti OR employ*:de,ab,ti OR personnel*:de,ab,ti OR staff:de,ab,ti OR worker*:ab,ti OR workplace*:de,ab,ti OR worksite*:ab,ti OR workforce:ab,ti OR 'at work':ab,ti OR (work NEAR/3 (site* OR place*)):ab,ti) AND ('job performance'/de OR ((job OR work*) NEAR/3 (perform* OR efficien* OR capacity* OR ability*)):ab,ti OR productivity/de OR productivit*:ab,ti OR 'work capacity'/de OR workabilit*:ab,ti OR ((sick* OR ill* OR work*) NEAR/3 (absen* OR leav*)):ab,ti OR ((work* OR time) NEAR/3 loss*):ab,ti OR (('self rated' OR general OR self-perceived OR perceived) NEAR/3 health*):ab,ti OR absenteeism/de OR presenteeism:ab,ti) NOT ([animals]/lim NOT /lim) AND (random*:ti,ab OR 'randomized controlled trial'/de OR trail*:ti,ab OR groups:ti,ab OR 'controlled clinical trial'/de))

PubMed

((health promotion[mesh] OR health behavior[mesh:noexp] OR occupational health[mesh] OR life style[tiab] OR lifestyle[tiab] OR intervent*[tiab] OR promotion*[tiab] OR prevent*[tiab] OR program*[tiab]) AND (exercise[mesh] OR motor activity[mesh] OR sports[mesh] OR fitness*[tw] OR exercis*[tiab] OR sport*[tiab] OR physical activ*[tiab] OR diet[mesh] OR food[mesh] OR diet[tiab] OR diets[tiab] OR dieting[tiab] OR nutrition*[tiab] OR food[tiab] OR weight loss[mesh] OR overweight[mesh] OR obes*[tiab] OR overweight[tiab] OR over weight[tiab] OR bmi[tiab] OR fat[tiab] OR fruit*[tiab] OR vegetable*[tiab] OR smoking[tw] OR tobacco[tiab] OR cigar*[tiab]) AND (manpower[tw] OR workplace[mesh] OR employ*[tiab] OR personnel*[tiab] OR staff[tiab] OR worker*[tiab] OR workplace*[tiab] OR worksite*[tiab] OR workforce[tiab] OR at work[tiab] OR work site*[tiab] OR work place*[tiab]) AND (job performance[tw] OR ((job[tw] OR work[tw] OR working[tw]) AND (perform* [tw] OR efficien*[tw] OR capacity*[tw] OR ability*[tw])) OR productivit*[tw] OR work capacity[tw] OR workabilit*[tw] OR ((sick*[tw] OR illness[tw] OR ill[tw] OR work[tw]) AND (absen*[tw] OR leave[tw])) OR (work loss*[tw] OR time loss*[tw]) OR ((self rated[tw] OR general[tw] OR self-perceived[tw] OR perceived[tw]) AND health[tw]) OR absenteeism[tw] OR presenteeism[tw]) NOT (animals[mesh] NOT humans[mesh]) AND (randomized controlled trial[pt] OR controlled clinical trial[pt] OR randomized[tiab] OR randomly[tiab] OR trial[tiab] OR groups[tiab]))

Web Of Science

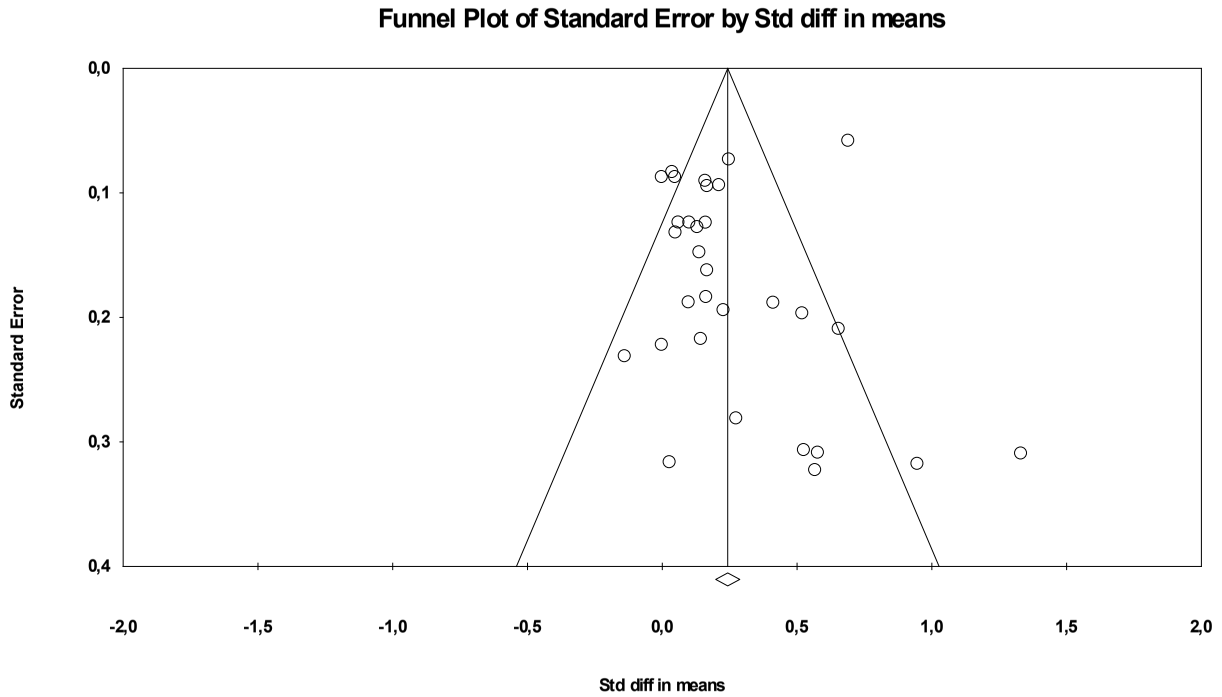
((health promotion OR health behavior OR occupational health OR life style OR lifestyle OR intervent* OR promotion* OR prevent* OR program*) AND (physical fitness OR exercise OR motor activity OR sports OR fitness* OR exercise* OR sport* OR physical active* OR diet* OR food OR weight loss OR overweight OR obes* OR over weight OR bmi OR fat OR fruit OR vegetable OR smoking OR tobacco OR cigar*) AND (manpower OR workplace OR employ* OR personnel* OR staff OR worker* OR workplace* OR worksite* OR workforce OR "at work" OR work site* OR work place*) AND (job perform* OR efficiency OR productivit* OR workabilit* OR work ability* OR work capacity* OR sickness absen* OR sickness leav* OR sick absen* OR sick leav* OR illness absen* OR illness leav* OR work absen* OR work leav* OR work loss* OR time loss* OR self rated health* OR general health* OR self-perceived health* OR perceived health* absenteeism OR presenteeism) NOT (animals NOT humans) AND (randomized controlled trial OR controlled clinical trial OR randomized OR randomly OR trial OR groups))

Appendix 2: Methodological quality criteria.

	Criteria	Definition
A	Randomization procedure	Positive if there was a clear description of the randomization procedure and if the randomization was adequately performed, i.e. by random aselect numbers or by a computer generated list.
B	Similarity of groups	Positive of the study groups were similar at the beginning of the study with regard to the relevant outcome variable ($p < 0.05$).
C	Blinding participants	Positive if the participant was unaware of being assigned to the intervention group or control group.
D	Compliance	Positive if participants attended the intervention satisfactory according to the opinion of the reviewers.
E	Loss to follow-up	Positive if the percentage of drop-puts during the study period did not exceed 20% for short term follow-up (<= 3 months) or 30% for long term follow-up (> 3 months)
F	Intention-to-treat	Positive if an intention-to-treat analysis was performed for the outcome variable
G	Controlled for confounders	Positive if the analysis was controlled for potential confounders
H	Data-collection method	Positive if objective measures were used for data collection on the outcome variable(s)
I	Follow-up	Positive if follow-up was 6 months or longer.

Appendix 3: Methodological quality score per publication per criterion.

Studies	Atlantis	Block	Brox	Eriksen	Gerdle	Groeneveld	Jeffrey	Kerr	Nurminen	Proper	Puig-Ribera	Terry	Von thiele Schwarz	Tveito	Reijonsaair	Robroek	Zavanela	Morgan
Methodological quality																		
Randomization procedure (clear description + random aselect numbers)	-	+	+	+	?	+	-	?	+	?	+	?	?	+	+	+	?	?
Similarity of groups at baseline on outcome	+	+/-	+/?	+	-	?	?	?	?	+	+	+	+	+	+	+	?	+
Blinding of allocation to which group (participants did not know)	-	-	-	-	-	-	?	-	-	-	+	+	-	-	-	+	-	-
Compliance to the intervention by opinion of the reviewer	+	+	-	?	+	+	?	?	?	+	?	?	-	-	-	-	+	-
Loss to follow-up (20% < 3 mnd, 30% > 3 mnd)	-	+	+	+	+	+	-	+	+	+	+	-	+	+	-	-	+	+
Intention to treat analysis performed	-	+	+	+	-	+	-	-	+	-	-	-	-	-	+	-	-	+
Analysis controlled for confounders	+	+	?	+	?	?	+	+	+	+	?	+	?	?	+	+	?	+
Data-collection method (subjective vs objective)	-	-	+/-	-	+	-	-	+/-	+/-	+	-	-	-	+/-	+/-	-	+	+/-
Follow-up (6 months or longer)	-	-	+	-	+	+	+	+	+	+	-	+	+	+	+	+	-	-
TOTAL	3	5.5	5	5	4	5	2	3.5	5.5	6	4	4	3	4.5	5.5	5	3	4.5

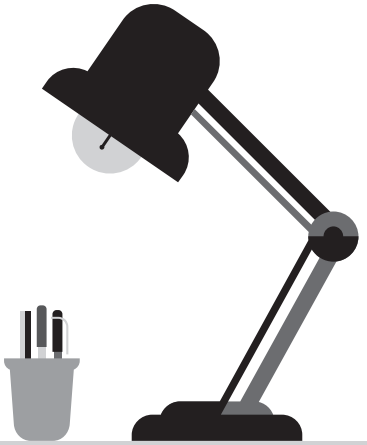


Appendix 4: Funnel plot of the standard difference in means expressed against the standard error.

PART THREE

PARTICIPATION IN HEALTH PROMOTION PROGRAMS AMONG EMPLOYEES

/06



BARRIERS AND FACILITATORS FOR PARTICIPATION IN HEALTH PROMOTION PROGRAMS AMONG EMPLOYEES: A SIX–MONTH FOLLOW–UP STUDY

BMC Public Health 2014;14:573

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ABSTRACT

Background: Health promotion programs (HPPs) are thought to improve health behavior and health, and their effectiveness is increasingly being studied. However, participation in HPPs is usually modest and effect sizes are often small. This study aims to (1) gain insight into the degree of participation of employees in HPPs, and (2) identify factors among employees that are associated with both their intention to participate and actual participation in HPPs.

Methods: Employees of two organizations were invited to participate in a six-month follow-up study (n=744). Using questionnaires, information on participation in HPPs was collected in two categories: employees' intention at baseline to participate and their actual participation in a HPP during the follow-up period. The following potential determinants were assessed at baseline: social-cognitive factors, perceived barriers and facilitators, beliefs about health at work, health behaviors, and self-perceived health. Logistic regression analyses, adjusted for demographics and organization, were used to examine associations between potential determinants and intention to participate, and to examine the effect of these determinants on actual participation during follow-up.

Results: At baseline, 195 employees (26%) expressed a positive intention towards participation in a HPP. During six months of follow-up, 83 employees (11%) actually participated. Participants positively inclined at baseline to participate in a HPP were more likely to actually participate (OR: 3.02, 95%CI: 1.88-4.83). Privacy-related barriers, facilitators, beliefs about health at work, social-cognitive factors, and poor self-perceived health status were significantly associated with intention to participate. The odds of employees actually participating in a HPP were higher among participants who at baseline perceived participation to be expected by their colleagues and supervisor (OR: 2.87, 95%CI: 1.17-7.02) and in those who said they found participation important (OR: 2.81, 95%CI: 1.76-4.49).

Conclusions: Participation in HPPs among employees is limited. Intention to participate predicted actual participation in a HPP after six months of follow-up. However, only 21% of employees with a positive intention actually participated during follow-up. Barriers, facilitators, beliefs about health at work, social-cognitive factors, and a poor self-perceived health status were associated with intention to participate, but hardly influenced actual participation during follow-up.

INTRODUCTION

Companies increasingly offer workplace health promotion programs (WHPPs) to their employees. Poor health and unhealthy lifestyle are important causes of displacement from the labor force and productivity loss.[1, 2] Workplaces are considered to be an effective setting for health promotion due to the possibility to reach a large proportion of the general population who spend a large amount of time there.[3] Hence, workplace health promotion programs have the potential to reach a large amount of persons aged 18 to 64, including many employees whose health and lifestyle needs improvement.

Systematic reviews have shown that WHPPs can improve lifestyle[4-7], increase productivity at work, and decrease sickness absence.[8-11] However, the effects of WHPPs are often small[12] and participation is usually modest[13], despite the fact that most employees are positive about health promotion at work.[14, 15] Since small effects and low participation greatly diminish the potential gains of WHPPs[10], it is important to study the factors that potentially impede or facilitate participation.

Intervention studies are mainly concerned with studying the effectiveness of WHPPs. However, since low participation results in low effectiveness and is not cost-effective, it may just be as important to study participation. Participation is one of the aspects studied in process evaluations, which looks at reasons for success or failure of the program. However, such evaluations are often not conducted[16] and are often only used to evaluate newly developed WHPPs. In companies, the health promotion programs (HPPs) offered to employees might differ from those. Therefore, it is relevant to investigate determinants of participation among employees in companies that already offer HPPs that are aimed at changing various types of employees' health behavior.

It is widely known that there are both barriers and facilitators to participation in a HPP. A review of the literature reveals multiple barriers that have claimed to impede participation in HPPs. These include lack of time, lack of motivation, unfavorable work schedule, inconvenient location, costs, and already feeling healthy.[17-21] There is also evidence for facilitators, such as willingness to change one's lifestyle.[18, 22] However, there is a lack of studies investigating the extent to which these barriers and facilitators influence actual participation in WHPPS.[13]

Social cognitive theories such as the Attitude Social-influence Self-efficacy (ASE) model[23] and the Theory of Planned Behavior (TPB)[24] are often used when developing interventions for health promotion.[25] These theories identify intention as being a core construct that precedes actual behavior, and intention towards a behavior (e.g. intention to participate in a WHPP) is often measured as a proxy for actual behavior.[26] However, there is increasing debate regarding the gap between intention and actual behavior, a debate that addresses the issue of a positive intention not necessarily resulting in

a behavior change.[27, 28] It is therefore crucial to investigate both intention and actual behavior to become engaged in health promotion.

Due to the potential gain in health and work productivity and due to the positive attitude of employees to workplace health promotion, there is a clear need to investigate how participation can be increased. This study aims to (1) gain insight into the degree of participation of employees in HPPs, and (2) identify factors among employees that are associated with both their intention to participate and actual participation in HPPs.

METHODS

Study population

The population in this six-month follow-up study consisted of employees of a plastics manufacturer (organization 1, n=874) and a paint manufacturer (organization 2, n=1281) who held various jobs (e.g. office, laboratory, and manual workers). Both organizations had in place a variety of HPPs that were accessible for all employees. The organizations provided access to a fitness center either on site or close to the organization, consults with a dietitian and an occupational physician, smoking cessation programs, and mindfulness training. Policy changes were not considered as HPPs.

Between 2010 and 2012, all employees were invited by e-mail to fill in two online questionnaires: a baseline questionnaire and a follow-up questionnaire six months later. For this study, we included all employees who completed both the baseline and follow-up questionnaires.

Of the 2155 employees invited, 1128 (52%) completed the baseline questionnaire. Of this group, 761 (68%) also completed the follow-up questionnaire after six months and 748 employees (98%) provided informed consent. Four employees were excluded due to implausible or missing data on height, weight, or physical activity. The final study sample comprised 744 employees (organization 1, n=279; organization 2, n= 465).

Informed consent was requested at the start of the baseline-questionnaire. The Medical Ethical Committee of Erasmus MC (Rotterdam, the Netherlands) declared that the Medical Research Involving Human Subjects Act did not apply to the current study and the committee had no objection to the execution of this study.

Data collection

Intention to participate and actual participation

Three measures of participation in a HPP were assessed: intention to participate, actual participation before the start of the study, and actual participation during the six-month follow-up period. A HPP was defined in the questionnaire as follows: "A program that is

aimed at improving your health behavior. For example, smoking cessation programs, fitness participation, participating in meetings on healthy nutrition."

At baseline, participants were asked whether they had the intention of participating in a WHPP. To enhance comparability with actual participation, the five possible answers were dichotomized into 'totally agree, agree' and 'totally disagree, disagree, neutral'.

At baseline, actual participation in a WHPP prior to enrollment in the study was assessed by asking participants whether they had participated in a WHPP in the past 12 months, and if so, what the topic of the program was (physical activity, healthy nutrition, smoking cessation, stress management, or health risks). Employees who had participated in multiple programs were asked to answer the question for to the most recent program followed.

At six-month follow-up, employees were asked whether they had participated in a HPP during the follow-up period. Employees who had participated were asked to name the topic of the HPP (physical activity, healthy nutrition, smoking cessation, stress management, or health risks), whereby multiple answers were permitted (i.e. multiple HPPs). For each topic, employees were then asked whether the HPP was organized through work or at their own discretion. Employees were classified as 'sustainers' if they had participated in a HPP in the year before enrollment and during the six-month follow-up period; as 'new' if they had not participated in the year before enrollment but had started a HPP during the follow-up period; and as 'quitters' if they had only participated in a HPP in the year before enrollment in the study.

Social-cognitive factors

We formulated six statements that addressed attitude (two items i.e. importance of participating in WHPP, pleasantness of participating in WHPP), social support (three items i.e. support for participating in WHPP from supervisor, from colleagues, from friends and or family), and self-efficacy (one item i.e. believing that when willing to one succeeds in participating in a WHPP). The statements on support from supervisor and colleagues were combined into a single item ('colleagues and or supervisor stimulate participation' (Spearman's Rho: 0.42)) that was positive when one of the underlying items was answered positively. The statements were based on important constructs from the Attitude-Social influence-Self-efficacy model[23] and were not strongly correlated (Spearman's Rho range: 0.02-0.32). Since the purpose was to investigate whether the presence or absence of a factor was associated with participation, the five possible answers were dichotomized into 'totally disagree, disagree, neutral' and 'totally agree, agree'.

Barriers and facilitators

Employees were asked to indicate the degree to which potential barriers or facilitators would respectively impede or facilitate them in their decision to participate in a WHPP. We

formulated two privacy-related barriers (e.g. 'I would rather keep my work and private life separate'), two health-related barriers (e.g. 'I'm healthy'), and another two work-related barriers (e.g. 'I have an unfavorable work schedule'). Two health-related facilitators were formulated (e.g. 'I want to improve my health'), and another two work-related facilitators (e.g. 'I find it enjoyable to work on my health together with colleagues.'). Since the purpose was to investigate whether the presence or absence of a factor was associated with participation, the five possible answers were dichotomized into 'totally disagree, disagree, neutral' and 'totally agree, agree'. Additionally, sum scores were calculated for barriers and facilitators based on the number of barriers and facilitators identified.

Beliefs about health at work

Three statements were formulated that addressed employees' beliefs with regard to workplace health promotion (e.g. 'It is a good thing that my employer is trying to improve employees' health'). Since the purpose was to investigate whether the presence or absence of a factor was associated with participation, the five possible answers were dichotomized into 'totally disagree, disagree, neutral' and 'totally agree, agree'.

Self-perceived health and health behavior

Self-perceived health was measured using the first question of the Short Form-12 (SF-12) questionnaire ("Overall, how would you rate your health during the past 4 weeks?"). The five possible answers were dichotomized into 'poor or fair' and 'good, very good, or excellent'.[29]

Body Mass Index (BMI: weight/height^2) was calculated based on self-reported weight in kilograms and height in meters and categorized into normal weight (BMI < 25 kg/m^2), overweight (25 ≤ BMI < 30 kg/m^2), and obese (BMI ≥ 30 kg/m^2).

Fruit and vegetable intake was measured using a slightly adapted version of the Dutch Food Frequency Questionnaire.[30] The six-item questionnaire asked about the monthly intake of different fruits (four items, e.g. apple, fruit juice) and vegetables (two items: cooked and raw vegetables). Dichotomization was based on the Dutch guidelines for healthy nutrition, which states that one should consume 200 grams of fruit and 200 grams vegetables daily. Employees who ate at least 400 grams of fruit and vegetables per day were considered those meeting the guidelines.

Physical activity was measured by a slightly adapted version of the International Physical Activity Questionnaire (IPAQ)[31], which measures physical activity of moderate and vigorous intensity. The average amount of leisure time spent on moderate and vigorous intensity physical activity was calculated as follows: employees were first asked how many days per week they engaged in moderate and vigorous intensity physical activity; they were then asked how many minutes on average was spent on moderate or vigorous intensity physical activity, per occasion. Dichotomization was based on recom-

mendations for moderate intensity physical activity that requires such levels of activity for at least 30 minutes per day.[32] Employees who were physically active at a moderate intensity level for at least 210 minutes a week (7 times 30 minutes) were considered to have met this recommendation. Someone who was active at vigorous intensity for at least 20 minutes on at least three occasions per week met the recommendations for vigorous intensity physical activity.

Smoking was assessed using a single-item question: "Do you smoke?". Answer possibilities were: 'yes', 'now and then', and 'no'. Employees answering the question with 'yes' or 'now and then' were defined as being a 'current smoker'.

Individual characteristics

The following individual characteristics were assessed: age, gender, and educational level. Age was categorized into three groups: 18-39, 40-49, 50-65. Educational level was determined by asking the employees about their highest level of education, which was then categorized as follows: low (primary school, lower and intermediate-level secondary schooling, or lower vocational training); intermediate (higher-level secondary schooling or intermediate vocational training); and high (higher vocational training or university).

Data analysis

Descriptive statistics were used to report on the following: characteristics of the study population; participation prior to enrollment and during follow-up; barriers, facilitators, beliefs about health at work, and social-cognitive factors; and positive intention and actual participation according to number of barriers or facilitators perceived.

Logistic regression analyses, adjusted for age, gender, educational level, and organization, were used to study associations between the independent and dependent variables. The independent variables were barriers and facilitators, beliefs about health at work, social-cognitive factors, health behaviors, and self-perceived health. The dependent variables were intention to participate and actual participation during the six-month follow-up period.

Additional analyses were conducted to investigate whether the associations between health behaviors and self-perceived health on the one hand, and intention to participate and actual participation on the other, remained after adjustment for barriers, facilitators, moral beliefs, and social-cognitive factors. We also investigated whether selective loss to follow-up occurred.

The odds ratio (OR) was estimated as measure of association with a corresponding 95% confidence interval (95% CI). All analyses were carried out using the IBM SPSS Statistics version 20 for Windows (SPSS Inc., Chicago, IL, USA).

RESULTS

Description of the study population

The study population consisted of 744 employees with a mean age of 44.9 years (SD: 9.2) and mean BMI of 25.7 kg/m^2 (SD: 3.6). Further details are presented in Table 1.

The percentage of employees aged 50 years or older was higher in the group who completed both questionnaires than in the group who completed only the baseline questionnaire (34% versus 26%), but gender and educational level distribution were similar. Employees lost to follow-up did not differ from those completing both questionnaires with regard to their intention to participate in a WHPP, past participation, health behavior, or self-perceived health. However, the percentage of employees with high self-efficacy was significantly lower among employees lost to follow-up (51% versus 63%) and a higher percentage of this group reported the barrier 'unfavorable work schedule' (17% versus 12%) (data not shown).

Table 1: Characteristics of the study population (n=744).

	n	%
Individual characteristics		
Age		
18-39	217	29.2
40-49	270	36.3
50-65	257	34.5
Male	548	73.7
Educational level		
Low	145	19.5
Intermediate	201	27.0
High	398	53.5
Health behaviors and health		
Body Mass Index		
Normal weight (BMI < 25 kg/m^2)	359	48.3
Overweight (25 ≤ BMI < 30 kg/m^2)	300	40.3
Obese (BMI 30kg/m^2 and higher)	85	11.4
Insufficient moderate physical activity (less than 30 min a day)	374	50.3
Insufficient vigorous physical activity (less than 3 days a week 20 min)	570	76.6
Insufficient fruit and vegetable intake (less than 400 grams a day)	493	66.3
Current smoker	140	18.8
Less than good self-perceived health	33	4.4
Participation in a health promotion program		
Intention to participate	195	26.2
Participated during the 12 month period prior to enrollment	95	12.8
Participation during six-month follow-up period	83	11.2

Participation in health promotion program

In the year before the baseline-measurement, 95 employees (13%) had participated in a WHPP (Table 2). During the six-month follow-up period, 83 employees (11%) participated in at least one HPP. The 83 employees participated in a total of 117 programs. Most employees participated in programs that were aimed at healthy nutrition (34%), health risks (32%), or physical activity (21%) (Table 2).

During the six-month follow-up period, 32 employees (34%) had continued with at least one program after enrollment (sustainers), 51 employees (8%) started with at least one program during follow-up (new), and 63 employees (66%) quit following a program (quitters) (Table 2).

Table 2: Actual participation in a health promotion program before enrollment and during follow-up divided by topic.

	Participation before enrollment	Participation during follow-up	Participation sustainers, new, and quitters		
			Sustainers	New	Quitters
	n=95	n=83	n=32	n=51	n=63
Physical activity	33%	21%	20%	21%	35%
Healthy nutrition	40%	34%	34%	34%	37%
Smoking cessation	1%	4%	2%	5%	0%
Stress management	13%	9%	14%	7%	14%
Health risks	14%	32%	30%	33%	14%

Participation before enrollment: participation in a WHPP during the 12-month period prior to the baseline measurement. Participation during follow-up: participation in a HPP during the six-month follow-up period. Sustainers: employees who participated in a program both before enrollment and also during follow-up. New: employees who only participated in a program during follow-up. Quitters: employees who only participated in a program before enrollment.

Social-cognitive factors

At baseline, 195 employees (26%) had a positive intention towards participating in a WHPP. Of those, 40 employees (21%) actually participated in a program during the six-month follow-up period. Employees with a positive intention at baseline were more likely to actually participate during follow-up (OR: 3.02, 95%CI: 1.88-4.83) (Table 3).

Employees who had a positive attitude towards WHPPs, a high level of social support, and a high level of self-efficacy had significantly higher odds of having a positive intention towards participating in a WHPP, and had slightly higher odds of actual participation during follow-up (Table 3). In particular, a positive attitude towards the importance of participating in a WHPP was strongly associated with a positive intention (OR: 43.00, 95%CI: 26.83-68.91) and was also statistically significantly associated with actual participation during the six-month follow-up period (OR: 2.81, 95%CI: 1.76-4.49) (Table 3).

Table 3: Characteristics of the determinants and their association with intention to participate and actual participation during follow-up.

	Positive on statement	Positive intention (n=195)	Actual participation during follow-up (n=83)
	n (%)	OR (95%CI)	OR (95%CI)
Intention to participate in a WHPP	195 (26.2)	n/a	3.02 (1.88-4.83)*
Participated during the 12 month period prior to enrollment	95 (12.8)	5.92 (3.70-9.49)*	5.82 (3.40-9.96)*
Social-cognitive factors			
Attitude			
Important to participate	215 (28.9)	43.00 (26.83-68.91)*	2.81 (1.76-4.49)*
Pleasant to participate	620 (83.3)	8.64 (3.73-20.06)*	1.99 (0.93-4.27)
Social support			
Colleagues and or supervisor stimulate participation	68 (9.1)	2.83 (1.70-4.73)*	1.77 (0.90-3.49)
Family and or friends stimulate participation	79 (10.6)	6.84 (4.13-11.31)*	1.64 (0.86-3.15)
Self-efficacy			
High self-efficacy	467 (62.8)	4.43 (2.89-6.79)*	1.60 (0.96-2.66)
Barriers			
Privacy related			
Holding work and private preferably separate	371 (49.9)	0.44 (0.31-0.62)*	0.91 (0.57-1.46)
Want to organize it self	434 (58.3)	0.25 (0.18-0.36)*	0.92 (0.58-1.48)
Health related			
I'm healthy	531 (71.4)	0.74 (0.52-1.06)	1.25 (0.74-2.11)
Currently under treatment	140 (18.8)	1.32 (0.88-1.99)	1.50 (0.88-2.58)
Work related			
Unfavorable work schedule	90 (12.1)	1.48 (0.91-2.41)	0.64 (0.28-1.45)
Not knowing who to go to	77 (10.3)	1.67 (1.01-2.76)*	0.65 (0.27-1.56)
Facilitators			
Health related			
Wanting to improve my health	498 (66.9)	7.15 (4.26-12.00)*	1.44 (0.86-2.42)
Thinking a WHPP is useful	419 (56.3)	13.50 (7.98-22.83)*	1.45 (0.90-2.35)
Work related			
Pleasant to engage in activities with colleagues	150 (20.2)	3.78 (2.58-5.55)*	1.07 (0.61-1.89)
Supervisor or colleagues expect me to participate	28 (3.8)	3.00 (1.40-6.46)*	2.87 (1.17-7.02)*
Beliefs about health at work			
Good thing that the supervisor tries to improve employees health	599 (80.5)	4.44 (2.43-8.10)*	0.93 (0.52-1.65)
Interference of my supervisor on my health is an invasion of my privacy	139 (18.7)	0.45 (0.27-0.74)*	1.22 (0.69-2.17)
My health is a personal matter	485 (65.2)	0.69 (0.49-0.98)*	0.81 (0.50-1.30)

Positive intention: employees with a positive intention towards participating in a WHPP. Participation during follow-up: employees who participated in a HPP during the six-month follow-up period. Determinants are categorized into social-cognitive factors, barriers, facilitators, and beliefs about health at work.
Analyses adjusted for age, gender, educational level, and organization.
* statistically significant at $p < 0.05$
n/a: not applicable

Barriers and facilitators

The higher the number of barriers perceived by employees as preventing them from participating in a WHPP, the less likely they were to have a positive intention towards participating in a WHPP. The reverse pattern was observed for the number of facilitators perceived. These patterns were not observed for actual participation (Figure 1).

The most frequently mentioned barrier preventing participation in a WHPP was 'I am already healthy' (71.4%) and the most frequently mentioned facilitator was 'I want to improve my health' (66.9%) (Table 3).

Employees who stated that privacy-related factors would inhibit them from participating in a WHPP were more likely to have a negative intention towards participation. All facilitators increased the likelihood of having a positive intention towards participation (ORs: 3.00-13.50). An increased likelihood for actual participation was also observed for these barriers and facilitators, but to a lesser – non-significant – extent (Table 3).

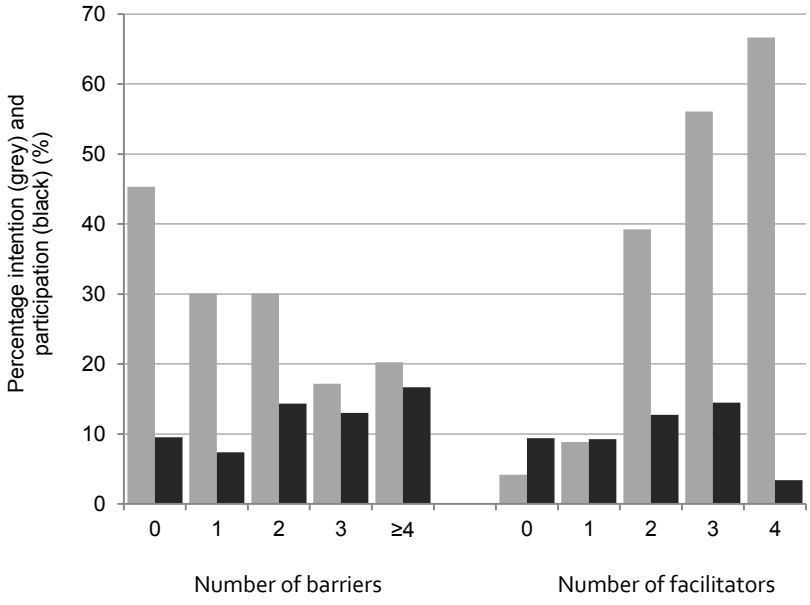

Figure 1: Number of barriers (left) or facilitators (right) perceived by the employees against the percentage of employees who expressed a positive intention to participate in a WHPP (grey) or actually participated (black).

Beliefs about health at work

In total, 81% of participants thought it was a good idea that their employer would try to improve employees' health, and only 19% considered it to be a violation of their privacy for their supervisor to interfere with their health. Employees who were positive about

health promotion at work were more likely to have a positive intention towards participating in a WHPP, but were not more likely to actually participate (Table 3).

Self-perceived health and health behaviors

Employees whose self-perceived health was less than good were more likely to have a positive intention towards participating in a WHPP (OR: 2.36, 95%CI: 1.15-4.82). However, such employees were not more likely to actually participate during follow-up (Table 4). None of the health behaviors were statistically significantly associated with either intention to participate or actual participation (Table 4). The strength of the associations between health and health behaviors and intention and participation barely changed following adjustment for barriers and facilitators (data not shown).

Table 4: Adjusted associations between health behaviors and self-perceived health, and positive intention and actual participation during follow-up.

	Positive intention (n=195)	Actual participation during follow-up (n=83)
	OR (95%CI)	OR (95%CI)
Health behaviors and health		
Body Mass Index		
Overweight	1.00 (0.69-1.45)	1.21 (0.72-2.04)
Obesity	1.37 (0.80-2.33)	1.77 (0.89-3.58)
Insufficient moderate physical activity	0.87 (0.63-1.22)	1.56 (0.97-2.50)
Insufficient vigorous physical activity	0.72 (0.49-1.04)	0.71 (0.43-1.19)
Insufficient fruit and vegetable intake	0.71 (0.50-1.00)	1.16 (0.71-1.90)
Smoking	0.85 (0.55-1.31)	0.60 (0.30-1.18)
Less than good self-perceived health	2.36 (1.15-4.82)*	1.38 (0.51-3.71)

Positive intention: employees with a positive intention towards participating in a WHPP.
Actual participation during follow-up: employees who participated in a HPP during the six-month follow-up period.
Adjusted for age, gender, educational level, and organization.
* statistically significant at $p < 0.05$

DISCUSSION

A minority of the employees who responded (26%) had a positive intention towards participating in a WHPP, and even fewer employees (11%) actually participated during the six-month follow-up period. Although employees who had a positive intention were more likely to actually participate in a HPP, only 21% of those employees with a positive intention turned this into action by actually participating in a HPP. Employees who experienced barriers were more likely to have a negative intention while those who experienced facilitators were more likely to have a positive intention towards participat-

ing in a WHPP. Employees were also more likely to have a positive intention if they had a positive attitude towards WHPPs, a high level of social support, and a high level of self-efficacy and if their self-perceived health status was less than good. However, very few of the tested possible determinants predicted actual participation during the six-month follow-up period.

The fact that we found such low levels of participation is partly in line with findings from others. A systematic review has shown that participation varies greatly between WHPPs, with a median participation of 33%.[13] The fact that the studies included in this review targeted newly implemented programs, while the current study assessed participation in programs already offered by the organizations, might explain the lower levels of participation observed here. The organizations in our study did not implement any new HPPs during the study period. It is also possible that employees who were motivated to participate had already attended a program in the past and, therefore, did not participate again. This notion of newness improving participation is supported by the results of a Delphi study that found that exposure to a behavior change intervention improved when the content of the intervention was changed regularly.[33]

Social cognitive theories such as the ASE-model[23] hypothesize that a positive attitude, high levels of social support, and high self-efficacy bring about a positive intention, which then leads to a behavior change. The first step is corroborated in this study: a positive attitude, a high level of social support, and a high self-efficacy were associated with a positive intention towards participation. However, our study could not corroborate the importance of specific behavioral determinants as observed in other studies on social-cognitive factors and actual behavior, for instance with an increase in fruit and vegetable intake.[34, 35] Although the second step – from intention to behavior – is also supported by our results (i.e. a positive intention predicted actual participation), in absolute terms, only 21% of those with a positive intention actually participated. This corroborates the idea of the so-called intention–behavior gap, whereby a positive intention does not necessarily result in a behavior change. The modest proportion of 21% falls within the range of 18% to 60% observed in a meta-analysis that studied the relationship between intention and behavior with regard to physical activity.[27] The intention-behavior gap was also seen in two other meta-analyses, which demonstrated that, when implementing interventions, targeting intention has limited success in changing behavior.[28, 36] In order to positively mediate the relationship of intention with behavior, careful planning, maintaining a high self-efficacy, and action control have been suggested.[37] So, although intention may predict behavior, researchers must be aware of a possible intention-behavior gap when conducting future research using intention as a proxy for behavior.

Almost all factors (i.e. social-cognitive factors, barrier, facilitators, and beliefs about health at work) were statistically significantly associated with intention to participate, but

not with actual participation during the six-month follow-up period. This suggests that other factors play a role when deciding to actually participate. One explanation might be that programs do not match employees' preferences. In other words, enrollment of participants may have been limited due to the set-up of the programs (e.g. group or individual programs; receiving information or completing assignments as content), the time at which the program takes place (e.g. after work hours)[20], or the way the program is delivered (e.g. provision of information, availability).[38] A second reason might be the influence of the social environment on actual participation. Social ecological models hypothesize that an individual's behavior is affected by factors at different levels: intrapersonal, interpersonal, institutional, community/society, and policy.[39] In this context, an employee might have the intention to participate in a program (intrapersonal), but may not be supported by management in executing his intended behavior (institutional level), for example in the case of WHPPs not being offered during work time.[39] Management support is found to be a major contributor to the success of WHPPs[40-42], which is supported by our results that showed that employees were more likely to participate when they felt that their supervisor or colleagues expects them to participate.

In an additional analysis, we found that barriers and facilitators had no influence on the transition from intention to participation. However, one should bear in mind that this analysis had limited power due to the small number of employees with a positive intention who also reported actual participation in a HPP.

Our finding that employees' health behavior did not significantly influence their intention nor their actual participation during follow-up is in line with that of Groeneveld and colleagues (2009).[17] Jorgensen and colleagues (2013) described that employees with a moderate self-perceived health were more likely to contact a health professional.[43] In our study, a low self-perceived health status was significantly associated with a positive intention, indicating that those employees who need it most are indeed interested. However, self-perceived health was not related to actual participation.

It has been suggested previously that research aimed at gaining more insight into the determinants of participation should focus on the underlying reasons for success and failure in participation.[39] Indeed, theories and frameworks such as the 'Intervention mapping' protocol[44] and participatory and peer-led interventions have been developed to this end, both aimed at developing successful interventions with a high take-up level by incorporating the needs and preferences of potential participants. Since the current study had an individualistic focus, future research needs to investigate the influence of the physical and social environment on actual behavior and whether this might partly explain the intention-behavior gap in participation.

Limitations

This study has four main limitations. First, the fact that the study-design investigating associations with intention were cross-sectional does not permit further exploration with regard to causality. However, the relation between potential determinants and actual participation were studied using a study design with a six-month follow-up. Second, employees' intention to participate was questioned about HPPs at the workplace, while actual participation was determined for HPPs both at the workplace and at employees' own discretion. The data structure made it impossible to disentangle participation through work and at a private setting; employees could have indicated that they had participated in multiple programs, one of which might have been through work and the other in a private setting. Therefore, actual participation in programs organized or facilitated by the employer might be even lower. In addition, this discrepancy in how participation is questioned might have led to differences in ORs for intention and actual participation, since these factors relate to a greater extent to participation in a WHPP (intention) than to a HPP (actual participation). However, the relations with actual participation were not statistically significant. The third limitation stems from the low percentage of employees who actually participated in a HPP during the six-month follow-up period, which resulted in a lack of statistical power. This is illustrated by several high non-significant ORs for relations between specific determinants and actual participation (for example, 'colleagues and or supervisor stimulate participation'). Future research in larger populations recommended. Finally, selection bias as well as reporting bias cannot be ruled out. It could be hypothesized that employees with a low intention towards participating in a WHPP did not participate in this study. A large proportion of employees in this study had a negative intention towards participating in a WHPP therefore, this will most likely not have affected our results. However, the prevalence of a less than good self-perceived health was lower among participants (4.4%) than in the general Dutch population (19.9%).[45] This difference might be partly explained by that the general population also includes unemployed and disabled persons who are more likely to have a poor self-perceived health status. For future research, it is recommended to gather also information on the health-related characteristics of non-responders. With regard to loss to follow-up, no differences were found with regard to gender, educational level, health, and health behaviors between employees who completed both questionnaires and those who completed only the baseline questionnaire.

CONCLUSION

Overall, actual participation of employees in health promotion programs was limited. Although a positive intention predicted actual participation, most employees with a positive intention did not engage in a health promotion program during the six-month follow-up period, indicative of an intention-behavior gap. Employees with a positive attitude, high levels of social support, and a high self-efficacy were more likely to have a positive intention to participate in a WHPP. Employees perceiving barriers were less likely to express a positive intention towards participation, while the opposite was true for employees perceiving facilitators. Employees with a less than good self-perceived health status were more likely to have a positive intention, indicating that those employees who need it most are also those most interested. Actual participation was higher among those employees who considered participation important and thought it was expected of them by their supervisor or colleagues, corroborating the idea that the workplace could be a fruitful setting for health promotion.

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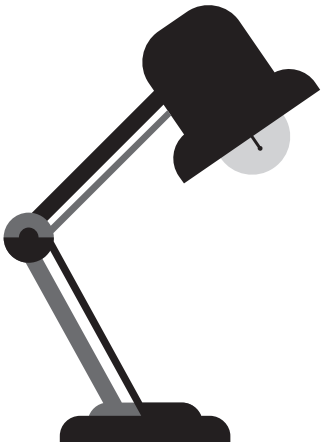

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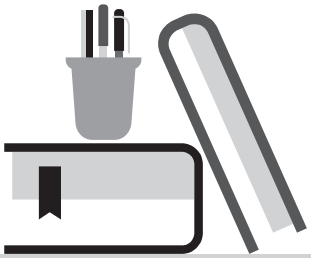
HOW NEEDS AND PREFERENCES OF EMPLOYEES INFLUENCE PARTICIPATION IN HEALTH PROMOTION PROGRAMS: A SIX-MONTH FOLLOW-UP STUDY



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ABSTRACT

Background: Low participation in health promotion programs (HPPs) might hamper their effectiveness. A potential reason for low participation is disagreement between needs and preferences of potential participants and the actual HPPs offered. This study aimed to investigate employees' need and preferences for HPPs, whether these are matched by what their employers provide, and whether a higher agreement enhanced participation.

Methods: Employees of two organizations participated in a six-month follow-up study (n=738). At baseline, information was collected on employees' needs and preferences for the topic of the HPP (i.e. physical activity, healthy nutrition, smoking cessation, stress management, general health), whether they favored a HPP via their employer or at their own discretion, and their preferred HPP regarding three components with each two alternatives: mode of delivery (individual vs. group), intensity (single vs. multiple meetings), and content (assignments vs. information). Participation in HPPs was assessed at six-month follow-up. In consultation with occupational health managers (n=2), information was gathered on the HPPs the employers provided. The level of agreement between preferred and provided HPPs was calculated (range: 0-1) and its influence on participation was studied using logistic regression analyses.

Results: Most employees reported needing a HPP addressing physical activity (55%) and most employees preferred HPPs organized via their employer. The mean level of agreement between the preferred and offered HPPs ranged from 0.71 for mode of delivery to 0.84 for intensity, and was 0.47 for all three HPP components within a topic combined. Employees with a higher agreement on mode of delivery (OR: 1.72, 95%CI: 0.87-3.39) and all HPP components combined (OR: 2.36, 95%CI: 0.68-8.17) seemed to be more likely to participate in HPPs, but due to low participation these associations were not statistically significant.

Conclusion: HPPs aimed at physical activity were most needed by employees. The majority of employees favor HPPs organized via the employer above those at their own discretion, supporting the provision of HPPs at the workplace. This study provides some indications that a higher agreement between employees' needs and preferences and HPPs made available by their employers will enhance participation.

INTRODUCTION

Workplace health promotion programs (WHPPs) are increasingly being provided to employees, especially in larger organizations.[1] Such programs have shown to be able to improve employees' lifestyle (e.g. physical activity, nutrition).[2-4] Moreover, WHPPs may increase employees' productivity at work and decrease their sickness absence.[5-8] However, effect sizes (ES = 0.24) of WHPPs are often modest[9], and although most employees are interested in WHPPs[10] few actually participate.[11] Since low participation limits the potential effectiveness of WHPPs it is essential to study how to enhance participation.[12]

The effectiveness of WHPPs as well as participation in WHPPs differ by demographic and intervention characteristics. Female employees are more inclined to participate and WHPPs among younger employees show greater effects.[9, 11] Higher participation is reached with WHPPs focusing on multiple behaviors and consisting of various components[11] and effectiveness of WHPPs is greater when it consists of multiple meetings.[9] Hence, participation in WHPPs and its effectiveness depend partly on the characteristics of the study population and the design of the WHPP. Furthermore, barriers related to the individual (e.g. no time, no motivation) as well as logistic reasons (e.g. location and time of the program) during implementation are often said to impede participation.[13-17] Although these barriers lower the likelihood of employees having a positive intention towards participation, they hardly influence their decision to actually participate.[18] So, more insight is needed into other factors that might explain participation.

Frameworks like the 'intervention mapping' protocol[19] and 'precede-proceed' model[20] emphasize the importance of a needs assessment for developing health promotion programs (HPPs) that are attractive and address the needs and preferences of the target population. Hence, a disagreement between the needs and preferences of the target population and the HPPs provided might lower participation. Studies on preferences for HPPs are often qualitative or limited to a HPP developed for a specific research purpose.[21-24] There is a lack of quantitative studies investigating HPP needs and preferences in general. Furthermore, it is unknown whether the degree to which individuals' preferences are met will actually enhance participation. At the workplace, low participation might be due to a mismatch between the needs and preferences of the employees and the HPPs their employers provide.

This study aimed to investigate employees' need and preferences with regard to HPPs, whether these are matched by what their employers provide, and whether a higher level of agreement enhances participation.

METHODS

Study population

The population in this six-month follow-up study consisted of employees of a plastics manufacturer (organization 1, n=874) and a paint manufacturer (organization 2, n=1281). Both organizations had in place a variety of HPPs that were accessible for all employees.

Between 2010 and 2012, all employees were invited by e-mail to fill in two online questionnaires: a baseline questionnaire and a follow-up questionnaire six months later. For this study, we included all employees who completed both the baseline and follow-up questionnaires.

Of the 2155 employees invited, 1128 (52%) completed the baseline questionnaire. Of this group, 761 (68%) also completed the follow-up questionnaire after six months and 748 employees (98%) provided informed consent. Four employees were excluded due to implausible or missing data on height, weight, or physical activity, and six employees because of incomplete information on HPP preferences. The final study sample comprised 738 employees (organization 1, n=276; organization 2, n=462).

Informed consent was requested at the start of the questionnaire. The Medical Ethical Committee of Erasmus MC (Rotterdam, the Netherlands) declared that the Medical Research Involving Human Subjects Act did not apply to the current study and the committee had no objection to the execution of this study.

Data collection

Participation in a HPP

At six-month follow-up, employees were asked whether or not they had actually participated in a HPP during the six-month follow-up period. A HPP was defined in the questionnaire as follows: "A program that is aimed at improving your health behavior. For example, smoking cessation program, fitness participation, participating in a meeting on healthy nutrition.". HPPs could either be organized by the employer or by the employees themselves (referred to as 'own discretion').

HPP preferences

At baseline, all employees were asked about their needs and preferences with regard to HPPs. The first question asked about the topic the HPP needed to address, distinguishing physical activity, healthy nutrition, smoking cessation, stress management, and general health ("When you would participate in a health promotion program, what should it be aimed at?"). Every employee was asked to choose at least one topic but multiple topics were permitted. A summation was calculated for the number of HPP topics the employee indicated. Per topic, employees were asked whether they favored

a HPP that was organized via their employer or at their own discretion. Additionally, per topic, employees were asked about what HPP they preferred with regard to three components with each two alternatives: mode of delivery (individual versus group program), intensity (single meeting versus multiple meetings), and content (provide information versus assignments).

HPPs offered by employers

In consultation with the occupational health managers (n=2), we collected information on the HPPs they provided. We specifically asked about the HPPs they provided that focused on physical activity, healthy nutrition, smoking cessation, stress management, or improving general health. Examples of HPPs the organizations offered are a fitness center on site or appointments with a dietician (Appendix 1). We categorized all provided HPPs according to the three components of the design of the HPP (i.e. mode of delivery, intensity, and content) (Appendix 2).

Level of agreement

By comparing employees' preferences for a HPP within a specific topic with the HPPs employers provided on that topic we assessed whether there was a match with regard to three components of the HPP (i.e. mode of delivery, intensity, content) per topic. Furthermore, the percentage of 'overall agreement' was calculated per HPP topic. This indicates the percentage of employees for whom their preferred HPP matched on all three components with what their employer provided.

Three different levels of agreement were calculated. The first level of agreement was assessed for each of the three components (i.e. mode of delivery, intensity, content) across all topics. This first level of agreement indicated the number of agreements between employees' preferences for the specific component and that of the HPPs provided expressed by the number of preferences, taking into account the number of topics an employee had indicated. The second level of agreement was calculated across all HPP topics and all components. It is the aggregated measure of the first levels of agreement and is referred to as all component agreement. The third level of agreement was calculated across all components per HPP topic. It assessed the agreement between employees' preference for a particular combination of components for a specific topic with the characteristics of the HPPs provided. This level of agreement is the strictest measure and is referred to as complete program agreement. All levels of agreement have a score ranging from 0 (no agreement at all) to 1 (perfect agreement).

Self-perceived health and health behavior

Self-perceived health was measured using the first question on the Short Form-12 (SF-12) questionnaire ("Overall, how would you rate your health during the past 4 weeks?").

The five possible answers were dichotomized into 'poor or fair' and 'good, very good, or excellent'.[25]

Body mass index (BMI: weight/height^2) was calculated based on self-reported height in meters and weight in kilograms and categorized into normal weight (BMI < 25 kg/m^2), overweight (25 ≤ BMI < 30 kg/m^2), and obesity (BMI ≥ 30 kg/m^2).

Physical activity was measured using a slightly adapted version of the International Physical Activity Questionnaire (IPAQ)[26], which measures physical activity of moderate intensity. The average amount of leisure time spent on moderate intensity physical activity was calculated at follows: employees were first asked how many days per week they engaged in moderate intensity physical activity; they were then asked how many minutes on average was spent on moderate intensity physical activity, per occasion. Dichotomization was based on recommendations for moderate intensity physical activity that requires such levels of activity for at least 30 minutes per day.[27] Employees who were physically active at a moderate intensity level for at least 210 minutes a week (7 times 30 minutes) were considered to have met this recommendation.

Fruit and vegetable intake was measured using a slightly adapted version of the Dutch Food Frequency Questionnaire.[28] The six-item questionnaire asked about the monthly intake of different fruits (four items, e.g. apple, fruit juice) and vegetables (two items: raw and cooked vegetables). Dichotomization was based on the Dutch guidelines for healthy nutrition that states that one should to consume 200 grams of fruit and 200 grams vegetables daily. Employees who ate at least 400 grams of fruit and vegetables per day were considered to meet the guidelines.

Smoking was assessed using a single-item question: "Do you smoke?". Answer possibilities were: 'yes', 'now and then', and 'no'. Employees answering the question with 'yes' or 'now and then' were defined as being a 'current smoker'.

Individual characteristics

The following individual characteristics were assessed: age, gender, and educational level. Age was categorized into three groups: 18-39, 40-49, and 50-65. Educational level was determined by asking the employees about their highest level of education, which was then categorized as follows: low (primary school, lower and intermediate-level secondary schooling, or lower vocational training); intermediate (higher-level secondary schooling or intermediate vocational training); and high (higher vocational training or university).

Data analysis

Descriptive statistics were used to report on the following: the characteristics of the study population, the topic the HPP needed to address according to the employees, whether employees favored the HPP to be organized by their employer or at their own

discretion, the preferred HPP per topic with regard to the three components (i.e. mode of delivery, intensity, content), and the levels of agreement between the preferred HPP and those provided by the employer.

First, logistic regression analysis were used to assess whether selective loss to follow-up had occurred. Second, logistic regression analyses were used to study associations between individual characteristics (age, gender, educational level) and the five needed topics of the HPP (i.e. physical activity, healthy nutrition, smoking cessation, stress management, general health). Third, logistic regression analyses were used to study how the health behaviors of the employees were associated with the corresponding topic of the HPP. Last, logistic regression analyses, adjusted for individual characteristics, were used to study associations between the three different levels of agreement and participation in a HPP. In these analyses, the level of agreement was entered as a continuous variable.

The odds ratio (OR) was estimated as measure of association with a corresponding 95% confidence interval (95%CI). All analyses were carried out using the IBM SPSS Statistics version 20 for Windows (SPSS Inc., Chicago, IL, USA).

RESULTS

Description of the study population

The study population consisted of 738 employees with a mean age of 44.9 years (SD: 9.3) and mean BMI of 25.6 kg/m^2 (SD: 3.6). Further details are presented in Table 1.

The percentage of employees aged 50 years or older was higher in the group who completed both questionnaires than in the group who completed only the baseline questionnaire (34% versus 26%), other individual characteristics were similarly distributed. Employees lost to follow-up did not differ from those completing both questionnaires with regard to self-perceived health and health behavior. Fewer employees who completed both questionnaires had a preference for a smoking cessation program (7% versus 11%).

Health promotion program preferences

More than half of the employees (55%) reported to need a HPP that addresses physical activity, followed by general health (45%), stress management (39%), healthy nutrition (33%), and smoking cessation (7%). About half of the employees (47%) indicated needing only one topic to be addressed by a HPP, 32% of the employees indicated two topics, and 21% three or more topics.

In general, most employees favored HPPs organized by their employer rather than those at their own discretion (59%). Across all topics, employees preferred HPPs that had an individual focus (67%) and HPPs that consisted of multiple meetings (62%). For HPPs

Table 1: The characteristics of the study population (n=738).

	n	%
Individual characteristics		
Age		
18-39	217	29.4
40-49	268	36.3
50-65	253	34.3
Male	544	73.7
Educational level		
Low	142	19.2
Intermediate	199	27.0
High	397	53.8
Health behaviors		
Body Mass Index (BMI)		
Normal weight (BMI < 25 kg/m^2)	358	48.5
Overweight (25 ≤ BMI < 30 kg/m^2)	297	40.2
Obese (BMI 30 kg/m^2 and higher)	83	11.2
Insufficient moderate intensity physical activity (less than 30 min a day)	371	50.3
Insufficient fruit and vegetable intake (less than 400 grams a day)	489	66.3
Current smoker	140	19.0
Self-perceived health		
Less than good self-perceived health	33	4.5
Participation in a health promotion program		
Participation during six-month follow-up period	83	11.2

that address physical activity or stress management, employees favored that the HPP gave assignments. For HPPs addressing the other topics (i.e. healthy nutrition, smoking cessation, and general health) employees favored HPPs that provide information (Table 2).

The need for a specific HPP topic differed by individual characteristics. HPPs addressing physical activity (18-39: OR: 1.58, 95%CI: 1.09-2.28), healthy nutrition (18-39: OR: 1.99, 95%CI: 1.34-2.96; 40-49: OR: 1.73, 95%CI: 1.18-2.53), and stress management (18-39: OR: 1.82, 95%CI: 1.25-2.64) were more often needed by younger employees, while HPPs focusing on general health were particularly requested by older employees (50-64: OR: 1.76, 95%CI: 1.21-2.54). Needs for HPPs on physical activity (intermediate: OR: 1.54, 95%CI: 1.00-2.38; high: OR: 1.52, 95%CI: 1.04-2.24) and stress management (intermediate: OR: 2.47, 95%CI: 1.53-3.97; high: OR: 2.35, 95%CI: 1.53-3.63) were more often expressed by higher educated compared to lower educated employees, while smoking cessation HPPs were mainly requested by lower (OR: 2.64, 95%CI: 1.28-5.44) and intermediate (OR: 2.36, 95%CI: 1.20-4.65) educated employees. Only for stress management HPPs there

Table 2: Preferences for health promotion programs among 738 employees.

	Setting	Mode of delivery	Intensity	Content
	Offered by employer rather than at own discretion	Individual rather than group	Multiple meetings rather than once	Assignments rather than information
Topic				
Physical activity (n=406)	58%	64%	69%	71%
General health (n=334)	59%	64%	47%	32%
Stress management (n=290)	58%	70%	69%	56%
Healthy nutrition (n=240)	62%	74%	60%	43%
Smoking cessation (n=51)	63%	65%	65%	37%

was a gender difference, with more female than male employees needing HPPs focusing on this topic (OR: 2.36, 95%CI: 1.69-3.29).

Employees being insufficiently physical active on a moderate intensity were more likely to indicate a need for a HPP addressing physical activity (OR: 1.45, 95%CI: 1.08-1.94) and employees who currently smoked were more likely to express needing a smoking cessation HPP (OR: 58.04, 95%CI: 22.49-149.81). For all other HPP topics no statistically significant associations were found between employees' health behavior and the corresponding HPP (data not shown).

Agreement between preferred and offered HPPs

Table 3 shows the degree of agreement for the 15 comparisons between the preferences of employees with regard to HPPs and what their employer provided. For five comparisons, all preferences were matched by the HPPs the employer provided. For the other comparisons, the degree of agreement ranged between 31% and 86% with a mean degree of agreement of 70%. The preferred HPP matched on all three components with what the organizations provided for 24% of the employees who needed a smoking cessation HPP to 69% for employees needing a physical activity HPP (Table 3).

The mean level of agreement on the three components of the HPPs varied from 0.71 (SD: 0.37) for mode of delivery to 0.84 (SD: 0.31) for intensity. The mean level of agreement on all components was 0.78 (SD: 0.20) and that of the complete program was 0.47 (SD: 0.41) (Table 4).

Influence of the levels of agreement on participation

Employees who indicated needing at least two topics to be addressed by a HPP were not more likely to participate in a HPP as compared to those employees who indicated a single topic (OR: 1.30, 95%CI: 0.82-2.07). The influence of the level of agreement on the separate components of the HPP (the first level of agreement) on actual participation

Table 3: Agreement (%) between preferred and offered health promotion programs (HPPs) among 738 employees, stratified by topic.

Components	Mode of delivery	Intensity	Content	Complete program
Topic				
Physical activity (n=406)	100%	69%	100%	69%
General health (n=334)	64%	100%	67%	45%
Stress management (n=290)	31%	91%	86%	26%
Healthy nutrition (n=240)	83%	100%	57%	46%
Smoking cessation (n=51)	35%	27%	43%	24%

ranged from OR=1.12 (95%CI: 0.55-2.28) for content to OR=1.72 (95%CI: 0.87-3.39) for mode of delivery. Employees with a higher agreement on all components combined seemed to be more likely to participate (OR: 2.36, 95%CI: 0.68-8.17). However, this association was not statistically significant. Agreement on all components within a topic between the preferred HPP and the HPP provided by the employers, the third level of agreement, did not enhance participation (OR: 0.99, 95%CI: 0.57-1.74) (Table 4). Age, gender, and educational level were not statistically significantly associated with participation (ORs close to unity) (data not shown).

Table 4: The influence of levels of agreement on participation in HPP among 738 employees.

	Level of agreement	Participation in HPP (n=83)
	Mean (SD)	OR (95%CI)
Level of agreement on		
Mode of delivery (0-1)	0.71 (0.37)	1.72 (0.87-3.39)
Intensity (0-1)	0.84 (0.31)	1.19 (0.55-2.58)
Content (0-1)	0.80 (0.33)	1.12 (0.55-2.28)
All components (0-1)	0.78 (0.20)	2.36 (0.68-8.17)
Complete program (0-1)	0.47 (0.41)	0.99 (0.57-1.74)

Note: the analyses are adjusted for individual characteristics, the level of agreement is a continuous variable, therefor the OR indicates the increase in odds by an increase in agreement.
HPP: health promotion program

DISCUSSION

Most employees needed a HPP aimed at improving physical activity. HPPs organized via the employer were favored rather than those at employees' own discretion. The preferred HPP for addressing physical activity had the highest agreement with the HPPs

the employers provided, followed by HPPs on healthy nutrition, general health, stress management, and smoking cessation. The mean level of agreement for the HPP components (i.e. mode of delivery, intensity, and content) ranged from 0.71 (mode of delivery) to 0.84 (intensity) with an agreement of 0.47 for the complete HPP. The results provided some indications that employee's with a higher agreement between their preferences and what their employer provided were more likely to participate in HPPs.

Physical activity is the most needed topic for HPP according to the respondents. The popularity of physical activity HPPs was also observed by Persson and colleagues (2014).[29] In their study, 46% of the employees expressed that they were willing to change their health behavior in relation to physical activity. Furthermore, in a recent systematic review on WHPPs aimed at a healthy lifestyle, the majority (61%) of the included WHPPs focused on improving physical activity.[9] Our finding that most employees favored a HPP organized by their employer corroborates earlier findings[10, 30] and supports the provision of HPPs at the workplace. It emphasizes the need to develop effective WHPPs attractive to employees. A concern in workplace health promotion is whether those employees are reached who would benefit most by participating in HPPs.[31, 32] Previous studies showed mixed results on this issue.[33, 34] We found that those employees not meeting the physically activity recommendations were more likely to indicate needing a HPP aimed at increasing physical activity. However, for the other health behaviors no association was found between unfavorable health behaviors and an expressed need for a HPP addressing that health behavior.

The needed topic of the HPP differed between demographic groups. Younger employees more often stated needing a HPP focusing on physical activity, healthy nutrition, and stress management while older employees wanted HPPs that addressed general health. The latter might reflect the higher prevalence of common health problems and chronic diseases at older age. Due to the differences in the needs of employees, it is recommended to conduct needs assessments and tailor interventions to the characteristics of the target population. Studies incorporating these methods have shown to lead to more positive results with regard to program effectiveness and appreciation.[35-37] Moreover, performing subgroup analysis in future research may expand our knowledge on who participates in which types of WHPP.

Previous studies investigating preferences for health promotion were often qualitative or they studied preferences with regard to the development of a specific program.[21-24] Blackford et al (2013) is one of the few investigating preferred strategies for WHPPs in general and reported that most employees preferred a stretching program at their desk and personalized dietary recipes.[13] However, the preferred HPPs were not implemented and therefore they could not study whether employees were indeed going to participate in the preferred programs. In our study, the needs and preferences of employees

for HPPs were investigated using questionnaires. In addition, we studied how well the HPPs the organizations provided matched the preferences of the employees. For HPPs on physical activity there was a high agreement between preferred HPPs and those provided (69%). This was due to the great diversity of physical activity programs the employers provided. Smoking cessation programs had the lowest agreement, but since only one organization provided such programs this result is distorted. For the organization that did provide smoking cessation programs, the level of agreement was much higher (55%). The limited provision of HPPs on smoking cessation may reflect a shift towards attention for implementing smoking bans. Employers in the Netherlands are since 2004 obliged by law to provide smoke-free workplaces.

Some indications were found that employees with a higher level of agreement on the way a program was delivered were more likely to participate in a HPP. For the participating organizations, there was a relatively high agreement on this component for HPPs addressing physical activity, healthy nutrition, and general health. However, for stress management HPPs there seems to be a lack of individually based HPPs. The associations between all component (second level of agreement) and complete program (third level of agreement) agreement and participation revealed that participation became more likely when more of the employees' preferences were matched by the HPP provided by the employers. However, a match on all three components of the HPP within a topic did not enhance participation. Hence, it seems that agreement on all HPP components is unnecessary for participation. Since agreement on the mode of delivery had the highest odds for participation, we assume that a match on this component is most important for participation.

Due to a limited number of employees actually participating in HPPs (11%) the associations between the levels of agreement and participation were not statistically significant and should therefore be interpreted with caution. However, the ORs of the specific components as well as of all components combined are in the same direction. It would be interesting to investigate in a larger cohort whether our results are corroborated. In future research, it might also be interesting to question about the preferred delivery of the content (e.g. through the internet, face-to-face) and to study whether a better fit between preferred and provided HPPs will lead to greater effectiveness. Moreover, previous research showed that the physical and social environment, incentives, time constraints, management support, and the possible outcome achieved could influence participation.[12, 38-43] In future research it would be interesting to investigate whether these factors modify the observed influence of workers' preferences on participation.

Strengths and Limitations

As far as we know this is the first study investigating the influence of the level of agreement between employees' preferences for a HPP and the HPPs provided by employers

on participation in HPPs. A strength of this study is the follow-up design. Therefore, we could assess actual participation instead of intention to participate, which is often used as a proxy for participation.[44] However, a positive intention does not always result in actual participation.[18] In addition, by using a follow-up design reversed causality is less likely whereby participation in a HPP will influence preferences for a specific program, which were questioned in the baseline questionnaire. However, the short follow-up period of the study may have resulted in the limited number of employees who actually participated in a HPP and, consequently, in a lack of power. Furthermore, concerning reporting bias and selection bias, no statistically significant differences were found on gender, educational level, health behaviors, and self-perceived health between employees who completed both questionnaires and those lost to follow-up. Last, since all participants were employed in the manufacturing industry, the generallizability of the findings to other sectors of industry may be questioned. Nonetheless, employees with a variety of jobs were enrolled into the study. Future research is advised to include a variety of organizations to increase statistical power and generalizability of the results. Furthermore, with a larger study population, it may also be possible to perform additional analyses such as stratification by new participants and employees who already participated in a HPP.

CONCLUSION

HPPs aimed at improving physical activity were most needed by employees. The majority of employees favored HPPs that were organized by their employer above those at their own discretion. This supports the implementation of HPPs at the workplace. Some indications were found that agreement between preferences of employees regarding HPP components and the HPPs employers provide will increase participation. More research, in a larger cohort and a diversity of companies, is needed to assess whether our finding are corroborated in other populations.

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Appendix 1: Health promotion programs the employers provided.

Lifestyle targeted	Organization 1	Organization 2
Physical activity	A fitness facility on site offering individual a group programs. And a physiotherapist offering preventive programs.	A fitness school subscription with individual programs and group activities. And a physiotherapist offering preventive programs.
Nutrition	A dietician on site. And a group program 'do I eat healthy'	Dietician on site
Smoking cessation	Individual smoking cessation coaching program	None
Stress management	Mediation and mindfulness in a group setting	A social worker giving information in a group setting
General health	A occupational physician on site	A occupational physician on site

Appendix 2: Classification of the health promotion programs the employers provided according to the three components of the HPPs.

Lifestyle targeted	Components	Organization 1	Organization 2
Physical activity	Mode of delivery	3	3
	Intensity	2	2
	Content	3	3
Healthy nutrition	Mode of delivery	3	1
	Intensity	3	3
	Content	1	1
Smoking cessation	Mode of delivery	1	0
	Intensity	2	0
	Content	3	0
Stress management	Mode of delivery	2	2
	Intensity	2	3
	Content	2	3
General health	Mode of delivery	1	1
	Intensity	3	3
	Content	1	1

- Mode of delivery: 0 = none, 1 = alone, 2= group, 3 = both options.
- Intensity: 0 = none, 1 = once, 2= more meetings, 3 = both options.
- Content: 0 = none, 1 = information, 2 = assignments, 3 = both options.

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THE IMPORTANCE OF INTERNAL HEALTH BELIEFS FOR EMPLOYEES' PARTICIPATION IN HEALTH PROMOTION PROGRAMS

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ABSTRACT

Objective: To investigate associations between employees' Health Locus of Control (HLOC) and self-perceived health, health behaviors, and participation in health promotion programs (HPPs) and the mediating effect of self-perceived health and health behaviors on the relation between HLOC and participation.

Method: Between 2010-2012, a six-month longitudinal study was conducted among 691 Dutch employees. Using questionnaires, information was collected on health behaviors, self-perceived health, HLOC, and intention to participate at baseline. Actual participation was assessed at follow-up. Logistic regression analyses were used to study associations between HLOC and self-perceived health, health behaviors, and participation, and to examine whether associations between HLOC and participation were mediated by self-perceived health and health behaviors.

Results: Higher internal HLOC was associated with sufficient physical activity (moderate: OR: 1.04, 95%CI: 1.00-1.08; vigorous: OR: 1.05, 95%CI: 1.01-1.10) and fruit and vegetable intake (OR: 1.05, 95%CI: 1.01-1.09), a good self-perceived health (OR: 1.20, 95%CI: 1.11-1.30), a positive intention towards participation (OR: 1.05, 95%CI: 1.00-1.09), and actual participation (OR: 1.06, 95%CI: 1.00-1.13). Self-perceived health or health behaviors did not mediate associations between HLOC and participation.

Conclusion: Employees with a higher internal HLOC behaved healthier and were more likely to participate in HPPs, irrespectively of their health. Increasing internal HLOC seems a promising avenue for improving employees' health and participation in HPPs.

INTRODUCTION

An unhealthy lifestyle is a major risk factor for several chronic diseases.[1] Numerous health promotion programs (HPPs) are developed to improve health behaviors. Workplaces are considered to be a promising setting for health promotion because of the amount of time people spent at work, the possibility to reach a large population, and the presence of supportive social networks.[2, 3] Workplace health promotion programs (WHPPs) are able to improve health behavior and health.[4-6] However, participation in these WHPPs is often modest[7] and it is questioned whether those employees who could benefit most are participating.[8] This limits the potential health benefits of WHPPs. It is therefore important to study factors that potentially impede or facilitate participation.

Peoples' perceptions about who is in control over their health differ and are conceptualized in the concept of health locus of control (HLOC).[9] Internal HLOC means that people feel they have influence over their health, whereas external HLOC refers to feelings that others (e.g. doctors) are in control over one's health or it is due to luck or fate.[9] A higher internal HLOC is associated with a healthier behavior and with a good self-perceived health.[10-13] A higher internal HLOC contributes also to searching for health information online[14], and individuals with a high internal HLOC adhere better to treatment regimes, screening calls, and medical check-ups.[15-17]

Thus, a high internal HLOC can be regarded as a personal characteristic positively related to adopting healthy behaviors and health-related activities. However, the influence of HLOC on participation in HPPs has not been studied. Furthermore, the relation between HLOC and participating in health-related activities might be explained by the association between HLOC and health behaviors or self-perceived health. The extent to which those characteristics have a mediating influence on the relation between HLOC and participating in health-related activities is unknown. This study aimed to gain insight into (1) associations between employees' HLOC and health behavior and self-perceived health, (2) associations between employees' HLOC and participation in HPPs, and (3) the potential mediating effect of health behaviors and self-perceived health on the relation between HLOC and participation in HPPs.

METHODS

Study population

The population in this longitudinal study consisted of employees of a plastic manufacturer (organization 1, n=874) and a paint manufacturer (organization 2, n=1281) in the Netherlands.

Between 2010 and 2012, all employees were invited by e-mail to fill in two online questionnaires: a baseline questionnaire and a follow-up questionnaire six months later. For this study, we included all employees who completed both the baseline and follow-up questionnaires.

Of the 2155 employees invited, 1128 (52%) completed the baseline questionnaire. Of this group, 761 (68%) also completed the follow-up questionnaire after six months and 748 employees (98%) provided informed consent. Four employees were excluded due to implausible or missing data on height, weight, or physical activity, and 53 employees because of incomplete information on HLOC. The final study sample comprised 691 employees (organization 1, n=226; organization 2, n= 465).

Informed consent was requested at the start of the questionnaire. The Medical Ethical Committee of Erasmus MC (Rotterdam, the Netherlands) declared that the Medical Research Involving Human Subjects Act did not apply to the current study and the committee had no objection to the execution of this study.

Data collection

Participation in a health promotion program

At baseline, participants were asked whether they had the intention of participating in a WHPP. To enhance comparability with actual participation, the five possible answers were dichotomized into 'totally agree, agree' and 'totally disagree, disagree, neutral'. At six-month follow-up, employees were asked whether or not they had participated in a HPP during the follow-up period.

Health locus of control

At baseline, HLOC was measured using the 18-item multidimensional health locus of control questionnaire, which distinguished internal HLOC and two components of external HLOC, namely powerful others HLOC, and chance HLOC. Each HLOC-scale was assessed by six statements (Cronbach's α=0.71, 0.76, and 0.71, respectively).[9,18] Per statement, the participant had to answer on a six-point scale ranging from strongly disagree (0) to strongly agree (5). Sum scores were calculated for internal HLOC, powerful others HLOC, and chance HLOC, ranging from 0 to 30.

Self-perceived health and health behavior

Self-perceived health and health behaviors were measured at baseline.

Self-perceived health was measured using the first question of the Short Form-12 (SF-12) questionnaire ("Overall, how would you rate your health during the past 4 weeks?"). The five possible answers were dichotomized into 'poor or fair' and 'good, very good, or excellent'.[19]

Body Mass Index (BMI: weight/height^2) was calculated based on self-reported height in meters and weight in kilograms and dichotomized (BMI<30 kg/m^2 and BMI≥30 kg/m^2).

Fruit and vegetable intake was measured by a slightly adapted version of the Dutch Food Frequency Questionnaire.[20] The six-item questionnaire asked about the monthly intake of different fruits (four items, e.g. apple, fruit juice) and vegetables (two items: raw and cooked vegetables). Dichotomization was based on the Dutch guidelines for healthy nutrition, which states that one needs to consume 200 g of fruit and 200 g vegetables daily. Employees who ate at least 400 g of fruit and vegetables per day were considered those meeting the guidelines.

Physical activity was measured by a slightly adapted version of the International Physical Activity Questionnaire (IPAQ)[21] which measures physical activity of moderate and vigorous intensity. The average leisure time spent on moderate and vigorous intensity physical activity was calculated as follows: employees were first asked how many days per week they engaged in moderate and vigorous intensity physical activity; they were then asked how many minutes on average was spent on moderate or vigorous intensity physical activity, per occasion. Dichotomization was based on the recommendation for moderate physical activity that requires physical activity at moderate levels for at least 30 minutes per day.[22] Employees who were physically active at a moderate intensity level for at least 210 minutes a week (7 times 30 minutes) were considered those meeting the recommendation. Someone who was active at vigorous intensity for at least 20 minutes on at least three occasions per week met the recommendations for vigorous intensity physical activity.

Smoking was assessed using a single-item question: "Do you smoke?". Answer possibilities were: 'yes', 'now and then', and 'no'. Employees answering the question with 'yes' or 'now and then' were defined as being a 'current smoker'.

Individual characteristics

At baseline, the following individual characteristics were assessed: age, gender, and educational level. Age was categorized into two groups: 18-39 and 40-65 years of age. Educational level was determined by asking the employees about their highest level of education, which was then dichotomized into 'low' (primary school, lower and intermediate secondary schooling, or lower vocational training) and 'high' (higher secondary schooling, intermediate vocational schooling, higher vocational training, or university).

Data analysis

Descriptive statistics were used to report on characteristics of the study population. The Pearson correlation coefficient was used for correlations between the internal HLOC, powerful others HLOC, and chance HLOC.

Logistic regression analyses were performed to study associations between HLOC-scales and health behaviors, and self-perceived health; and to examine whether health behaviors, self-perceived health, and HLOC are associated with intention to participate and actual participation in HPPs. These associations were adjusted for individual characteristics.

The mediating effect of health behaviors and self-perceived health on the association between the HLOC-scales and intention to participate and actual participation was assessed using the step-approach of Baron and Kenny (1986).[23] First, associations between the independent (i.e. HLOC-scales) and dependent (i.e. participation) variables, and second between the independent and the potential mediating (i.e. health behaviors and self-perceived health) variables were tested as described in the previous paragraph. Thereafter, by logistic regression analysis, associations between the potential mediators and dependent variables were assessed adjusted for the independent variables and controlled for individual characteristics. Last, the first step was repeated now also adjusted for the mediators that were statistically significantly associated with both an HLOC-scale and with participation to assess the effect of the mediator.

The odds ratio (OR) was estimated as measure of association with a corresponding 95% confidence interval (95%CI). For HLOC, this entails that by every point increase (range 0-30) the odds on the outcome variable will increase by that odd. All analyses were carried out using the IBM SPSS Statistics version 20 for Windows (SPSS Inc., Chicago, IL, USA).

RESULTS

Description of the study population

The study population consisted of 691 employees with a mean age of 44.8 years (SD: 9.4) and a mean BMI of 25.6 kg/m^2 (SD: 3.6) (Table 1). Internal HLOC was not correlated with powerful others HLOC (Pearson's r: -0.02) and chance HLOC (Pearson's r: -0.13). The latter two HLOC-scales were moderately correlated (Pearson's r: 0.32).

HLOC and health behavior and self-perceived health

Employees with a higher internal HLOC were more likely to meet the recommendations for moderate (OR: 1.04, 95%CI: 1.00-1.08) and vigorous physical activity (OR: 1.05, 95%CI: 1.01-1.10), and fruit and vegetable intake (OR: 1.05, 95%CI: 1.01-1.09), and to have a good self-perceived health (OR: 1.20, 95%CI: 1.11-1.30). Employees with a higher external HLOC were less likely to have a good self-perceived health (powerful others HLOC: OR: 0.91, 95%CI: 0.94-0.99; chance HLOC: OR: 0.89, 95%CI: 0.83-0.97) (Table 2).

Table 1: Characteristics of the study population (N=691).

	n	%
Individual characteristics		
Aged 40 and above	481	69.6
Female	195	28.2
Educational level		
Low	122	17.7
Intermediate or high	569	82.3
Health behaviors		
BMI < 30 kg/m^2	615	89.0
Sufficient moderate physical activity (≥ than 30 min a day)	339	49.1
Sufficient vigorous physical activity (≥ than 3 days a week 20 min)	164	23.7
Sufficient fruit and vegetable intake (≥ than 400 grams a day)	234	33.9
Not smoking	566	81.9
Self-perceived health		
Good self-perceived health	659	95.4
Health Locus of Control (HLOC)		
Internal HLOC (range 0-30), mean (SD)	16.4 (4.1)	
Powerful others HLOC (range 0-30), mean (SD)	9.5 (4.2)	
Chance HLOC (range 0-30), mean (SD)	12.1 (4.5)	
Participation		
Intention to participate	180	26.0
Participation during six month follow-up period	79	11.4

Table 2: Adjusted associations between HLOC and health behaviors and self-perceived health among 691 employees.

	BMI < 30 kg/m^2	Sufficient moderate physical activity	Sufficient vigorous physical activity	Sufficient fruit and vegetable intake	Not smoking	Good self-perceived health
	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)
Higher internal HLOC (0-30)	1.00 (0.95-1.06)	1.04 (1.00-1.08)*	1.05 (1.01-1.10)*	1.05 (1.01-1.09)*	1.00 (0.95-1.05)	1.20 (1.11-1.30)*
Higher powerful others HLOC (0-30)	0.98 (0.93-1.04)	1.01 (0.97-1.05)	0.99 (0.95-1.04)	0.99 (0.95-1.03)	0.96 (0.91-1.00)	0.91 (0.94-0.99)*
Higher change HLOC (0-30)	0.98 (0.92-1.03)	1.00 (0.96-1.03)	0.98 (0.94-1.02)	0.92 (0.89-0.96)*	0.97 (0.93-1.02)	0.89 (0.83-0.97)*

* Indicates statistically significant at p<0.05

HLOC: Health Locus of Control

Note: Associations of HLOC and health behaviors and self-perceived health are adjusted for age, gender, and educational level.

Health behavior, self-perceived health, and HLOC and participation

Employees with a higher internal HLOC were more likely to have a positive intention to participate in a HPP (OR: 1.05, 95%CI: 1.00-1.09) and to report actual participation in a HPP during the six-month follow-up period (OR: 1.06, 95%CI: 1.00-1.13). Employees with a good self-perceived health were less likely to express a positive intention towards participation (OR: 0.39, 95%CI: 0.19-0.80) (Table 3).

Table 3: Adjusted associations between health behaviors, self-perceived health, and HLOC and intention to participate and actual participation in HPPs among 691 employees.

	Positive intention to participate	Actual participation during follow-up
	OR (95%CI)	OR (95%CI)
Health behaviors		
BMI < 30 kg/m^2	0.69 (0.41-1.16)	0.56 (0.29-1.07)
Sufficient moderate PA	1.12 (0.79-1.58)	0.68 (0.42-1.11)
Sufficient vigorous PA	1.35 (0.91-1.99)	1.40 (0.83-2.37)
Sufficient fruit and vegetable intake	1.36 (0.95-1.94)	0.87 (0.52-1.44)
Not smoking	1.42 (0.88-2.27)	1.55 (0.78-3.08)
Self-perceived health		
Good self-perceived health	0.39 (0.19-0.80)*	0.71 (0.27-1.92)
Health Locus of Control		
High internal HLOC (0-30)	1.05 (1.00-1.09)*	1.06 (1.00-1.13)*
High powerful others HLOC (0-30)	1.02 (0.98-1.07)	1.03 (0.98-1.09)
High chance HLOC (0-30)	0.98 (0.94-1.02)	1.01 (0.96-1.07)

* Indicates statistically significant at p<0.05
HLOC: Health Locus of Control
Note: Associations of health behaviors, self-perceived health, and HLOC are adjusted for age, gender, and educational level.

Mediation analysis

As described above, a higher internal HLOC was associated with a positive intention to participate and actual participation (first step mediation analysis) and all HLOC-scales were associated with self-perceived health but not with any of the measured health behaviors (second step mediation analysis). Employees with a good self-perceived health were regardless of their HLOC less likely to have a positive intention towards participation (internal HLOC: OR: 0.31, 95%CI: 0.15-0.66; powerful others HLOC: OR: 0.40, 95%CI: 0.19-0.83; chance HLOC: OR: 0.36, 95%CI: 0.18-0.75) (third step mediation analysis). The final step showed that the influence of a higher internal HLOC on intention to participate and actual participation remained unchanged after taking into account self-perceived health (intention: OR: 1.06, 95%CI: 1.01-1.11; actual: OR: 1.06, 95%CI: 1.00-1.13).

DISCUSSION

A higher internal HLOC was associated with healthier behaviors and with intended and actual participation in HPPs. The influence of a higher internal HLOC on intended or actual participation in HPP was not mediated by self-perceived health, which suggests that internal HLOC is an independent determinant of employee participation in HPPs.

HLOC and self-perceived health and health behavior

Employees with a higher internal HLOC reported a better self-perceived health, while those with higher external HLOC were more likely to report a poorer health status. These findings corroborate previous studies.[11, 24] The importance of internal HLOC for health status might be explained that the employees also report healthier behaviors and more often took part in health-related activities which both positively affect health status.

As reported in previous studies, we found that employees with a higher internal HLOC were more likely to comply with the recommendations for physical activity.[10, 12, 25, 26] Additionally, these employees had higher odds for meeting the recommendations for fruit and vegetable intake where prior research found no associations.[10, 12] Higher external HLOC was not associated with any of the measured health behaviors. Previous studies reported both no associations for external HLOC and health behavior as that external HLOC negatively influences health behavior.[10-12, 25-27] Our study supported previous studies by showing no association between HLOC and BMI.[25, 26, 28] The lack of an association might be attributed to the fact that BMI might not be a behavior like physical activity and fruit and vegetable intake. BMI might be more than the sole effect of an unhealthy behavior and therefore making the relation between BMI and HLOC more complex.[25]

None of the HLOC-scales were associated with smoking behavior. For internal HLOC and powerful others HLOC this is in line with previous research but a higher chance HLOC has shown previously to be unfavorable for smoking behavior.[25-27] In contrast to these studies, we adjusted our analyses for educational level as potential confounder, since lower educated tend to smoke more often and have higher levels of exernal HLOC.[26, 29] In an additional analysis a statistically significant association was found between a higher chance HLOC and smoking when educational level was left out (OR: 1.05, 95%CI: 1.00-1.09).

Association internal HLOC and participation

Employees with a higher internal HLOC were more likely to express a positive intention towards participation in a HPP as well as to actual participate in a HPP. This finding confirms previous studies on the favorable role of internal HLOC for engaging in health-related behavior such as following treatment regimens or searching online for health information.[14, 16] Within the workplace, Kudo and colleagues (2009) studied whether

HLOC was related with employees' usage of the results of a health check-up which was offered to them by their employer.[30] They found that employees with a higher internal HLOC more often reported using the results for managing their own health and thereby corroborate that internal HLOC is important for health-related behavior for maintaining a healthy workforce. That particularly internal HLOC is important for participation in HPPs might be due to the preventive character of HPPs. Therefore, participation in HPPs is mainly at ones' own discretion and participation is possibly influenced by believing in that HPPs are capable of improving ones' lifestyle and less by trusting the ones providing the program or care (e.g. doctors).

Implications for interventions

The importance of internal HLOC for participation raises the question whether HLOC is amendable to change. Persons' locus of control is considered to be a stable personality trait.[31] However, it has shown that internal locus of control on obesity can be manipulated by asking people to list the most important individual causes of obesity. Afterwards, they responded more favorably towards individually-responsibility framed messages.[32] Moreover, an increase in internal HLOC can be achieved over four months by three educational workshops with special emphasis on HLOC.[33] Hence, it seems that internal HLOC can be increased. Still, information is scarce and more research is warranted on how HLOC can be incorporated effectively in health promotion. Furthermore, the importance of internal HLOC as a construct for HPP participation is in line with the current attention on HPPs focusing on self-management and empowerment.[34, 35] These types of programs focus heavily on individuals taking responsibility for their own health.

Limitations

The strength of this study is the longitudinal design. However, the relative short follow-up period might be a limitation. Associations of the HLOC-scales with intention to participate in HPPs were investigated in a cross-sectional design, which does not permit further explanation with regard to causality. However, the results for intention were supported by the associations with actual participation during the follow-up period. Another limitation was that the different health behaviors and health status as mediator variable were measured at the same time as HLOC, which may have contributed to the absence of any mediating role of poor health.

CONCLUSION

Employees with a higher internal HLOC reported healthier behaviors and more often had a good self-perceived health as opposed to employees with a higher external HLOC. Employees with a higher internal HLOC were also more inclined to participate in HPPs and reported higher actual participation in HPPs. Self-perceived health and health behaviors did not mediate the relation between internal HLOC and participation. This indicates that internal HLOC is an important factor that positively influences participation in HPPs. Therefore, increasing internal HLOC seems as a promising avenue for improving employees' health behavior and participation in HPPs.

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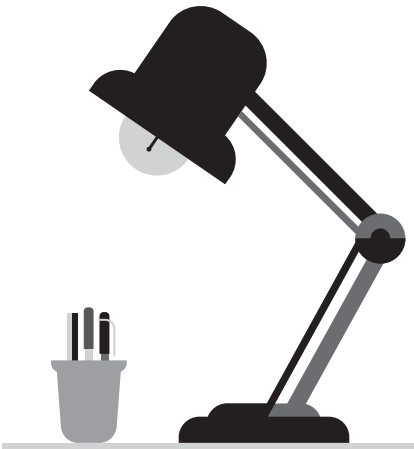
GENERAL DISCUSSION



INTRODUCTION

Due to the ageing workforce, scientists and practitioners ask the question how to ensure that employees remain productively employed without compromising their health, in other words how to build a sustainable workforce. Factors such as being obese, having a low job control, and working in strenuous physical jobs negatively influence employees' ability to work productively in good health.[1-4] These determinants not only affect sustainable employability independently, they are also interrelated. For instance, low work ability in combination with low job control leads to greater productivity losses than merely the summation of their independent effects.[5] However, knowledge on what determines sustainable employability is still scarce. Therefore, the first objective of this thesis was:

> To identify individual, health behavior, and work-related determinants of sustainable employability, expressed by self-perceived health, work ability, sickness absence, and labor force participation.

Due to the importance of health behavior for sustainable employability, many workplace health promotion programs (WHPPs) focused at changing employee' health behavior have been developed and evaluated during the past decades.[e.g. 6, 7] These studies differ greatly with regard to methodological quality, study design, and content of the interventions. These differences may question the generalizability of WHPPs. More insight into the differential effectiveness is needed to give sound advice on how to achieve the greatest impact, given a particular setting and population. Therefore, the second objective of this thesis was:

> To estimate the differential effectiveness of workplace health promotion programs on self-perceived health, productivity at work, work ability, and sickness absence by population, study, and intervention characteristics, and methodological quality.

WHPPs' effectiveness is often impeded by low participation.[8] Various barriers and facilitators for participation are mentioned in the literature. First, social-cognitive factors included in the theory of planned behavior may influence intention towards a behavior and actual behavior (i.e. participation in a health promotion program).[9, 10] Second, factors related to the work situation (e.g. work schedule) and privacy issues (e.g. engaging in health promotion at work) are often mentioned by employees as reasons for participating or not.[11, 12] Third, frameworks for health promotion program development are built on the belief that meeting the preferences of the population will facilitate participation.[13, 14] Last, persons who belief more strongly that they can influence their own health

status engage more often in health-related activities.[15, 16] However, the degree to which these factors actually influence participation in health promotion programs among employees has seldom been studied. Therefore, the third objective of this thesis was:

> To study the influence of barriers and facilitators for participation in health promotion programs among employees.

In this chapter the main findings of the performed studies are presented and their methodological issues discussed. Thereafter, new insights following the results of this thesis will be presented and the chapter will end with the implications of this thesis for future research and practice.

MAIN FINDINGS

Objective 1: To identify individual, health behavior, and work-related determinants of sustainable employability, expressed by self-perceived health, work ability, sickness absence, and labor force participation.

In our studies, sustainable employability was operationalized by self-perceived health, work ability, sickness absence, leaving the current job or profession, and exiting paid employment. The studies presented in part one of this thesis confirm the multifactorial nature of sustainable employability. Educational attainment, health behavior, and work-related characteristics all influenced sustainable employability (chapter 2-4). Lower educated employees were at greater risk of leaving paid employment before the statutory retirement age through different exit routes (odds ratios (ORs): 1.53-1.84) (chapter 3). In addition, insufficient physical activity increased the likelihood of having a low work ability (OR: 2.50), being absent from work due to illness (OR: 2.59), and leaving paid employment prematurely (ORs: 1.12-1.64) (chapter 3 and 4). Furthermore, a low job control negatively influenced sustainable employability: low work ability (ORs: 2.19-2.23), leaving paid employment prematurely (ORs: 1.20-1.34) (chapter 3 and 4). Low work engagement also negatively influenced employees' sustainable employability: work ability (OR: 3.68), long-term sickness absence (OR: 1.84) (chapter 4).

Besides studying the independent effects of individual, health behavior and work-related characteristics on sustainable employability, possible interrelations were investigated. The relation between low work engagement and low work ability was observed to be independent from the employees' health behavior and work-related characteristics (chapter 4). When work engagement, besides health behavior and work-related characteristics, was taken into account the explained variance of work ability

improved relatively by 25%. Furthermore, among nursing staff with a low work ability the risk on changing employer doubled when they also experienced unfavorable work-related characteristics (ORs: 1.82-2.12). In contrast, among nursing staff with a good work ability the risk on leaving the current position was independent from work-related characteristics (chapter 2). Last, health-behaviors and work-related characteristics could explain 13% to 69% of the educational inequalities in displacement from the labor force (chapter 3).

In conclusion, multiple individual, health-related, and work-related factors determine employees' sustainable employability. Moreover, work engagement seemed to be an additional independent determinant of sustainable employability. The strength by which these determinants affect sustainable employability seems greater for lower educated employees and those with a low work ability.

Objective 2: To estimate the differential effectiveness of workplace health promotion programs on self-perceived health, productivity at work, work ability, and sickness absence by population, study, and intervention characteristics, and methodological quality.

The systematic review and meta-analysis summarizing 18 randomized controlled trials on the effectiveness of WHPPs for sustainable employability showed that the overall effectiveness of WHPPs is modest (effect size (ES): 0.24, 95%CI: 0.14-0.34) (chapter 5). The effect sizes did not differ across the different outcome measures of sustainable employability (i.e. self-perceived health, work ability, productivity at work, sickness absence) (ESs: 0.21-0.29). However, effect sizes did differ by study and intervention characteristics. In general, when the participants in the study were relatively young (mean age ≤40) and most participants (>67%) had a white-collar job the WHPP reported a greater effect. The effectiveness was also greater when initial participation was low (<34%), the study had a short follow-up period (<6 months), the control group received no intervention (e.g. waiting list control), and there were weekly contact moments. Most striking was that studies with a weak methodological quality reported a two times greater effect of their intervention (ES: 0.41 vs. ES: 0.20). Especially studies that had not randomized correctly or did not report on how they randomized (ES: 0.29 vs. ES: 0.17), performed no intention-to-treat analysis (ES: 0.36 vs. ES: 0.14), or did not control for confounders (ES: 0.33 vs. ES: 0.20) reported a greater effect of their WHPP.

Objective 3: To study the influence of barriers and facilitators for participation in health promotion programs among employees.

Of the participants in our study, 26% expressed the intention to participate in a program and 11% actually participated during the six-month follow-up period. Those with a posi-

tive intention were three times more likely to participate (OR: 3.02). However, only 21% of the employees with a positive intention did actually participate.

Of 19 factors described in the literature that may influence participation, 16 were statistically significantly associated with intention to participate and only three factors predicted actual participation. A positive intention as well as actual participation was more likely when employees thought it was important to participate (intention OR: 43.00; actual participation OR: 2.81), when they thought that their supervisor or colleagues expected them to participate (intention OR: 3.00; actual participation OR: 2.87), and when they had a stronger belief that they were able to change their own health status (internal health locus of control) (intention OR: 1.05; actual participation OR: 1.06). Additionally, employees with a higher internal health locus of control more often behaved healthier (ORs: 1.04-1.05) but this did not alter the association between internal health locus of control and participation (chapter 8). Furthermore, factors strongly associated with a positive intention were willingness to improve one's health, thinking such a program is useful and pleasant, having friends and family support participation, and believing that health promotion at work is a good thing (ORs: 4.44-8.64). Moreover, perceiving more barriers declined the likelihood of having a positive intention and the reverse pattern was observed for facilitators, however, these patterns were not observed for actual participation (chapter 6).

HPPs most favored by employees were those that addressed physical activity (55%), followed by general health (45%), stress management (39%), healthy nutrition (33%), and smoking cessation (7%). In general, these programs were preferred to be organized by the employer (versus at own discretion), individual programs (versus group-based), and to consist of multiple meetings (versus one meeting). For programs addressing physical activity or stress management assignments were favored over receiving information, whereas for other programs receiving information was favored. The preferences for a physical activity program were well matched by the programs the organizations provided (69%), followed by those that addressed healthy nutrition (46%) and general health (45%). A higher agreement between preferences of employees for a HPP and HPPs provided by employers seemed to increase participation (OR: 2.36). Especially a match with the way the program was delivered (i.e. individual or in a group) was likely to enhance participation (OR: 1.72).

In conclusion, diminishing barriers and amplifying facilitators could increase participation in HPPs. Especially, participation is more likely when employees appreciate the importance of HPPs, are stimulated by employers and supervisors, and believe that they are capable of changing their own health status. In addition, implementing programs that match the needs and preferences of employees may enhance participation.

METHODOLOGICAL ISSUES

Study design

A longitudinal design was used to study the determinants of sustainable employability (chapters 2 to 4) and the factors that may enhance actual participation in HPP (chapters 6 to 8). This study design allows for conclusions on causality. However, choosing the proper follow-up period is a concern. For example, in chapter 2, the process to leave ones job may take longer than one year. Change of job may be the result of an accumulation of unfavorable factors over time, most likely indicated by the excess risk on leaving the job when experiencing both unfavorable work-related characteristics and low work ability. A study with a longer follow-up and with repeated measurements is needed to gain more insight into the mechanisms of causality. In chapter 4 the contribution of work engagement to the prediction of sustainable employability was studied by assessing work engagement six months before the outcome measurement. In our study we assumed work engagement to be stable over time, however, also fluctuations over the week have been observed.[17] Diary studies are found useful for linking work engagement with situational factors.[17] Future research could adopt this method for additional insight into the association between work engagement and work productivity and the factors that coincide with this relation. In addition to studying actual participation in a follow-up design, associations with intention to participate were investigated in a cross-sectional design (chapters 6 to 8). Although these associations do not permit to draw conclusions on causality, they were insightful since we also measured actual participation at six months follow-up. This provided the opportunity to compare determinants of intention with those of actual participation. Furthermore, it made the intention-behavior gap quantifiable; one fifth of the participants turned intention into action. Hence, we need to be careful with generalizing associations based on intention to actual behavior. Unfortunately, due to the small study population and few employees who actually participated we could not conduct additional analyses on factors that contribute to bridging the intention-behavior gap. In addition, the six-month follow-up might been too short since few employees actually participated during this time, which resulted in a lack of statistical power. Future research needs to include a larger study population to ensure statistical power and to be able to perform stratified analyses by for example intention.

Measurement instruments

Sustainable employability was operationalized differently in chapters 2 to 4; self-perceived health, work ability, sickness absence, leaving the current job or profession, and exiting paid employment. This diversity in conceptualization of sustainable employability is due to the broad definition of sustainable employability. All outcomes have

their own strengths and weaknesses and relate to different parts of sustainable employability. Prematurely exiting the workforce requires a long follow-up while changes in work ability or productivity can be expected in the nearer future. These long follow-up periods are not always feasible in research; therefore, proper proxies need to be developed. Another possibility might be to use more advanced methods that can model outcomes in the distant future such as leaving employment.

In chapter 6 statements on barriers and facilitators were used that were based on available literature. We mainly asked about individual factors for participating or not, and those that related to the surroundings (e.g. social support) were still answered at the individual level. Factors at macro-level such as the organizational culture, leadership, and physical environment might also influence participation.[18-20] The factors examined in our study mainly influenced the intention of employees toward HPP participation but hardly actual participation. It might be that intention is foremost driven by internal reasons while for actual participation the surroundings come into play.[21] Some indication of the importance of the social environment for actual participation was found; employees who though that their colleagues or supervisor expected of them to participate were more likely to do so.

In chapter 7 we asked about the preferred design of a HPP by asking employees to choose between two alternatives with regard to three components of the design (i.e. mode of delivery, intensity, content). This method might be too restricted to gain insight into all factors important to employees in order to participate. Another option would have been to ask for preferences by an open-ended question. However, most likely not every employee would have answered on similar components of the design. Therefore, we advise that future research on preferred HPPs will use the same approach but expands the design-options by preferred communication channel or whether incentives should be offered since these are also often named to influence participation.[22, 23] Indications were found that a match on the delivery of the program with the employees' preferences is more important for participation than the intensity or content of the program. However, we had no insight into whether a better match enhances effectiveness or whether employees are willing to give up a match on a preference for another match (i.e. whether there is a trade-off). The latter could be studied using a discrete choice experiment.[e.g. 24, 25] In such an experiment employees are given different HPP options between the need to choose.

Statistical analyses

Different methods for studying the interrelations between the determinants of sustainable employability were used: additive interaction (chapter two), mediation analysis (chapter three), and adjustment for independent determinants (chapter four). Although all provide insight into the complexity of sustainable employability, these methods

answer different questions. The Relative Excess Risk due to Interaction (RERI) aims to investigate the joint effect of two factors and is easy to interpret since it only uses two covariates. However, this is also a disadvantage of the method when, as possibly the case with sustainable employability, more factors play a role simultaneously.[26] Mediation analyses answers the question whether – part of – the effect of a determinant on the outcome is explained by another factor. However, as in every study, it might be that a factor that had not been measured is part of the explanation. Furthermore, the independent as well as the possible mediator were measured at the same time point, which may bias the results.[27]

Participation into the study

We performed a six-month follow-up study among three Dutch organizations. Due to the very low participation (<20%) in one organization, we decided to exclude this organization from the analyses due to the high risk of selective participation. Various actions were undertaken to stimulate participation such as using multiple communication channels and organizing a meeting for supervisors. An action that might have helped to enhance participation is offering incentives.[22] However, there is no clear evidence that incentives will influence the results achieved.[23] Although enrollment among the other organizations was acceptable (>50%), selective participation could still be an issue.

Generalizability

Generalizability refers to the degree to which it is expected that similar results will be achieved in other settings (e.g. organizations, study populations). The generalizability of WHPPs may be limited (chapter 5) since we found that it depends upon population characteristics. Therefore, the demonstrated effectiveness of a particular WHPP may not be achieved when that same WHPP is implemented in another population. Furthermore, we found indications that intervention characteristics influence effectiveness. This questions whether the often used measure of effect size to quantify the magnitude of the effectiveness provides the best guidance for policy development and implementation in practice. Chapters 2 and 3 included large study populations of employees working in the nursing profession in Europe and Dutch employees working in a variety of occupations, respectively. This increases the likelihood that these results hold for other employees working in the nursing profession (chapter 2) or Dutch employees in general (chapter 3).

INTERPRETATION AND NEW INSIGHTS

Complexity of sustainable employability

Due to the absence of a single instrument that measures sustainable employability, we operationalized it by the following indicators: self-perceived health, work ability, productivity at work, (lack of) sickness absence, leaving the current job or profession, and exiting paid employment. All these indicators of sustainable employability were influenced by health behavior and work-related characteristics. The strength of the associations between these determinants differed across the indicators of sustainable employability used; self-perceived health was more strongly influenced by health behaviors while work ability was particularly influenced by characteristics of the work situation. Still, in general, the prediction of sustainable employability improved when taking into account work engagement besides health behavior and work-related characteristics. This implies that policy and practice need to take into account three groups of determinants (i.e. health behavior, work factors, work engagement) to enhance sustainable employability.

The relative importance of determinants for sustainable employability depends upon educational attainment and work ability. First, unhealthy behaviors and unfavorable work-related characteristics are more present among lower educated employees, which put them at higher risk of low sustainable employability. Preventive programs at work could narrow these educational inequalities since lower educated employees could potentially benefit more from these programs. However, attention should be paid to the possibility that programs do not narrow the inequalities but can even widen them.[28, 29] Our meta-analysis also pointed into this direction by showing that WHPPs among white collar employee showed larger effectiveness (chapter 5). Second, work-related characteristics influence the likelihood of employees leaving the organization among those with a low work ability, but not among those with a high work ability. This indicates that the influence of work-related characteristics on leaving the current job depends upon employees' perception of being able to fulfil one's job (chapter 2).

Effectiveness and generalizability of workplace health promotion programs

The pooled effect size of 0.24 of WHPPs reported in our meta-analysis is in line with previous systematic reviews that concluded that WHPPs might have a modest positive impact on sustainable employability.[30, 31] In our review, the effect estimates did not differ greatly across the proxies of sustainable employability. In addition, for direct outcomes of WHPPs such as physical activity levels and nutrition also small changes are reported.[e.g.32]

Methodological quality had a profound impact on the effectiveness of the WHPPs; lower quality studies in general reported a 3-fold greater effect than high quality studies. This finding is indicative for publication bias. This inverse relation between methodological quality and effectiveness has also been documented for return-on-investment

of WHPPs and programs aimed at work productivity of employees with musculoskeletal disorders.[33, 34] In order to quantify the impact of methodological quality on effectiveness, the stratified meta-analysis showed to be a good method above the graphical presentation by a funnel plot. Future meta-analyses need to take into account the methodological quality by stratifying the analysis by high and low quality studies or adjusting for the methodological quality when performing meta-regression analyses by other characteristics. This advice also pertains to systematic reviews, whereby it seems a better strategy to formally evaluate the impact of study quality on reported outcomes than *a priori* selecting the studies with highest quality for the evidence synthesis.

Effectiveness of WHPPs depends also on study and intervention characteristics such as participation level and intensity of the program. Therefore, presenting only overall pooled effect estimates of interventions in meta-analyses might be too limited for drawing conclusions about effectiveness and potential generalizability. Presenting stratified analysis in meta-analysis by core study characteristics (e.g. participation, control group) and features of the intervention (e.g. main intervention component, duration) may broaden our knowledge on how to achieve the greatest impact. This information will help to advise organizations about tailored investments in WHPPs.

WHPPs are often developed with the aim to improve sustainable employability; however we had to exclude 39% of the abstracts from our meta-analysis because they had not investigated the influence of the WHPP on sustainable employability. Information on sustainable employability provides insight into the cost-effectiveness of the WHPP, which could persuade organizations to invest in WHPPs. In research, WHPPs effectiveness studies often have a short follow-up period. Therefore, we advise to use indicators of sustainable employability that are amendable to short-term changes, such as productivity at work and work ability.

Participation in health promotion at the workplace

More employees (59%) favored to participate in health promotion programs organized by their employer than in programs at their own discretion. This supports the continuation of provision of health promotion programs at the workplace. Nevertheless, limited participation in WHPPs is often a concern since it may jeopardize the effectiveness and cost-effectiveness of the program. In our study, 26% of the employees expressed the intention to participate and 11% of the population participated in a health promotion program in the following six months. However, only one fifth of the employees turned a positive intention into action. This gap between intention and behavior has been reported before.[35] More insight is needed on how this gap may be bridged.

We considered that 11% participation is low, since it is at the lower bound of the range of participation reported by Robroek and colleagues.[8] However, there are no clear cut-offs for determining whether participation is high or low and several comparisons have

been adopted in the literature: (1) 100% participation, (2) the percentage with an unhealthy lifestyle, (3) participation in similar programs, and (4) participation in programs among similar populations. The first option seems unrealistic and therefore we advise one of the latter three reference categories for determining whether participation is acceptable. The most appropriate comparison will depend on the aim of the study and/or intervention. Participation in primary preventive program may be judged using the third option while for secondary preventive programs the fourth category is more suitable.

Actual participation was influenced by the following three factors: expectations by others in the organization with regard to participation, the belief that WHPP participation is important, and a strong intrinsic belief in being able to change one's own health . It seems that factors related to health were more important for actual participation than factors related to the work situation or privacy issues. Possible routes for organizations to enhance health promotion program participation are therefore creating a culture of health (i.e. the influence of the surrounding/colleagues/supervisors), explaining the role of health promotion programs at the workplace (i.e. the importance), and being aware in communication that personal beliefs of employees about their own ability to change their health behavior are not alike for all employees. Therefore, motivational interviewing may be well suited for employees with a high internal health locus of control whereas those with a low internal health locus of control possibly benefit more by structured support or environmental interventions.

Employees do not have the same needs or preferences regarding health promotion; there is no 'one size fits all' when it comes to health promotion. Preferences about the health behavior addressed in the program depend on age, gender, and educational attainment. A better agreement between preferences of employees and the programs offered by their employers will improve participation. Hence, conducting a needs assessment among employees before implementing a program seems imperative.

RECOMMENDATIONS

Recommendations for future research

Understanding the complexity of sustainable employability

Different proxies of sustainable employability were used in this thesis due to the absence of a single instrument that measures sustainable employability. Future research could be aimed at developing such an instrument. Furthermore, sustainable employability is influenced by health behavior, work-related characteristics, and work engagement. We found some indications that the strength of these associations depend upon educational attainment and work ability. However, to further unravel the puzzle of sustainable

employability, more research is needed on the relative importance of determinants such as age and gender, and their interrelationships. This information is crucial for improving and tailoring programs and strategies aimed at sustainable employability.

Include measures of sustainable employability in WHPP evaluations
Information on whether the WHPP positively influences sustainable employability provides important information about the cost-effectiveness of the WHPP. This information may help to engage stakeholders and encourage them to invest in sustainable employability by implementing WHPPs. Therefore, we advise that future effectiveness studies of WHPPs also include measures of sustainable employability.

Understanding the intention-behavior gap
Most employees with a positive intention towards participation in a health promotion program did not actually participate in such a program during the subsequent six months. Hence, there is a clear gap between intention and behavior. To enhance participation, more insight is needed into the factors that determine actual participation and those that trigger employees with a positive intention to actually participate, thereby, narrowing the intention-behavior gap.

Recommendations for policy and practice

Focus on the three pillars of sustainable employability
In this thesis we identified three pillars that influence sustainable employability, namely: health behavior, work-related characteristics, and work engagement. Therefore, it is recommended to focus on all three pillars simultaneously for effective policies that aim to enhance sustainable employability.

Look beyond WHPP effectiveness
WHPP effectiveness depends upon population and intervention characteristics. Hence, effectiveness achieved among a specific group may not hold for another group. Therefore, usefulness of WHPPs will depend on similarities between intervention population and the target population.

Offer a diversity of health promotion programs at the workplace
Employees prefer a variety of health promotion programs. Therefore, offering a great diversity of programs may enhance participation thereby facilitating as many employees as possible. Making an inventory of the preferences seems to be a good starting point when planning to invest in health promotion at work. For employees, agreeing with the delivery of the program (i.e. individual or group) seems more important for participation

than its intensity or content. Therefore, it is recommendable to offer individual as well as group programs.

Focus on importance, expectations by other, and personal convictions during implementation

The following factors are important during implementation since these influence both intention and actual participation: the importance of participating (e.g. what can be gained), expectations by colleagues and supervisor (e.g. do they belief that I need to participate, what is the organizations' vision on health behavior), and internal beliefs to be able to change ones behavior (e.g. how do we address possible participants).

GENERAL CONCLUSION

Educational level, health behavior, psychosocial and physical work-related characteristics, and work engagement play an important role in keeping and maintaining a sustainable workforce. Not only do these factors directly influence sustainable employability, they also interact. For lower educated employees the effect of unhealthy behavior on exiting the labor force is even greater and unfavorable work-related characteristics play a greater part in leaving one's current job among employees with a low work ability. Workplace health promotion programs focused at improving the health behaviors of employees are able to enhance sustainable employability. However, participation in these programs is a concern. A minority of employees had a positive intention towards participation and fewer actually participated in a health promotion program. Various barriers and facilitators related to the work situation (e.g. having time to participate) and health status of the employee (e.g. wanting to improve health behavior), social support by others, and attitude towards health promotion programs were associated with employees' intention to participate but they hardly influenced actual participation. Actual participation seemed to increase when employees think participation is important, feel that their supervisor or colleagues expected them to participate, and when they feel more able to alter their health status. Furthermore, participation will likely be improved when the provided HPPs match well with the preferences of the employees.

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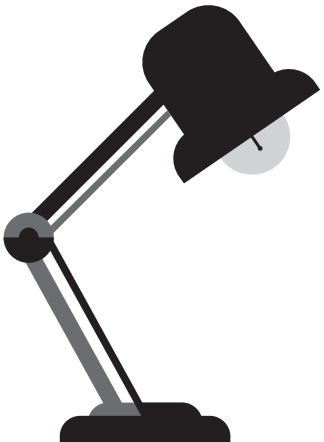
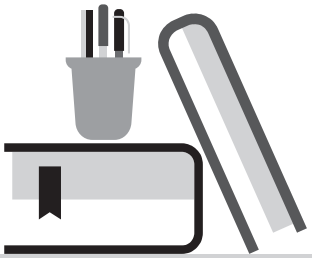


SUMMARY/ SAMENVATTING



SUMMARY

The workforce ages and consequently health problems among employees become more prevalent. In addition, unhealthy behavior is a concern among employees. These issues lead to the question: how can we ensure that employees remain productively employed without compromising their health? In other words, how to maintain a sustainable workforce. To this end, workplace health promotion programs have incrementally been provided to employees. However, a lack of participation may hamper their effectiveness. In this thesis we studied determinants of sustainable employability, to which degree workplace health promotion programs improve sustainable employability, and which factors determine participation in these programs. The following objectives were formulated:

1. To identify individual, health behavior, and work-related determinants of sustainable employability, expressed by self-perceived health, work ability, sickness absence, and labor force participation.
2. To estimate the differential effectiveness of workplace health promotion programs on self-perceived health, productivity at work, work ability, and sickness absence by population, study, and intervention characteristics, and methodological quality.
3. To study the influence of barriers and facilitators on participation in health promotion programs among employees.

Determinants of sustainable employability

Chapter 2 presents a study among European nursing staff (n=9,972) investigating the role of work-related factors and work ability in leaving the current position to either work somewhere else in nursing or leave the profession. A low work ability, after adjustment for individual and work-related characteristics, was related with both changing employer within the nursing profession (Odds Ratio (OR): 1.39) and leaving the nursing profession (OR: 1.71). Among nursing staff with a decreased work ability, the presence of unfavorable work-related characteristics (i.e. high efforts, frequent patient handling activities, and frequent awkward postures) roughly doubled the risk on leaving the current position to work for another employer within the profession. Experiencing unfavorable work-related characteristics did not change the likelihood of leaving the current position among nursing staff with a good work ability.

In chapter 3 the degree to which health status, health behavior, and work-related characteristics predict labor force exit among Dutch employees (n=14,708) was examined. Moreover, it was investigated whether these determinants could explain the educational inequalities in labor force exit. A poor health status increased the likelihood on leaving the labor force through disability benefits (Hazard Rate (HR): 6.45) and unemployment (HR: 1.76). In addition, unhealthy behavior and unfavorable work-related characteristics

increased the risk of leaving paid employment prematurely (HRs: 1.12-2.40). Lower educated employees were more likely to behave unhealthy, to have unfavorable work-related characteristics, and to leave the workforce prematurely as compared to higher educated employees. Improving the health status, health behavior, and work-related characteristics among lower educated employees could decrease the educational inequalities in labor force exit by 13% for economic inactivity, 25% for unemployment, and 69% for disability benefits.

Chapter 4 presents a study investigating the influence of health behaviors, work-related characteristics, and work engagement on four proxies of sustainable employability (i.e. self-perceived health, work ability, short and long-term sickness absence) at six months follow-up among 733 employees. Employees with a lack of sports participation were more likely to have a less than good self-perceived health (OR: 4.30), a decreased work ability (OR: 2.50), and to leave work due to sickness (OR: 2.59). Furthermore, unfavorable psychosocial work-related characteristics were related with a decreased work ability (ORs: 2.19-2.23). A low work engagement predicted a decreased work ability (OR: 3.68) and long-term sickness absence (OR: 1.84) at six-month follow-up. This relation remained for work ability after taking into account employees' health behaviors and work-related characteristics (OR: 3.51). Adding work engagement, besides health behaviors and work-related characteristics, to the model explaining work ability led to a relative improvement of 25% of the explained variance.

Effectiveness of workplace health promotion programs

Chapter 5 presents a systematic review and meta-analysis of 18 randomized controlled trials investigating the effectiveness of a workplace health promotion program aimed at healthy behavior on sustainable employability. These programs showed to have small effects (effect size: 0.24) with studies of poor methodological quality reporting greater effects. Furthermore, effectiveness of the program was greater when the participants were relatively young, most had a white collar job, initial participation was low, effects were studied after a short follow-up period, the control group received no intervention, and the program had weekly contact moments.

Participation in health promotion programs among employees

The studies described in the third part of this thesis were based on a six-month follow-up study among employees of two Dutch manufacturing companies. Both provided several health promotion programs to their employees. Overall, 26% of the employees had a positive intention towards participating in a health promotion program at work and 11% actually participated in a health promotion program during the follow-up period. Intention to participate increased the odds on actual participation (OR: 3.02). However, 21% of those employees with a positive intention actually participated.

In chapter 6 the associations between various barriers and facilitators and intention to participate and their influence on actual participation were studied. A positive intention as well as actual participation were more likely when employees thought it was important to participate (intention OR: 43.00; actual participation OR: 2.81) and when they thought that their supervisor or colleagues expected them to participate (intention OR: 3.00; actual participation OR: 2.87). Perceiving more barriers decreased the likelihood of having a positive intention towards participation while the reverse was observed for perceiving more facilitators. However, these patterns were not observed for actual participation.

Chapter 7 describes a study that examined the needs and preferences of employees concerning health promotion programs, whether they were in agreement with what their employer provided, and whether a higher agreement enhanced participation. Most employees preferred a program focused at physical activity (55%), followed by general health (45%), stress management (39%), healthy nutrition (33%), and smoking cessation (7%). In general, these programs were preferred to be organized by the employer (versus at own discretion), individual programs (versus group-based), and to consist of multiple meetings (versus one meeting). A higher agreement between health promotion program preferences and those provided seemed to increase the chance on participation (OR: 2.36). Especially a match on the way the program was delivered (i.e. individual or in a group) was likely to enhance participation (OR: 1.72).

In chapter 8 the association between employees' health status, health behavior and internal health locus of control (i.e. believing that oneself is in control of one's health status) was studied, as well as the relation between internal health locus of control and participation in health promotion programs. Employees with a higher internal health locus of control behaved healthier (ORs: 1.04-1.05) and were more likely to have a good self-perceived health status (OR: 1.20). Moreover, these employees had higher odds for having the intention to participate (OR: 1.06) and to actually participate (OR: 1.06) in a health promotion program, which was independent of the employees' self-perceived health status.

In chapter 9 the main findings are presented, the methodological issues are discussed, new insights following the performed studies are described, and recommendations for future research and for policy and practice are presented. The following conclusions and recommendations are drawn:

- Educational level, health behavior, psychosocial and physical work-related characteristics, and work engagement play an important role in maintaining a sustainable employable workforce. For lower educated employees the effect of unhealthy behavior on exiting the labor force is even greater and unfavorable work-related characteristics play a greater role in leaving ones current job among employees with

a decreased work ability. These results show the complexity of sustainable employability. Future research is needed to further unravel the puzzle of sustainable employability by for example investigating the relative importance of age and gender and the interrelations of determinants. Furthermore, based on the importance of lifestyle, work-related characteristics and work engagement, it is recommended that policy focusses on these three factors simultaneously to increase effectiveness.

- Workplace health promotion programs focused at improving the health behaviors of employees are able to enhance sustainable employability. However, the effectiveness is dependent upon the methodological quality (lower quality leads to greater effects), population characteristics (e.g. among younger populations, greater effects), and intervention characteristics (e.g. more contact moments, greater effects). Therefore, it is important that policy and practice take not only the methodological quality into account but also the other characteristics of the study.
- A minority of employees had a positive intention towards participation and fewer actually participated in a health promotion program. Actual participation increased when employees thought that participation was important, felt that their supervisor or colleagues expected them to participate, and when they thought they had control over their own health status. Therefore, it seems important to focus at the health-aspect during implementation.
- Employees choose for a variety of health promotion programs and these choices depend upon age, gender, and education attainment. Moreover, participation will likely be improved when the provided health promotion programs match well with the preferences of the employees. Therefore, it is recommended that organizations assess the needs and preferences of employees and offer a variety of health promotion programs.

SAMENVATTING

Als gevolg van de ouder wordende beroepsbevolking stijgt de prevalentie van gezondheidsklachten. Daarnaast is een ongezonde leefstijl een zorg bij werknemers. Deze kwesties leiden tot de vraag: hoe kunnen we ervoor zorgen dat werknemers langer in goede gezondheid kunnen blijven werken? Kortom, hoe blijven werknemers duurzaam inzetbaar? Binnen organisaties worden in toenemende mate gezondheidsprogramma's aangeboden aan werknemers om dit te bewerkstelligen. Echter, een lage deelname kan de effectiviteit van deze programma's verminderen. In dit proefschrift is onderzoek gedaan naar de determinanten van duurzame inzetbaarheid, in welke mate gezondheidsprogramma's op het werk inzetbaarheid kunnen bevorderen en welke factoren deelname aan deze programma's beïnvloeden. De volgende doelstellingen zijn geformuleerd:

1. Het identificeren van individuele, leefstijl, en werk-gerelateerde determinanten van duurzame inzetbaarheid, uitgedrukt in ervaren gezondheid, werkvermogen, ziekteverzuim en arbeidsparticipatie.
2. Het bepalen van de effectiviteit van gezondheidsprogramma's op het werk op ervaren gezondheid, arbeidsproductiviteit, werkvermogen en ziekteverzuim afhankelijk van populatie-, studie- en interventiekarakteristieken en methodologische kwaliteit.
3. Het bestuderen van de invloed van belemmerende en bevorderende factoren op deelname aan gezondheidsprogramma's onder werknemers.

Determinanten van duurzame inzetbaarheid

Hoofdstuk 2 beschrijft een studie onder Europese verpleegkundigen (n=9972) waarin werd onderzocht in hoeverre werkomstandigheden en werkvermogen van invloed zijn op het verlaten van de huidige werkplek om ergens anders te werken binnen de zorg of de sector te verlaten. Een verminderd werkvermogen, gecorrigeerd voor individuele factoren en werkomstandigheden, was gerelateerd aan zowel het wisselen van werkgever binnen de zorg (Odds Ratio (OR): 1.39) als het verlaten van de sector (OR: 1.71). Voor werknemers met een verminderd werkvermogen verdubbelde de kans op het verlaten van de huidige werkplek wanneer zij ook slechte werkomstandigheden ervoeren zoals hoge inspanningen, veelvuldig uitvoeren van patiëntgebonden activiteiten en werken in ongemakkelijke houdingen. Voor werknemers met een goed werkvermogen was de kans op het verlaten van de huidige werkplek gelijk ongeacht de werkomstandigheden.

In hoofdstuk 3 werd onderzocht in welke mate een ervaren verminderde gezondheid, ongezonde leefstijl en ongunstige werkomstandigheden de kans op het vroegtijdig verlaten van de arbeidsmarkt voorspellen (n=14708). Verder werd onderzocht of deze factoren de opleidingsverschillen in verlaten van de arbeidsmarkt kunnen verklaren. Een slechte ervaren gezondheid vergrootte de kans op het verlaten van de arbeidsmarkt

door arbeidsongeschiktheid (Hazard Rate (HR): 6.45) en werkloosheid (HR: 1.76). Ook een ongezonde leefstijl en ongunstige werkomstandigheden vergrootten de kans op het vroegtijdig verlaten van de arbeidsmarkt (HR's: 1.12-2.40). Werknemers met een laag opleidingsniveau hadden een grotere kans op een ongezonde leefstijl, ongunstige werkomstandigheden en het vroegtijdig verlaten van de arbeidsmarkt. Het verbeteren van de gezondheid, leefstijl en werkomstandigheden van werknemers met een laag opleidingsniveau kunnen de opleidingsverschillen in het verlaten van de arbeidsmarkt verkleinen met 13% voor economische inactiviteit, 25% voor werkloosheid en 69% voor arbeidsongeschiktheid.

Hoofdstuk 4 beschrijft een studie (n=733) waarin de invloed van leefstijl, werkomstandigheden en bevlogenheid op het werk op vier maten van duurzame inzetbaarheid wordt onderzocht, te weten ervaren gezondheid, werkvermogen en kort en langdurig ziekteverzuim. Werknemers die onvoldoende sporten hadden een grotere kans op een slechte ervaren gezondheid (OR: 4.30), verminderd werkvermogen (OR: 2.50) en langdurig ziekteverzuim (OR: 2.59). Verder was de kans op een verminderd werkvermogen groter wanneer de werknemer ongunstige werkomstandigheden ervoer (OR's: 2.19-2.23). Een lage bevlogenheid op het werk was een voorspeller voor een verminderd werkvermogen (OR: 3.68) en langdurig ziekteverzuim (OR: 1.84). Ook wanneer er rekening werd gehouden met de werkomstandigheden van de werknemer, was er een associatie tussen bevlogenheid op het werk en werkvermogen (OR: 3.51). Het toevoegen van bevlogenheid op het werk, naast leefstijl en werkomstandigheden, resulteerde in een relatieve verbetering van 25% in de verklaarbare variatie van werkvermogen.

Effectiviteit van gezondheidsprogramma's op het werk

Hoofdstuk 5 presenteert een systematische review en meta-analyse van 18 gerandomiseerde onderzoeken waarin de effectiviteit van gezondheidsprogramma's op het werk op duurzame inzetbaarheid werd onderzocht. Deze programma's hebben een klein positief effect (effectmaat: 0.24) waarbij studies van een slechte methodologische kwaliteit vaker een groter effect rapporteerden. Verder was de effectiviteit van het programma groter wanneer de populatie relatief jong was, het merendeel een witte-boorden baan had, deelname aan de studie laag was, de nameting op korte termijn was, de controlegroep geen interventie ontving en het programma een wekelijks contact moment had.

Deelname aan gezondheidsprogramma's onder werknemers

De studies beschreven in het derde deel van dit proefschrift zijn gebaseerd op een studie onder werknemers van twee productiebedrijven in Nederland. Zij ontvingen twee vragenlijsten; een beginmeting en een nameting op zes maanden. De bedrijven boden zelf verschillende gezondheidsprogramma's aan hun werknemers aan. Van de deelnemers aan dit onderzoek had 26% een positieve intentie tot deelname aan een gezondheids-

programma op het werk en 11% had daadwerkelijk deelgenomen aan een programma gedurende de studieperiode. Het hebben van een positieve intentie vergrootte de kans op daadwerkelijke deelname (OR: 3.02). Echter, maar 21% van de werknemers met een positieve intentie nam daadwerkelijk deel aan een gezondheidsprogramma.

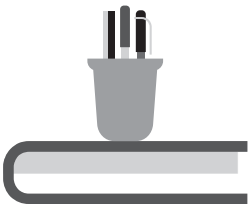
In hoofdstuk 6 werden de associaties tussen verschillende belemmerende en bevorderende factoren en intentie tot deelname en daadwerkelijke deelname onderzocht. De kans op een positieve intentie en daadwerkelijke deelname was groter wanneer werknemers het belangrijk vonden om deel te nemen (intentie OR: 43.00; daadwerkelijke deelname OR: 2.81) en wanneer zij dachten dat hun collega's of leidinggevende van hen verwachtten dat zij zouden deelnemen (intentie OR: 3.00; daadwerkelijke deelname OR: 2.87). Het ervaren van meer belemmerende factoren verkleinde de kans op een positieve intentie terwijl het ervaren van meer bevorderende factoren de kans erop vergrootte. Deze patronen waren echter niet zichtbaar voor daadwerkelijke deelname.

Hoofdstuk 7 beschrijft een studie waarin de voorkeuren van werknemers aangaande gezondheidsprogramma's werden onderzocht, of deze overeen kwamen met de programma's die hun werkgever hen aanbood en of een grotere mate van overeenkomst de kans op deelname vergrootte. Het merendeel van de werknemers gaf de voorkeur aan een programma gericht op lichamelijke activiteit (55%), gevolgd door algemene gezondheid (45%), stress management (39%), gezonde voeding (33%) en stoppen met roken (7%). Over het algemeen gaven de meeste werknemers de voorkeur aan een programma dat wordt georganiseerd door hun werkgever (versus het zelf organiseren), een individueel programma (versus een groepsprogramma) en een programma dat bestaat uit meerdere bijeenkomsten (versus eenmalig). Een grotere overeenkomst tussen de voorkeuren en wat werd aangeboden door de werkgever leek de kans op deelname te vergroten (OR: 2.36). In het bijzonder was de kans op deelname waarschijnlijk groter (OR: 1.72) wanneer de manier van aanbieden van het programma (individueel of groep) overeen kwam.

In hoofdstuk 8 werd de associatie onderzocht tussen de ervaren gezondheid, leefstijl van werknemers en de mate van overtuiging dat je zelf invloed hebt op je gezondheid (interne beheersingoriëntatiegraad met betrekking tot gezondheid). Verder werd de relatie onderzocht tussen interne beheersingoriëntatiegraad en deelname aan een gezondheidsprogramma. Werknemers met een hogere interne beheersingoriëntatiegraad hadden een grotere kans op een gezonde leefstijl (OR's: 1.04-1.05) en een goede ervaren gezondheid (OR: 1.20). Ook de kans op het hebben van een positieve intentie aangaande deelname aan gezondheidsprogramma's (OR: 1.06) en daadwerkelijke deelname (OR: 1.06) nam toe met een hogere interne beheersingoriëntatiegraad met betrekking tot gezondheid. De associaties met deelname waren onafhankelijk van de ervaren gezondheid van de werknemer.

Hoofdstuk 9 beschrijft de belangrijkste bevindingen uit dit proefschrift, methodologische kwesties, nieuwe inzichten voortvloeiend uit de bevindingen, en aanbevelingen voor toekomstig onderzoek, beleid en praktijk. De volgende conclusies en daaruit voortvloeiende aanbevelingen zijn geformuleerd:

- Opleidingsniveau, leefstijl, fysieke en psychosociale werkomstandigheden en bevlogenheid spelen een belangrijke rol in de inzetbaarheid van werknemers. Bij werknemers met een laag opleidingsniveau is de invloed van een ongezonde leefstijl op het vroegtijdig verlaten van de arbeidsmarkt sterker. Daarnaast spelen ongunstige werkomstandigheden een grotere rol bij het verlaten van de huidige functie bij werknemers met een verminderd werkvermogen. Deze resultaten tonen de complexiteit van duurzame inzetbaarheid aan, maar meer onderzoek is nodig om een volledig beeld te krijgen van duurzame inzetbaarheid zoals de invloed van leeftijd en geslacht en de samenhang tussen de factoren. Daarnaast is het gezien de invloed van leefstijl, werkomstandigheden en bevlogenheid op duurzame inzetbaarheid aan te bevelen dat beleid zich op deze drie groepen van factoren tegelijk richt.
- Gezondheidsprogramma's op het werk kunnen de duurzame inzetbaarheid van werknemers vergroten. Echter, effectiviteit is afhankelijk van methodologische kwaliteit (lage kwaliteit leidt tot groter effect), populatiekarakteristieken (jongere populaties, groter effect) en interventiekarakteristieken (meer contact momenten leidt tot grotere effect). Hierdoor is het van belang dat beleid en praktijk niet alleen rekening houdt met de kwaliteit van de studie maar ook naar deze karakteristieken kijkt bij implementatie.
- Een minderheid van de werknemers had een positieve intentie aangaande deelname aan gezondheidsprogramma's en nog minder werknemers namen daadwerkelijk deel. De kans op daadwerkelijke deelname nam toe wanneer werknemers dachten dat deelname belangrijk was en dachten dat hun collega's en leidinggevende dit ook vonden en wanneer zij een sterkere interne overtuiging hadden dat zij zelf invloed hadden op hun gezondheid. Het lijkt daarom belangrijk om tijdens de implementatie op het gezondheidsaspect te focussen.
- Werknemers kiezen voor een diversiteit aan gezondheidsprogramma's en keuzes hangen af van leefstijl, geslacht en opleidingsniveau. Daarnaast lijkt deelname te worden bevorderd wanneer organisaties programma's aanbieden die beter aansluiten bij de wensen en behoeftes van werknemers. Het is voor organisaties van belang om de voorkeuren van hun werknemers in kaart te brengen en om een diversiteit aan gezondheidsprogramma's aan te bieden.



DANKWOORD
CURRICULUM VITAE
LIST OF PUBLICATIONS
PHD PORTFOLIO

DANKWOORD

Hier ligt het dan, mijn proefschrift. Ook al staat alleen mijn naam op de voorkant, het was er niet geweest zonder het meewerken en –denken en de steun van vele mensen.

Als eerste wil ik mijn begeleiders bedanken. Lex, dank je voor je continue goede begeleiding tijdens dit traject. Ik zag soms tussen alle analyses en tekst de lijn van het gehele artikel niet meer. Jouw focus op het einddoel heeft ertoe geleid dat er een prachtige reeks reeds gepubliceerde artikelen in dit proefschrift staan. Je hebt mij geleerd om kritisch te blijven en te blijven zoeken naar het vernieuwende in de onderzoeken. Suzan, de afgelopen viereneenhalf jaar waren voor ons beiden nieuw; ik de nieuwe onderzoeker en jij de begeleider. Ik vind het erg fijn om jou als mijn dagelijks begeleider te hebben gehad. Je altijd kritische en geduldige blik hebben ertoe geleid dat het niveau van de artikelen altijd een stapje hoger kwam, ook al zag ik dat vooraf zelf niet. Ik heb maar enkele momenten van stress gekend tijdens dit traject. Dit is misschien niet zoals promoveren hoort te zijn, maar ik heb in deze situatie het beste kunnen presteren. En dit komt ook zeker voor een groot deel door jouw begeleiding.

Ik wil graag de leden van de promotiecommissie bedanken voor de tijd en aandacht die zij aan mijn proefschrift hebben besteed. Mijn dank gaat ook uit naar allen die betrokken waren bij mijn onderzoek, voor hun inzet en betrokkenheid. Zonder jullie was het allemaal minder goed en soepel verlopen. Bibi en Dennis vanuit Lifeguard, dank jullie voor het meedenken met de vragenlijst en het proces hier omheen. Wouter, dank je voor jouw vragen over wat dit onderzoek kan betekenen voor de praktijk. Marianne, Henri en Joost, zonder jullie tomeloze inzet en drive was er geen onderzoek geweest. Jullie motivatie en enthousiasme zorgden ervoor dat ik deze ook niet verloor al was het soms best even moeilijk om de medewerkers mee te krijgen in dit enthousiasme. Ik wil dan ook hartelijk alle deelnemers aan mij onderzoek bedanken. Coauteurs, bedankt voor jullie expertise en het meedenken bij de artikelen. Debbie, het symposium dat wij samen hebben georganiseerd is zeker een van mijn leukste herinneringen aan mijn promotietijd.

Ik heb een zeer fijne tijd op MGZ gehad en dit is mede door de fijne collega's. A&G-genoten, bedankt voor de gezellige samenwerking. Oude en nieuwe kamergenootjes; ik kwam terecht in een jongenskamer en nam afscheid van een meisjeskamer. Het druk werken aan analyses en papers werd afgewisseld met gezellig kletsen. Ik kan alleen maar hopen dat ik weer zulke fijne kamergenoten zal treffen. Collega's, wat had ik jullie soms hard nodig en wat was het gezellig tijdens de koffiebreaks en de drankjes na werktijd. Heel erg bedankt voor de gezellige tijd die wij samen op MGZ hebben gehad.

Lieve Vera, lang lang geleden toen wij als kleine meisjes aan tafel zaten was al duidelijk wie van ons tweeën de creatieveling was. Ik vind het heel erg leuk dat jij de vormgeving van mijn proefschrift hebt gedaan. Nu ben ik de trotse eigenaresse van twee mooie kunstwerken van jouw hand!

Lieve vriendinnen en vrienden, hoe kan ik jullie ooit in een paar regels bedanken voor onze vriendschap. Jullie zijn voor mij allemaal erg waardevol. Jullie aandacht voor mijn promotieonderzoek en alle leuke en sportieve activiteiten zorgden ervoor dat dit een fijne periode was met de broodnodige afleiding. Hierbij denk ik met name aan mijn oud–ploeggenoten van EJD05 (al tien jaar alle veranderingen de baas), mijn oud-NEMO-collega's (van keten op de vloer naar HT'en en B&B'en), mijn FBW-vrienden (de volgende promotie alweer, wie had dat gedacht), aan de vriendinnen uit mijn Maastricht-tijd (ondanks de korte periode in dezelfde stad is de vriendschap gebleven), mijn vriendinnen uit Rotterdam (door jullie ben ik van Rotterdam gaan houden) en mijn ploeggenoten bij Nautilus (er was niets fijner dan roeien na een dag werken).

Lieve paranimfen, wat fijn dat 'you got my back' op deze speciale dag. Suzan, ik ben erg blij met jouw vriendschap. Ik weet dat ik met alles bij je kan komen en altijd kan vertrouwen op je luisterend oor om met mij mee te denken. De mogelijkheid om tegen jouw als mede-promovenda stoom af te kunnen blazen was erg fijn. Maar ook de vele gezellige dingen die wij hebben gedaan en meegemaakt maken de afgelopen periode onvergetelijk. Karen, we begonnen als kamergenootjes en konden het gelijk goed vinden. Je bent de persoon die ik misschien wel het meest heb gezien, gesproken en de 'standaard' promoveerdingen mee heb besproken in deze periode. Het spreekt dus voor zich dat jij ook op deze dag een speciale rol hebt. Van collega's uitgegroeid naar vrienden en ik hoop dat deze vriendschap blijft, waar we dan ook wonen.

Lieve Eric, we hebben elkaar steeds opgevolgd; ik naar de universiteit en jij naar de middelbare school, en niet lang nadat ik aan mijn promotieonderzoek begon ging jij studeren. Nu is mijn proefschrift af. Wat jouw volgende stap ook zal zijn, ik ben voor altijd trots op je.

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CURRICULUM VITAE

Anne Rongen was born on March 25th 1985 in Utrecht, The Netherlands. She obtained her secondary school education at O.S.G. de Meergronden in Almere and graduated in 2003. Thereafter, she started studying Human Movement Science at the VU University in Amsterdam and obtained her Master of Science degree in 2007 with a specialization in ergonomics and rehabilitation. Next, she started with the master program 'work and health' of the faculty of health sciences at Maastricht University and obtained a Master of Science degree in 2009. Subsequently, she worked for half a year as a research assistant at the VU University in Amsterdam. In 2010 she started with a PhD project at the Department of Public Health of the Erasmus Medical Center in Rotterdam which resulted in this thesis. While working on her PhD-project, she also completed the Master of Science program at the Netherlands Institute for Health Science(NIHES) in 2013 with obtaining her Masters in health sciences with a specialization in Public Health.

Anne Rongen werd geboren op 25 maart 1985 te Utrecht, Nederland. In 2003 behaalde zij haar VWO diploma aan O.S.G. de Meergronden te Almere. Vervolgens startte zij met de studie bewegingswetenschappen aan de Vrije Universiteit te Amsterdam. In 2007 behaalde zij haar Master of Science met als afstudeerrichting 'revalidatie' en 'ergonomie'. Daarna volgde zij de afstudeerrichting 'arbeid en gezondheid' van de faculteit gezondheidswetenschappen van Maastricht Universiteit die zij in 2009 afsloot met het behalen van de titel Master of Science. Vervolgens werkte zij een half jaar als onderzoeksassistent bij de Vrije Universiteit te Amsterdam. Vanaf 2010 was zij als onderzoeker verbonden aan de afdeling Maatschappelijke Gezondheidszorg van het Erasmus Medisch Centrum te Rotterdam. Hier voerde zij het promotieonderzoek uit dat resulteerde in dit proefschrift. In deze periode volgde zij de opleiding Maatschappelijk Gezondheidszorg bij het Netherlands Institute for Health Sciences (NIHES), die zij in 2013 met een Master of Science afrondde.

LIST OF PUBLICATIONS

Workplace health promotion: a meta-analysis of effectiveness
American Journal of Preventive Medicine 2013;44(4):406-415

Influence of work-related characteristics and work ability on changing employer or leaving the profession among nursing staff
Journal of Nursing Management 2014;22(8):1065-1075

The contribution of work engagement to self-perceived health, work ability, and sickness absence beyond health behaviors and work-related factors
Journal of Occupational and Environmental Medicine 2014;56(8):892-897

The importance of internal health beliefs for employees' participation in health promotion programs
Preventive Medicine 2014;67:330-334

Barriers and facilitators for participation in health promotion programs among employees: a six-month follow-up study
BMC Public Health 2014;14:573

How needs and preferences of employees influence participation in health promotion programs: a six-month follow-up study
BMC Public Health 2014;14:1277

Educational inequalities in exit from paid employment among Dutch workers: the influence of health, lifestyle and work
Submitted

PHD PORTFOLIO

Summary of PhD training and teaching activities

Name PhD student: Anne Rongen
Erasmus MC, Department of Public Health
Research School: Netherlands Institute for Health Sciences

PhD period: 2010-2014
Promotor: Prof.dr.ir. A. Burdorf
Co-promotor: dr. S.J.W. Robroek

	Year	Workload (ECTS)
PhD TRAINING		
General research skills		
Master of Science in Public Health, Netherlands Institute for Health Sciences (NIHES), Rotterdam, the Netherlands	2010-2013	70.0
General academic skills		
Biomedical English writing and communication	2011-2012	1.0
Presentation course	2012	0.1
Scientific presentations		
Research meeting, Department of Public Health, Erasmus MC, Rotterdam, the Netherlands • Barriers and facilitators for successful participation in health intervention in companies – an implementation study	2011	0.5
Nederlands Congres Volksgezondheid, Amsterdam, the Netherlands • Bedrijfsgezondheidsprogramma's: wat is het aanbod en wie doen er mee?	2012	0.5
Annual conference of the International Society of Behavioral Nutrition and Physical Activity, Austin, Texas, the United States of America • Role of population characteristics, study characteristics, and intervention content of the effectiveness of workplace health promotion programs aimed at healthy lifestyles	2012	0.5
Research meeting, Department of Public Health, Erasmus MC, Rotterdam, the Netherlands • Workplace health promotion – a meta-analysis of effectiveness	2013	0.5
Nederlands Congres Volksgezondheid, Ede, the Netherlands • Symposium: Implementatie en participatie aan gezondheidsprogramma's op het werk: waar moeten we op letten?	2013	0.5
Annual conference of the International Society of Behavioral Nutrition and Physical Activity, Gent, Belgium • Symposium: Optimizing implementation of (worksite) health promotion programs: lessons learned	2013	0.7
International Epidemiology in Occupational Health, Utrecht, the Netherlands • Poster presentation: work engagement as a predictor of employees' health, work ability, and sickness absence	2013	0.5

Wellbeing at Work, Copenhagen, Denmark • Participation in health promotion programs: preferences, barriers, facilitators	2014	0.5

Conferences

Conference of the European Association of Work and Organizational Psychology, Maastricht, the Netherlands	2011	0.6
Nederlands Congres Volksgezondheid, Amsterdam, the Netherlands	2012	0.3
Annual conference of the International Society of Behavioral Nutrition and Physical Activity, Austin, Texas, the United States of America	2012	0.6
Nederlands Congres Volksgezondheid, Ede, the Netherlands	2013	0.3
Annual conference of the International Society of Behavioral Nutrition and Physical Activity, Gent, Belgium	2013	0.6
International Epidemiology in Occupational Health, Utrecht, the Netherlands	2013	0.6
Wellbeing at Work, Copenhagen, Denmark	2014	0.6

Seminars

Attending seminars of the Department of Public Health, Erasmus MC	2010-2014	3.6
Tweede onderzoeksbijeenkomst Duurzame Inzetbaarheid en Werkvermogen, Utrecht, the Netherlands	2012	0.1
Congres Gezond en Actief Betrokken aan het Werk, Amsterdam, the Netherlands	2012	0.1
Symposium de Gezonde Werkvloer, Den Haag, the Netherlands	2012	0.1
Symposium de Gezonde Werkvloer, Den Haag, the Netherlands	2013	0.1

TEACHING

Supervising of Bachelor students Occupational Health, Hogeschool Rotterdam, Rotterdam, The Netherlands • Thesis title: Health promotion by organizations (in Dutch)	2011	1.0
Supervising third year medical students' community project, University of Rotterdam, Rotterdam, The Netherlands	2012 & 2013	1.0

OTHER

Board member (secretary) of the association for PhD students of Erasmus MC Promeras	2012-2014	1.0
Research project for the Centre of Effective Public Health in the larger Rotterdam area (CEPHIR) • Title: Effects of preventive lifestyle interventions on public health – a literature review (in Dutch)	2014	15.0