Innovations in organisational-level work stress interventions

Maartje Bakhuys Roozeboom

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INNOVATIONS IN ORGANISATIONAL-LEVEL WORK STRESS INTERVENTIONS

An application in primary schools

Maartje Bakhuys Roozeboom

Amsterdam UMC
Universitair Medische Centra

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Introduction

Work stress in primary schools

Work stress is a serious issue among workers in workplaces throughout the globe. Especially in the (primary) education sector workers are at risk to suffer from work stress. Widespread media reports of this problem have dominated newspaper headlines for decades (see previous page). In the Netherlands, the sector with the highest proportion of employees reporting work stress is the educational sector (1). Especially teachers are at risk to suffer from work stress, and this appears to be a worldwide phenomenon. Studies from different contexts such as Europe, the United States, China, South Korea, Thailand and Kenya, report high levels of work stress and burnout among teachers (2-7). Other studies have shown that teachers report more work stress or burn-out symptoms than workers in other sectors. Heus & Diekstra (8) for example found that teachers show significantly more burnout symptoms than other social professions (e.g. nurses, managers, physicians, dentists, psychotherapists, social workers). A recent study conducted by the Gallup Panel Workforce in the United States also found that teachers report the highest levels of burnout in comparison to the workforce in other sectors (9).

From research it is known that work stress can have severe consequences for workers by causing mental health problems (10), cardiovascular diseases (11) and musculoskeletal disorders (12). Additionally, work stress among teachers can have negative consequences for schools, leading to decreased performance (13), decreased commitment (14), and increased sickness absence (15) and for students by negatively impacting the quality of education (16). High levels of work stress also increase the risk of teachers' turnover (17-19) and make the sector less appealing. This is worrying since there are substantial shortages of teachers. In the Netherlands, in 2023 the shortage of primary school teachers is estimated at 9.700 full time jobs (9,5% of the total employment of teachers). But also in other countries teacher shortages are threatening the quality of education systems (20).

Considering the high prevalence of work stress and the severe consequences, adequate interventions to prevent or decrease work stress in primary schools are required. Before we elaborate more on existing and potentially effective interventions, it is important to understand the concept of work stress.

Definition of work stress

In one of the first theories of work stress, introduced by Selye (21), work stress is defined as the individual's psychological or physiological response to an external threat, often referred to as 'stressor'. Selye found that over time, coping with stress can exhaust the body and result in physical and mental illness. Decades later, the understanding of work stress was expanded

by Lazarus & Folkman (22). In their approach, stress is seen as an interaction between the individual and the (work) environment. According to their theory, the duration and intensity of the stress response is determined by the individuals perception or appraisal of the stressor. In the Person-Environment (P-E) Fit (23) the perspective on stress was broadened further, also paying attention to the work environment as perceived by the employee. According to the PE-Fit model, work stress is defined as a 'misfit' between personal needs and the resources in the (work) environment, or a misfit between personal possibilities and the demands from the environment. This balance principle also formed the basis of theoretical work stress models that were introduced later. According to the Job Demands Control (Support)-model (JDC(S)model) (24), perceived job demands, such as a high workload or emotionally demanding tasks, do not necessarily cause stress, but they can become stressors when combined with a lack of control over the work (e.g. poor decision latitude). The original JDC model was later extended to include the role of social support (25). The JDC(S) model emphasizes the importance of social support as a resource that can buffer the negative effects of high job demands and low control.

Building on earlier models, the Job Demands-Resources (JD-R) model suggests that the balance between job demands and resources determines positive and negative work-related outcomes, such as work engagement or burnout (exhaustion)(26). Job demands refer to aspects of the job that require effort (27), whereas resources refer to aspects of the job that reduce job demands, help achieve work goals and stimulate personal development (26). Resources can be divided into organisational resources (e.g. supervisor support, co-worker support, autonomy) and personal resources (e.g. resilience, optimism). Unlike previous models, the JD-R model asserts that any work characteristic can be a potential demand or resource.

Nowadays, the most common view is that an imbalance between job demands and resources can cause (work) stress, and prolonged stress can eventually lead to burnout. Burnout is defined as a syndrome consisting of emotional exhaustion, depersonalization, and reduced personal accomplishment (28-30). Among the three burnout components, emotional exhaustion is considered the most critical, often emerging first and leading to higher levels of depersonalization and reduced personal accomplishment (30, 31). In addition, emotional exhaustion consistently shows the strongest relations with negative outcomes (32-35). In studies on teachers, emotional exhaustion contributes more strongly to overall burnout scores than other components (36).

In this thesis, the JD-R model is used as theoretical framework since it provides a generic, widely applicable, comprehensive framework for understanding and addressing work stress in organisations. The JD-R model is commonly used to study work stress and burnout within working populations in different sectors, and focuses on exhaustion and (dis)engagement as (negative) core outcome variables of the model. Consequently, this thesis focuses on work-

related emotional exhaustion as outcome variable to study work stress among employees in primary schools.

Organisational-level interventions for work stress prevention

Despite decades of intervention research on preventing and decreasing work stress among teachers, effective interventions and preventive strategies are lacking or insufficient (37-39). Most studied interventions aimed at teachers' work stress or burnout are directed at the individual and focus on secondary risk prevention by empowering individuals to deal with job demands or stress (e.g. relaxation training, mindfulness, cognitive behavioural theory)(40, 41). Although there is evidence that some of these type of interventions can help individuals cope with stressors (42-44), they do not target the actual causes of stress. For this reason scholars question whether these types of interventions are the most adequate and sustainable approach to prevent work stress (45).

According to the 'hierarchy of controls' principle, interventions are most (cost)effective when they eliminate work stress risks at source (e.g. targeting job demands and resources). For this reason, to manage psychosocial risks at work organisational-level-interventions are the recommended approach (46-49). Organisational-level interventions are defined as planned, behavioural, theory-based actions to change the way work is organised, designed and managed in order to improve the health and well-being of participants (50). These interventions focus on eliminating causes of work stress. Following a stepwise, cyclical approach, work stress risks are identified and an action plan is implemented by a working group consisting of workers and management from the organisation. The action plan contains tailored measures to mitigate or remove the causes of work stress (50-53). After implementation of the action plan, the intervention is evaluated and steps can be repeated when needed. These interventions are characterized by employee participation during all steps of the approach.

Although there is evidence for the effectiveness of organisational-level-interventions on employee health (54) and burnout (55), not all bring about the intended outcomes (54-57). This also applies to organisational-level-interventions to decrease work stress in teachers (37, 58). The inability of an intervention to achieve it's intended outcomes is defined as 'program failure'. The central mechanism of organisational-level interventions is that measures are implemented that target the work stress risks. Possible explanations for program failure of organisational-level interventions therefore include, among others, the selection of inadequate or inappropriate measures to decrease of eliminate work stress risks (program failure due to inadequate measures) (55, 59) or the unsuccessful implementation of the planned measures (implementation failure of the action plans)(50, 55).

Program failure due to inadequate measures

In this thesis, program failure due to inadequate measures refers to situations where the designed action plans, (including the planned measures), do not achieve the intended outcomes as a result from flaws in addressing the most important work stress risks, or selecting ineffective measures. Program failure due to inadequate measures centers on the effectiveness of the action plan itself (by design), regardless of the implementation of the action plan.

Organisational-level interventions to manage work stress can be considered as complex interventions, because they often contain multiple components and aim for change at different levels of the organisation (60). Due to the complexity and dynamics of the organisational context and the interrelatedness of different work stress risks, selecting appropriate measures to target work stress risks is difficult. Selecting adequate measures requires adequate specification of what needs to change. When it comes to the underlying mechanism of work stress, increasing organisational and personal resources and reducing job demands often requires different actors within the organisation to take specific behavioural actions (e.g. employees and managers prioritizing tasks, taking breaks, and providing constructive feedback). However, traditional risk assessments typically focus on identifying general risk factors (e.g. high job demands, or low control or social support) as described in dominant work stress theories without specifying the necessary (behavioural) changes (61). More attention for the needed behavioural changes may contribute to selecting appropriate measures to accomplish these changes.

In addition, the selection of inadequate measures could potentially be prevented by using theories of change and explicating the program logic (62, 63). A theory of change is a comprehensive and detailed description of how and why a desired change is expected to happen in a particular context. It is a tool commonly used in the field of intervention program planning and evaluation to map out the causal pathway from activities to outcomes. Recent studies have focused on the development and evaluation of middle range theories (MRT's) (theories about the working mechanism of the intervention) as part of organisational-level intervention research (64). However, these MRT's often describe the general mechanisms of organisational-level interventions (e.g. employee participation, management support, intervention-context fit (57), but they often do not cover the actual measures that are planned and implemented to target the identified work stress risks. In addition, although theories linking determinants (e.g. job demands and resources) to health outcomes (e.g. burnout, work stress) are used very often in organisational interventions, theories linking planned measures to changes in work stress risks (job demands and resources) are often lacking (65, 66).

Implementation failure of the action plan

In this thesis, implementation failure of the action plan refers to the inability to successfully implement the action plans including the planned measures as intended. This type of failure occurs when there are obstacles or hinderances in the process of implementing the planned measures. Implementation failure can compromise the achievement of the intended outcomes of the intervention regardless of the potential effectiveness of the planned measures.

Even if appropriate measures are planned, they can only accomplish the intended effects when they are successfully implemented. However, implementing these interventions is often complex, and successful implementation depends on various factors, such as sufficient and continuous management support (54, 55, 57, 67), active involvement of employees (54, 55, 57, 67), clear and transparent communication towards employees (57, 67) perceptions and appraisals of individuals in the organisation towards the intervention (67, 68) as well as contextual factors such as restructuring and turn-over (54, 55, 67). In practice, the implementation of organisational-level interventions is often hindered by these specific factors (50, 54, 55).

Aim of the thesis

As described in the previous paragraphs, work stress is an urgent issue among employees in primary education. Organisational-level interventions are considered the gold standard to prevent and decrease work stress, but they are at risk of program failure due to inadequate measures and/or implementation failure of the action plans. Innovations in organisational-level interventions to optimise the selection of measures and the implementation of action plans, could potentially reduce the risk of program failure and make these interventions more effective. The main aim of this thesis is to increase our understanding of how organisational-level interventions can be designed and implemented to effectively decrease work stress in primary schools, and to investigate innovations that can optimise these interventions.

The following objectives are addressed in this thesis:

- To explore the effects of an organisational-level intervention (version 1) in primary schools to decrease work stress;
- To explore the relation between design, implementation and effects of occupational risk prevention and health promotion interventions;
- To design an organisational-level intervention (version 2) to decrease work stress, with innovative aspects to prevent program failure due to inadequate measures or

due to implementation failure of the action plans, and evaluate the implementation process and effects in primary schools.

Outline of the thesis

The thesis is divided in three parts.

Part 1: Exploring effects of an organisational-level work stress intervention in primary schools

In part one of this thesis, the effect of an organisational-level work stress intervention (version 1) to decrease work stress among employees in primary schools is explored (**chapter 2**). Using a multiple case study design, effects were investigated of an organisational-level work stress intervention that was implemented at five primary schools in the Netherlands. In addition, the effects of the intervention were also studied in relation to the implementation success. Results of this study are used to design an improved organisational-level work stress intervention (version 2) to decrease work stress in primary schools (see part three).

Part 2: Exploring the relation between design, implementation and effects of occupational risk prevention and health promotion interventions

Part two of this thesis focuses on the design of interventions within the occupational safety and health domain to prevent program failure. **Chapter 3** focuses on a regularly applied method for designing interventions in the public health domain, Intervention Mapping (IM) (69). IM is used in the public health domain to design interventions whilst preventing program failure. The aim of this chapter was to investigate whether IM is also effectively used within the occupational safety and health domain. Specifically, the relation between the fidelity regarding the use of the IM protocol for intervention development, the implementation process and the effectiveness of the interventions was explored. Results of this study are used to design an improved organisational-level work stress intervention to decrease work stress in primary schools (see part three).

Part 3: Design, process and effect of an organisational-level work stress intervention to decrease work stress in primary schools

Part three of this thesis describes the design, implementation process and effects of an organisational-level work stress intervention to decrease work stress in primary schools. Based on the lessons learned from the multiple case study with the organisational-level work stress intervention (version 1) in primary schools (**chapter 2**) and the results of the review on occupational risk prevention and health promotion interventions designed using IM (**chapter**

3), chapter 4 presents the outline of a participatory organisational-level work stress prevention approach (version 2), specifically designed to prevent program failure due to inadequate measures or due to implementation failure of the action plans and decrease work stress in primary schools. Chapter 5 focuses on the implementation of the intervention and provides a detailed evaluation of the implementation process. In addition, the chapter reflects on the use of real-time feedback as implementation strategy. Chapter 6 presents the effect evaluation of the intervention using a quasi-experimental study design with an intervention group (4 schools, n=102 employees) and a control group (26 schools, n=656 employees). Specifically, the effects of the intervention on emotional exhaustion as primary outcome and work stress determinants were studied, as well as the impact of implementation success on these outcomes.

References

1. Hooftman WE, Mars G, Knops J, van Dam L, de Vroome E, Ramaekers M, et al. Nationale Enquête Arbeidsomstandigheden 2020. Methodologie. Leiden/ Heerlen, 2021.
2. Ratanasiripong P, Ratanasiripong NT, Nungdanjark W, Thongthammarat Y, Toyama S. Mental health and burnout among teachers in Thailand. Journal of Health Research. 2021;36(3):404-16.
3. Bulatevych N. Teacher's burnout syndrome: the phenomenology of the process. Polish Journal of Public Health. 2017;127(2).
4. Kilonzo TM, Were S, Odhiambo R. Influence of employee engagement on the performance of teachers in secondary schools in Machakos County in Kenya. International Journal of Novel Research in Humanity and Social Sciences. 2018;5(1):52-71.
5. Yorulmaz YI, Çolak İ, Altinkurt Y. A meta-analysis of the relationship between teachers' job satisfaction and burnout. Eurasian Journal of Educational Research. 2017;17(71):175-92.
6. Greenberg MT, Brown JL, Abenavoli RM. Teacher stress and health effects on teachers, students, and schools. Edna Bennett Pierce Prevention Research Center, Pennsylvania State University. 2016:1-12.
7. Kim WH, Ra Y, Park JG, Kwon B. Role of burnout on job level, job satisfaction, and task performance. Leadership & Organisation Development Journal. 2017;38(5):630-45.
8. De Heus P, Diekstra RF. Do teachers burn out more easily? A comparison of teachers with other social professions on work stress and burnout symptoms. Understanding and preventing teacher burnout: A sourcebook of international research and practice. 1999:269-84.
9. K-12 workers have the highest burnout rate in the U.S. [Internet].; 2022. Available from: https://news.gallup.com/poll/393500/workers-highest-burnout-rate.aspx.
10. Harvey SB, Modini M, Joyce S, Milligan-Saville JS, Tan L, Mykletun A, et al. Can work make you mentally ill? A systematic meta-review of work-related risk factors for common mental health problems. Occup Environ Med. 2017 Mar;74(4):301-10.
11. Kivimäki M, Nyberg ST, Batty GD, Fransson EI, Heikkilä K, Alfredsson L, et al. Job strain as a risk factor for coronary heart disease: a collaborative meta-analysis of individual participant data. The Lancet. 2012;380(9852):1491-7.
12. Da Costa BR, Vieira ER. Risk factors for work-related musculoskeletal disorders: a systematic review of recent longitudinal studies. Am J Ind Med. 2010;53(3):285-323.
13. Asaloei SI, Wolomasi AK, Werang BR. Work-Related stress and performance among primary school teachers. International Journal of Evaluation and Research in Education. 2020;9(2):352-8.

14. Klassen R, Wilson E, Siu AF, Hannok W, Wong MW, Wongsri N, et al. Preservice teachers' work stress, self-efficacy, and occupational commitment in four countries. European journal of psychology of education. 2013;28(4):1289-309.
15. Duijts SF, Kant I, Swaen GM, van den Brandt, Piet A, Zeegers MP. A meta-analysis of observational studies identifies predictors of sickness absence. J Clin Epidemiol. 2007;60(11):1105-15.
16. Varghese R, Kurian J. A Study on the Impact of Occupational Stress on the Performance of School Teachers in the State of Kerala. European Journal of Molecular & Clinical Medicine. 2020;7(11):100-9.
17. Weiss EM. Perceived workplace conditions and first-year teachers' morale, career choice commitment, and planned retention: A secondary analysis. Teaching and teacher education. 1999;15(8):861-79.
18. Perrachione BA, Rosser VJ, Petersen GJ. Why Do They Stay? Elementary Teachers' Perceptions of Job Satisfaction and Retention. Professional Educator. 2008;32(2):n2.
19. Rajendran N, Watt HM, Richardson PW. Teacher burnout and turnover intent. The Australian Educational Researcher. 2020;47(3):477-500.
20. Eurydice E. Teaching careers in Europe: Access, progression and support. European Commission, Bruxelles. 2018.
21. Selye H. A syndrome produced by diverse nocuous agents. Nature. 1936;138(3479):32.
22. Lazarus RS, Folkman S. Stress, appraisal, and coping. Springer publishing company; 1984.
23. French JR, Caplan RD, Van Harrison R. The mechanisms of job stress and strain. 1982.
24. Karasek Jr RA. Job demands, job decision latitude, and mental strain: Implications for job redesign. Adm Sci Q. 1979:285-308.
25. Johnson JV, Hall EM. Job strain, work place social support, and cardiovascular disease: a cross-sectional study of a random sample of the Swedish working population. Am J Public Health. 1988;78(10):1336-42.
26. Demerouti E, Bakker AB, Nachreiner F, Schaufeli WB. The job demands-resources model of burnout. J Appl Psychol. 2001;86(3):499.
27. Schaufeli WB, Bakker AB, Van Rhenen W. How changes in job demands and resources predict burnout, work engagement, and sickness absenteeism. Journal of Organisational Behaviour: The International Journal of Industrial, Occupational and Organisational Psychology and Behaviour. 2009;30(7):893-917.
28. Maslach C, Jackson SE. The measurement of experienced burnout. J Organ Behav. 1981;2(2):99-113.
29. Maslach C, Jackson SE, Leiter MP, Schaufeli WB, Schwab RL. Maslach burnout inventory. Consulting Psychologists Press Palo Alto, CA; 1986.
30. Maslach C, Schaufeli WB, Leiter MP. Job burnout. Annu Rev Psychol. 2001;52(1):397-422.
31. Byrne BM. Burnout: Testing for the validity, replication, and invariance of causal structure across elementary, intermediate, and secondary teachers. American educational research journal. 1994;31(3):645-73.

32. Cordes CL, Dougherty TW. A review and an integration of research on job burnout. Academy of management review. 1993;18(4):621-56.
33. Demerouti E, Bakker AB, Nachreiner F, Schaufeli WB. The job demands-resources model of burnout. J Appl Psychol. 2001;86(3):499.
34. Halbesleben JR, Bowler WM. Emotional exhaustion and job performance: the mediating role of motivation. J Appl Psychol. 2007;92(1):93.
35. Green DE, Walkey FH, Taylor AJ. The three-factor structure of the Maslach Burnout Inventory: A multicultural, multinational confirmatory study. Journal of Social Behaviour and Personality. 1991;6(3):453.
36. Grayson JL, Alvarez HK. School climate factors relating to teacher burnout: A mediator model. Teaching and teacher education. 2008;24(5):1349-63.
37. Naghieh A, Montgomery P, Bonell CP, Thompson M, Aber JL. Organisational interventions for improving wellbeing and reducing work-related stress in teachers. Cochrane Database Syst Rev. 2015;4(4):CD010306.
38. Iancu AE, Rusu A, Măroiu C, Păcurar R, Maricuțoiu LP. The effectiveness of interventions aimed at reducing teacher burnout: A meta-analysis. Educational psychology review. 2018;30(2):373-96.
39. Dreer B, Gouasé N. Interventions fostering well-being of schoolteachers: A review of research. Oxford Review of Education. 2022;48(5):587-605.
40. von der Embse N, Ryan SV, Gibbs T, Mankin A. Teacher stress interventions: A systematic review. Psychology in the Schools. 2019;56(8):1328-43.
41. Hagermoser Sanetti LM, Boyle AM, Magrath E, Cascio A, Moore E. Intervening to decrease teacher stress: A review of current research and new directions. Contemporary School Psychology. 2021:1-10.
42. Zarate K, Maggin DM, Passmore A. Meta-analysis of mindfulness training on teacher well-being. Psychology in the Schools. 2019;56(10):1700-15.
43. Oliveira S, Roberto MS, Veiga-Simão AM, Marques-Pinto A. A meta-analysis of the impact of social and emotional learning interventions on teachers' burnout symptoms. Educational Psychology Review. 2021;33(4):1779-808.
44. Hepburn S, Carroll A, McCuaig-Holcroft L. A complementary intervention to promote wellbeing and stress management for early career teachers. International Journal of Environmental Research and Public Health. 2021;18(12):6320.
45. Lamontagne AD, Keegel T, Louie AM, Ostry A, Landsbergis PA. A systematic review of the job-stress intervention evaluation literature, 1990–2005. International journal of occupational and environmental health. 2007;13(3):268-80.
46. EU-OSHA. Second European Survey of Enterprises on New and Emerging Risks (ESENER-2). In Overview Report: Managing Safety and Health at Work. 2016.
47. International Labour Office (ILO). Guidelines on occupational safety and health management systems (ILO-OSH 2001). Geneva, Switzerland: ILO; 2001.

48. UK Health and Safety Executive. Managing the causes of work-related stress: A step-by-step approach using the management standards (2nd ed.). Great Britain: HSE; 2007.
49. World Health Organisation. WHO guidelines on mental health at work. Geneva: World Health Organisation; 2022.
50. Nielsen K, Randall R, Holten A, González ER. Conducting organisational-level occupational health interventions: What works? Work & Stress. 2010;24(3):234-59.
51. Kompier MAJ, Marcelissen FHG. Handboek werkstress: systematische aanpak voor de bedrijfspraktijk. Nederlands Instituut voor Arbeidsomstandigheden (NIA); 1995.
52. Cox T, Griffiths A, Randall R. A risk management approach to the prevention of work stress. The handbook of work and health psychology. 2003;191.
53. Leka S, Jain A, Cox T, Kortum E. The development of the European framework for psychosocial risk management: PRIMA-EF. Journal of occupational health. 2011;53(2):137-43.
54. Montano D, Hoven H, Siegrist J. Effects of organisational-level interventions at work on employees' health: a systematic review. BMC Public Health. 2014;14(1):1-9.
55. Aust B, Møller JL, Nordentoft M, Frydendall KB, Bengtsen E, Jensen AB, et al. How effective are organisational-level interventions in improving the psychosocial work environment, health, and retention of workers? A systematic overview of systematic reviews. Scand J Work Environ Health. 2023.
56. Semmer NK. Job stress interventions and organisation of work. Handbook of occupational health psychology. 2003:325-53.
57. Roodbari H, Axtell C, Nielsen K, Sorensen G. Organisational interventions to improve employees' health and wellbeing: A realist synthesis. Appl Psychol. 2022;71(3):1058-81.
58. Schelvis R, Wiezer NM, Van der Beek, Allard J, Twisk JW, Bohlmeijer ET, Oude Hengel KM. The effect of an organisational-level participatory intervention in secondary vocational education on work-related health outcomes: results of a controlled trial. BMC Public Health. 2017;17(1):1-14.
59. Cox T, Taris TW, Nielsen K. Organisational interventions: Issues and challenges. Work & stress. 2010;24(3):217-8.
60. Craig P, Dieppe P, Macintyre S, Michie S, Nazareth I, Petticrew M, et al. Developing and evaluating complex interventions: the new Medical Research Council guidance. BMJ. 2008 Sep 29;337:a1655.
61. Nielsen K, Taris TW, Cox T. The future of organisational interventions: Addressing the challenges of today's organisations. Work & stress. 2010;24(3):219-33.
62. von Thiele Schwarz U, Richter A, Hasson H. Getting everyone on the same page: Cocreated program logic (COP). In: Organisational Interventions for Health and Well-being. Taylor & Francis; 2018.
63. von Thiele Schwarz U, Nielsen K, Edwards K, Hasson H, Ipsen C, Savage C, et al. How to design, implement and evaluate organisational interventions for maximum impact: The

Sigtuna Principles. European Journal of Work and Organisational Psychology. 2021;30(3):415-27.
64. Roodbari H, Nielsen K, Axtell C, Peters SE, Sorensen G. Developing initial middle range theories in realist evaluation: a Case of an organisational intervention. International Journal of Environmental Research and Public Health. 2021;18(16):8360.
65. Karanika-Murray M, Biron C. The nature of change in organisational health interventions: Some observations and propositions. Salutogenic organisations and change: The concepts behind organisational health intervention research. 2013:239-58.
66. Nielsen K. How can we make organisational interventions work? Employees and line managers as actively crafting interventions. Human Relations. 2013;66(8):1029-50.
67. Nielsen K, Noblet A. Chapter Introduction: Organisational interventions: Where we are, where we go from here? In: Organisational Interventions for Health and Well-being. Taylor & Francis; 2018.
68. Augustsson H, von Thiele Schwarz U, Stenfors-Hayes T, Hasson H. Investigating variations in implementation fidelity of an organisational-level occupational health intervention. Int J Behav Med. 2015;22:345-55.
69. Bartholomew, L.K.B.; Markham, C.M.; Ruiter, R.A.; Fernández, M.E.; Kok, G.; Parcel, G.S. Planning Health Promotion Programs: An Intervention Mapping Approach; John Wiley & Sons: San Francisco, 2016.

PART 1

Exploring effects of an organisational-level work stress intervention in primary schools

Chapter 2

Decreasing Employees' Work Stress by a Participatory, Organisational-Level Work Stress Prevention Approach:

A Multiple-Case Study in Primary Education

Maartje. C. Bakhuys Roozeboom

Roosmarijn M.C Schelvis

Irene L. D. Houtman

Noortje M. Wiezer

Paulien M. Bongers

Based on:

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Abstract

Background: Work stress is an important problem among employees in education in the Netherlands. The present study aims to investigate the effects of a participatory organisational-level work stress prevention approach to reduce (quantitative) job demands, increase resources (i.e. autonomy, supervisor and coworker support) and to reduce work stress and increase job satisfaction of employees in primary education.

Methods: This study makes use of a multiple case study research design. The stress prevention approach is implemented at 5 primary schools and questionnaires were filled out by 119 employees of the 5 schools at baseline and one year later, measuring job demands, resources, work stress, job satisfaction and implementation factors.

Results: Multilevel analyses showed a significant decrease in job demands and a significant increase in job satisfaction between baseline and follow up. In addition, employees that were more satisfied with the communication about the intervention showed more improvements in autonomy and job satisfaction. However, employees reporting an increased dialogue in work stress between employees and management showed smaller decrease in job demands.

Conclusion: The study shows a decrease in job demands and an increase in job satisfaction in the schools that implemented a stress prevention approach. Results of the study underline the importance of communication about the intervention as part of the implementation process, impacting the effectiveness of the intervention to improve autonomy and job satisfaction.

Trial registration: ISRCTN14697835

Keywords: work stress, job satisfaction, primary education, organisational-level intervention

Introduction

Among EU-workers, 25% consider their health to be at risk due to work stress (1), and this number is even higher for workers in education (42%) (2). According to a survey that is representative for the Dutch workforce, one in five employees in education in the Netherlands actually suffers from work stress (3), i.e. they feel emotionally drained and exhausted especially at the end of the work day, and are tired when they get up again in the morning. In primary education, the target group of the present study, this would equal 32,165 of the 168,400 employed workers in 2017. In addition, at present there is a significant shortage of teachers in the Netherlands, especially in primary education and this problem is jeopardizing the quality of the Dutch educational system.

There is a lot of evidence that work stress causes major health problems, such as cardiovascular diseases (4-7), musculoskeletal disorders (8), and poor mental health (9). Work stress is also found to increase sickness absence (10), decrease job satisfaction (11) and lower productivity (12). Considering the severe consequences of work stress for employees and employers, it is important that organisations take measures to reduce these risks. The high prevalence of work stress in primary education, combined with the shortage of teachers in this sector, ask for effective interventions to reduce work stress and increase job satisfaction, to prevent teachers from leaving their profession.

In the last decades, a lot of research has focused on causes of work stress and several theoretical models have been developed (e.g. JDC(S)-model (13), the DISC-model (14) and JDR-model (15)). These models are all based on the balance principle: work stress as a result of excessive job demands combined with a shortage of available resources. Job demands are the physical, social or organisational aspects of the job that require effort (16). Resources refer to aspects of the job that reduce job demands and the required efforts, help to achieve work goals and stimulate learning and development (17). Job demands that have been found to correlate positively with teacher burnout are time pressure and work overload (18-21). Resources that are found to be related to work stress in teachers are amongst others lack of autonomy (22, 23) and lack of supervisor support (20, 24).

According to the “hierarchy of controls” principle, interventions are presumed to be most (cost-) effective when work stress risks are managed at their source (i.e. primary prevention, aiming at job demands and resources) (25). In addition, it is assumed that organisational interventions hold most potential for structural changes as opposed to individual interventions. These latter interventions may improve the well-being of individuals, but organisational interventions target the actual causes of stress, and may thus lead to substantial and sustainable improvements at both individual and organisational-level. In practice, most interventions to prevent or reduce work stress in education focus on

empowering individuals to deal with job demands. Different studies have shown only partial effects of these interventions on work stress (26-28). Based on their review of organisational interventions aimed at reducing work stress in teachers, Naghieh et al. (29) conclude that organisational interventions lead to improvements in well-being of teachers, even though good quality effect evaluations of organisational interventions are scarce.

In the last decades, considerable efforts have been put into the consolidation of evidence concerning good practice interventions dealing with stress in the workplace. A large study on best practices of psychosocial risks (including work stress) management in Europe has resulted in a best practice framework for psychosocial risk management (PRIMA-EF) (30). Based on interviews and focus group meetings, seven key features of work stress interventions have been identified. That is, interventions need to: 1) be theory and evidence-based; 2) follow a systematic, stepwise approach, including developing clear goals, tasks and intervention-planning; 3) apply a proper risk assessment, identify risk factors and vulnerable groups; 4) be tailored to the organisational context (e.g. sector, size, culture), and be adaptable and flexible; 5) be accessible and user friendly; 6) be targeted at the individual as well as the organisation, and 7) develop (management and leadership) capacities and skills. Several interventions that include these features have been tested (31-34). In most cases, the intervention consists of several steps that can be summarized as: a preparation phase, a risk assessment phase, an action planning phase, an implementation phase, and an evaluation phase. The first three steps of the intervention, the preparation phase, risk assessment phase and the action planning phase, result in a tailored action plan that targets organisation specific stressors or hindrances. Implementation of this action plan is – in line with the Job Demands Resources model – hypothesized to reduce job demands and increase resources, which will in turn decrease levels of work stress and increase job satisfaction (16, 17, 35).

However, the implementation of these interventions is complex (36) and the success of such interventions depends on many factors (37, 38). Several implementation factors that appear to be important for the success of the intervention are employee participation, communication, and dialogue (39). Implementation factors are not only considered to be crucial for successful implementation, but these factors in themselves can be considered as active ingredients of the intervention since they provide resources for employees. The process evaluation model of Nielsen & Randall (40) identifies participation of employees during the implementation process as an important driver of change. Employee participation is important because employees have expert knowledge of the workplace and work processes, and by involving them in managing psychosocial risks this knowledge is accessible (31, 34). In addition, participation of employees in the intervention, provides opportunities for employees to control their working conditions and “worker control” is an important determinant of employee wellbeing (13). Furthermore, involving employees in identifying stressors and finding solutions will increase employees’ readiness for change and ensure commitment for the implementation of the measures. For these reasons, the participatory

approach has been broadly advocated as an effective strategy in organisational interventions to improve occupational health (34). Another important implementation factor mentioned in previous research is clear and transparent communication (39, 41-43). Communication about and throughout the process is very important to get and keep employees informed and involved. Communication about the intervention and the intervention process contributes to employees' understanding of the intentions behind the interventions, increasing employee participation in and commitment to the intervention (44). In their model of process evaluation, Nielsen & Randall (40) consider communication to be a crucial aspect of the implementation strategy. In addition, Nielsen & Randall (40) stress the importance of the perceptions and appraisals of individuals in the organisation towards the intervention, since these so-called mental models determine how individuals behave and react to the intervention. Different individuals in the organisation (e.g. employees, supervisors, management) can have different and conflicting agendas. Aust et al. (45) showed that differences in stakeholder views may hinder successful implementation, stressing the importance of shared mental models of individuals in the organisation towards the intervention. The dialogue on stress among employees and between employees and management can contribute to shared mental models and facilitate the implementation. Other researchers also stress the importance of the dialogue between management and employees as a driver for organisational improvement regarding the work environment and employee health (39, 41, 43, 46).

Not only is the implementation of an organisational-level work stress intervention difficult, the evaluation of intervention effects is challenging as well. In applied research, the research design has been a topic of discussion for years. Traditional research designs in the psychology and health domain are experimental designs and randomized controlled trials (RCT), usually involving a pre- and posttest, an experimental (or intervention) and a control group and random assignment of respondents or research units to the experimental (or intervention) and control group. These research designs are by many considered as the golden standard. However, in applied organisational research, these research designs are often not feasible since (quasi-)experimental designs with a control and experimental group are often difficult to establish and the organisational context is often complex and therefore hard to control, making extrapolation of the results to other organisations and individuals difficult (47-50). Randall, Griffith and Cox (48) propose an alternative research design to cope with these problems, that better fits the organisational context, by using the results of the process evaluation of the implementation (measuring e.g. participant's participation and intervention exposure as a proxy of the level of implementation) in the effect evaluation. Huijs et al. (51) followed a similar approach by using data obtained in a process evaluation of participants' experiences and exposure to the intervention and investigated whether changes in the outcome measure between baseline and follow-up were related to the level of intervention

exposure. Following this approach provides the possibility to account for the complex and often uncontrollable organisational setting.

Work stress prevention approach

For the present study, a work stress prevention guideline for intervention facilitators (e.g. internal HR-advisor or external consultant) was developed, based on the above described existing knowledge. The guideline is designed as an interactive pdf document, in order to tailor information based on the facilitator's prior knowledge of the topic. The guideline provides a detailed description of a participative, five-step approach to prevent work stress (the work stress prevention approach), including per step what to do, how to do it, when to do it and with whom. And since the implementation factors described earlier are considered very important for the success of the intervention, the guideline provides information and inspiration to enhance employee participation, to provide employees with clear communication during the intervention and to improve the dialogue on work stress within the organisation. Following the work stress prevention approach results in a tailored action plan for each school, that addresses school specific risk factors (in terms of job demands and resources).

The work stress prevention approach consists of five successive steps aiming to facilitate the formulation, implementation and evaluation of specific work stress measures. These steps are: 1) preparation, 2) risk assessment, 3) action planning, 4) implementation, and 5) evaluation. In all the five schools that participated in this study, the implementation process of the approach is facilitated and coordinated by the same intervention facilitator. The intervention facilitator is experienced in change- and project management and received three two-hour training sessions on the work stress prevention approach by the researchers. In this training the approach is explained in detail, and special attention is paid to the important implementation factors: employee participation, communication and the dialogue on stress. The facilitator follows the protocol as described in the work stress prevention guideline.

Step 1 entails the preparation phase. In this phase a working group is formed in each school consisting of the director, 1-3 workers with an interest in the topic of work stress and the intervention facilitator. The working group is responsible for facilitating steps 1-5 to be followed in their own school, involving and informing employees and monitoring the implementation process. The working group decides upon a suitable communication strategy to keep employees informed during the intervention process (e.g. weekly newsletters, posters in the staff room, presentation at personnel meetings). A kick-off meeting is organised and the project is announced by the working group to all employees. Tasks of the working group are performed within working hours.

In step 2- the risk assessment phase- causes of work stress are examined. For this purpose a questionnaire is administered by the researchers with amongst others questions on

determinants (job demands and resources) and on outcomes (work stress and job satisfaction) (see paragraph on measures). Results of the baseline questionnaire are benchmarked against data representative for the entire Dutch primary education sector, based on the Netherlands Working Condition Survey (3) in order to prioritize the factors causing work stress. In addition, a participatory focus group session is organised with all personnel to present and discuss the results of the questionnaire, to check whether the priorities based on the numbers relate to their experience of the causes of stress and to identify additional causes of stress (if any) in their school.

In step 3, the action planning phase, work stress measures are jointly developed. In a brainstorm session with all personnel an extensive list with all possible solutions based on expert knowledge of the participants about their working environment was formed (divergent technique). Next, a selection of the 5-10 most appropriate and feasible work stress measures is made (convergent technique). Based on this selection a detailed action plan is developed by the working group under supervision of the facilitator.

Step 4- the implementation phase- entails the implementation of the measures as described in the action plan resulting from step 3. The working group implements the measures according to the action plan and regularly discusses progress and communicates about the process to the employees.

In step 5- the evaluation phase- the effects of the work stress prevention approach and the implementation process are investigated. A follow up questionnaire, the same as the baseline questionnaire, is administered, and 5 interviews are conducted per school by the researchers. Results from the questionnaire and interviews are discussed with the working group by the facilitator to evaluate the success of the measures and to decide upon next steps. Results of the questionnaire and interviews are also shared with all personnel.

The current study aims to explore the effect of the work stress prevention approach on (quantitative) job demands and resources (autonomy, supervisor and coworker support) and on work stress and job satisfaction. The current study follows a similar approach as Huijs et al. (2019) by investigating the effects of the intervention in relation to the implementation success, as measured by the level of employee participation, communication and dialogue on stress.

The study examines the effects of the work stress prevention approach as a whole, rather than the effects of specific measures as described in the school specific action plans (result of Step 3).

Each school developed or selected their own measures, and as a result of the variation in contexts and priorities there is also a variation of different kinds of measures, making it difficult to examine the effects of separate measures. The authors believe that the effects of the stress prevention approach is related to the approach as a whole. The fact that the

measures as determined in the action planning phase are tailored to school specific problems is considered more important than the exact content of the measures.

Based on the above, the following hypotheses were formulated (see Figure 1):

- Hypothesis 1 (H1): The level of job demands will decrease and resources (autonomy, supervisor and coworkers support) will increase between baseline and follow-up (proximal outcomes)
- Hypothesis 2 (H2): Work stress will decrease and job satisfaction will increase between baseline and follow-up (distal outcomes).
- Hypothesis 3 (H3): The implementation factors (participation, communication and dialogue on stress) will positively affect the decrease in job demands and the increase in resources (proximal outcomes) between baseline and follow-up.
- Hypothesis 4 (H4): The implementation factors (participation, communication and dialogue on stress) will positively affect the decrease in work stress and the increase in job satisfaction (distal outcomes) between baseline and follow-up.

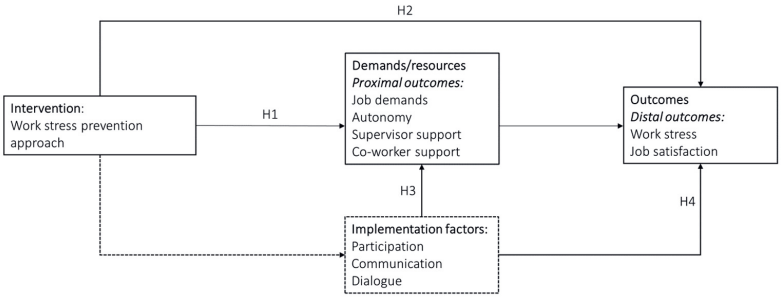

Figure 1: Schematic overview of hypotheses

Methods

Study population

The study population consisted of teaching (i.e. teachers) and non-teaching staff (i.e. managers, support staff) from five schools in primary education (N=119). Schools were recruited via the network of the primary education labour market platform (Arbeidsmarktplatform Primair Onderwijs) by placing an advertisement in a sector specific magazine. Five schools applied for participation. Reasons for participation were amongst

others signals of work stress reported by employees. The schools were geographically spread throughout the Netherlands. The schools differed in size, and included small, medium and large schools (teaching and non-teaching staff at baseline: school A: N=15, school B: N =61, school C: N =45, school D: N =37 and school E: N =41).

Data collection

A digital questionnaire was sent out by email to all personnel of the five primary schools as part of step 2 'risk analysis' (baseline) and step 5 'evaluation' (follow-up) of the work stress prevention approach. The baseline questionnaire was sent out in March 2016. The follow up questionnaire was sent out 12 months after the baseline questionnaire. Data on proximal outcomes (job demands and resources) and distal outcomes (job satisfaction and work stress) were collected by means of the baseline and follow up questionnaires. Data on implementation factors were collected by means of the follow up questionnaire.

Measures

Job demands and resources (proximal outcomes)

Job demands and resources are measured using a proxy of subscales of the Dutch version of the Job Content Questionnaire (JCQ (52)): quantitative job demands (4 items; α=.84) and resources: autonomy (3 items, α=.67), supervisor support (4 items; α=.77) and co-worker support (4 items: α=.73). Response scales range from 1 = strongly disagree to 4 = strongly agree.

Outcome variables (distal outcomes)

Work stress was measured with a shortened version of the Utrecht Burnout Scale (UBOS) (53), a slightly adjusted Dutch version of the Maslach Burnout Inventory-General Survey (MBI-GS) (54). The questionnaire consists of 5-items including the key dimension of burnout: emotional exhaustion (feeling drained by one's work). Response scales range from 0 = never to 6 = every day (α=.84). Studies have shown that the MBI-GS and its subscales are excellently reliable and valid (55, 56).

Job satisfaction can be viewed as a general and one-dimensional construct, resulting from positive and negative work experiences (57). It was measured with one item: "*I am satisfied with my present job*". This item was rated on a 5-point Likert scale, response scales range from 1 (strongly disagree) to 5 (strongly agree).

Implementation factors

The follow up questionnaire contained the following items on the implementation that are used in the analyses to indicate the implementation success: the level of employee participation, communication and dialogue on stress. Employee participation was assessed

by a single item: "*Could you rate your involvement with the intervention program on a scale from 1 (=poor) to 10 (=excellent)?*" Communication was measured by a single exploratory item: "*Could you rate your satisfaction with the communication about the intervention program on a scale from 1 (=poor) to 10 (=excellent)?"* Dialogue on stress was measures by three separate items. Respondents were asked to indicate on a 5-point Likert scale (response scales range from 1 (strongly disagree) to 5 (strongly agree)) *"to what extent did you notice any changes regarding the following areas?": "Work stress is discussed more often among employees"* (dialogue between employees); *"Work stress is discussed more often between employees and management"* (dialogue with management); *"There is more attention for the issue of work stress throughout the school"* (attention for work stress).

Data analyses

Analyses were performed on the data of the five primary schools combined. To adjust for clustering persons in schools, multilevel analyses were performed using IBM Statistics SPSS version 25.0. Multilevel modelling can be used to analyse data that contains an inherent hierarchical structure. The data from the current study contain two levels: the first level of the data contains the individual scores of the participants on the proximal and distal outcomes as baseline and follow-up (within-subjects level) and the second level of the data contains the schools in which the individual participants are nested (between schools level). To start, the variables have been prepared for analyses. For all the variables a new 'centered' variable was calculated, by subtracting its mean from each individual score, to make the interpretation of the output of the analyses more straightforward. For each outcome a random intercept was added to the model to adjust for differences between the schools in the way the proximal and distal outcomes changed over time.

To test hypotheses 1 and 2, difference scores (between baseline and follow-up) were calculated for each outcome. Univariate analyses were carried out with the difference scores of each of the proximal (job demands, resources) and distal outcomes (work stress and job satisfaction) as dependent variable; the centered score of the outcome at baseline as the independent variable and the intercept to indicate the average change in the outcome between baseline and follow up. In the analysis covariates were added based on differences between schools regarding the baseline measurement of general characteristics. These analyses test the difference between baseline and follow up for each of the proximal and distal outcomes corrected for age and the outcome at baseline.

In addition, the analyses of the previous step were repeated including the centered implementation factors as covariates. These analyses test hypotheses 3 and 4, and show whether a difference between baseline and follow up in the proximal and distal outcomes (job demands, resources, work stress and job satisfaction) was moderated by the implementation factors (participation, communication and dialogue) controlling for covariates (differences between schools on the baseline measure of general characteristics)

and the outcome at baseline. To obtain the amount of variance explained by the differences between the schools, the intraclass correlation coefficient (ICC) was calculated for each analysis. For all hypotheses a p-value of <0.05 was indicated as statistically significant.

Qualitative analyses

In addition to the quantitative data that were collected to explore the effects of the intervention and test the hypotheses, also qualitative data were collected to explore the implementation process in more detail. Qualitative data on the implementation process were collected during Step 5 by four semi-structured interviews in each primary school on the experience of various employees with different roles during the implementation of the approach. These interviews were conducted by the researchers. In each school interviews were held with the director, a working group member, a randomly selected worker not taking part in the working group, and the intervention facilitator who accommodated all five schools. The interviews were conducted according to a semi-structured interview protocol, either by telephone (n=15) or face to face (n=5), and lasted between 30-60 minutes. Minutes were made during the interview by a research assistant. The interview transcripts were coded according to different topics that were determined beforehand: experiences with the five phases of the work stress prevention approach and the actions within each phase (questionnaire, focus group meeting, brainstorm session, conducting action plan, progress meetings, role of intervention facilitator, role of working group, participation of employees), drivers and barriers for implementation of the work stress prevention approach and strengths and weaknesses of the work stress prevention approach (the semi-structured interview protocol is added as an appendix).

Results

Figure 2 shows the participant flow and response rates of the baseline and follow up. At baseline, the response rate was 78% (of all eligible workers), and at follow up the response rate was 80% (of all eligible workers). In total 119 respondents completed both baseline and follow up and were included in the analyses since this is the group for which repeated measure analyses could be performed.

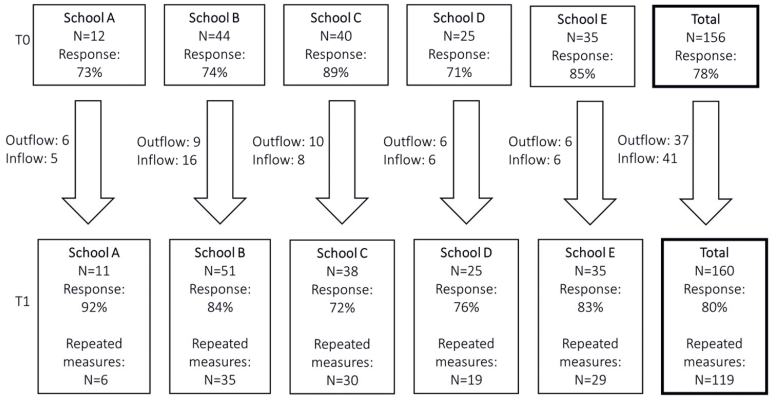

Figure 2: Flow-chart of response rated for the five primary schools

Table 1 shows general personal characteristics of the study population. There are some statistically significant differences between schools in relation to several of these characteristics, particularly regarding age. For this reason, age was added as a covariate in the analyses. There are no statistically significant differences on the baseline proximal and distal outcome measures between the schools.

Table 1: General characteristics of study population

	Total	School A	School B	School C	School D	School E
N:	119	6	35	30	19	29
% of total sample:	100%	5%	29%	25%	16%	24%
Gender [N=119]						
· Male	9.2%	16.7%	14.3%	3.3%	5.3%	10.3%
· Female	90.8%	83.3%	85.7%	96.7%	94.7%	89.7%
Age (in years) [N=119]						
· 20-30	15.1%	0%	11.4%	10.0%	36.8%▲	13.8%
· 30-40	31.1%	16.7%	42.9%	40.0%	15.8%	20.7%
· 40-50	18.5%	16.7%	11.4%	20.0%	10.5%	31.0%▲
· 50-60	29.4%	16.7%	28.6%	26.7%	36.8%	31.0%
· +60	5.9%	50.0%▲	5.7%	3.3%	0%	3.4%
Position [N=119]						
· Teacher	85.7%	100%	88.6%	76.7%	84.2%	89.7%
· Staff	10.1%	0%	11.4%	16.7%	5.3%	6.9%
· Management	4.2%	0%	0%	6.7%	10.5%	3.4%
Job demands (range 1-4, 4 items)[N=119]						
Mean	2.74	2.75	2.82	2.69	2.59	2.80
Standard deviation	0.60	0.84	0.63	0.47	0.67	0.60

	Total	School A	School B	School C	School D	School E
Autonomy (range 1-3, 3 items)[N=119]						
Mean	2.34	2.17	2.26	2.46	2.40	2.32
Standard deviation	0.47	0.75	0.52	0.40	0.42	0.44
Supervisor support (range 1-5, 4 items)						
Mean	2.99	3.08	2.90	2.83	3.20	3.09
Standard deviation	0.63	0.34	0.76	0.57	0.52	0.57
Co-worker support (range 1-5, 4 items)						
Mean	3.37	3.58	3.36	3.43	3.28	3.36
Standard deviation	0.45	0.34	0.49	0.38	0.52	0.46
Work stress (range 1-7, 5 items)						
Mean	2.68	3.47	2.81	2.41	2.60	2.70
Standard deviation	1.17	1.52	1.30	1.21	0.89	1.04
Job satisfaction (range 1-5, 1 item)						
Mean	3.79	3.33	3.69	3.90	3.95	3.79
Standard deviation	0.78	1.21	0.96	0.71	0.40	0.68

Note. Percentages are column percentages and are tested with the Pearson χ^2-test (horizontal comparisons). The contrast is subgroup vs 'rest' (weighted deviation contrast). ▲ and ▼: $p<0.05$, significant high (low) percentages (two-tailed), and Cohen's d is at least 0.20.

Quantitative analyses

Table 2 shows the results of the analyses performed to test H1 and H2. Even though in the analyses we corrected for clustering effects of school by means of a multilevel approach, for job demands, co-worker support, work stress and job satisfaction no differences were found between the schools (Table 2). Results show a statistically significant decrease in job demands and increase in job satisfaction from baseline to follow up, partly confirming H1 and H2. All other proximal and distal outcomes appear to have changed between baseline and follow up in a favorable direction, although these results are not statistically significant (for work stress the effect is marginally significant, $p <.10$).

Table 2: Effects of the work stress prevention approach on the difference scores of the proximal and distal outcomes (H1 and H2)

	H1				H2	
	Job demands B (95% CI)	Autonomy B (95% CI)	Supervisor support B (95% CI)	Coworker support B (95% CI)	Work stress B (95% CI)	Job satisfaction B (95% CI)
Intercept	-.10* (-.20 - .01)	.05 (-.11 - .21)	.15 (-.11 - .41)	.03 (-.03 - .11)	-.15* (-.32 - .03)	.12* (.02 – .21)
Baseline of outcome measure	-.70* (-.86 - -.54)	-.47* (-.63- -.31)	-.58* (-.73- -,43)	-.52* (-.67- -.37)	-.27* (-.42- -.12)	-.43* (-.55- -.31)
Age	-.08 (-.16 - .00)	-.03 (-.09 - .04)	.08 (-.01 - .16)	.01 (-.05 - .07)	-.18* (-.33- -.03)	.04 (-.04-.12)
ICC	~.00	.03	.07	~.00	~.00	~.00

Note: *p<0.05

Table 3 shows the results of the analyses performed to test H3 and H4 indicating an effect of the implementation factors on the change in proximal and distal outcomes between baseline and follow up. Results show that the implementation factor communication affects the differences between baseline and follow up on job satisfaction and autonomy. Respondents who were more satisfied with the communication about the work stress prevention approach, showed a larger increase in job satisfaction and autonomy between baseline and follow up, than respondents who were less satisfied with the communication.

Finally, results show that the 'dialogue with employer' affects the differences between baseline and follow up on job demands. The direction of this effect was in contrast to the hypothesis and indicates that respondents who did report an increased dialogue between employees and their employer regarding work stress, showed a smaller decrease in job demands between baseline and follow up, compared to respondents who reported no increased dialogue between employees and their employer regarding work stress.

To summarize, the results show a statistically significant decrease in job demands and an overall increase in job satisfaction between baseline and follow up, partly confirming H1 and H2. And satisfactory communication about the work stress prevention approach is related to an increase in job satisfaction and autonomy between baseline and follow up. In contrast to our expectations, results show that an increased dialogue between employees and the management is related to a smaller decrease in job demands between baseline and follow up. H3 and H4 are partly confirmed.

Table 3: Results from multivariate mixed model multilevel analyses on H3 and H4

	H3				H4	
	Job demands B (95% CI)	Autonomy B (95% CI)	Supervisor support B (95% CI)	Coworker support B (95% CI)	Work stress B (95% CI)	Job satisfaction B (95% CI)
Intercept	-10* (-.19 - -.01)	.04 (-.16 - .24)	-15 (-.10 -.40)	.04 (-.03 - .11)	-.15 (-.32 - .03)	.11 (-.14 - .36)
Baseline of outcome measure	-.70* (-.86 - -.53)	-.47* (-.62 - -.32)	-.64* (-.80 - -.48)	-.58* (-.74 - -.42)	-.32* (-.47 - -.15)	-.44* (-.56 - -.32)
Employee involvement	-.03 (-.11 - .06)	-.02 (-.08 - .05)	.05 (-.03 -.13)	-.01 (-.07 - .05)	-.01 -.17 - .15)	-.08 (-.16 - .01)
Communication	-.00 (-.10 -.10)	.08* (.01 - .16)	.01 (-.09 - .11)	.05 (-.02 - .13)	-.06 (-.25 - .13)	.13* (.03 - .23)
Dialogue among colleagues	.03 (-.09 - .16)	.06 (-.03 - .15)	-.05 (-.17 - .07)	-.00 (-.09 - .09)	.03 (-.20 - .25)	.10 (-.02 -.22)
Dialogue with management	.15* (.01 - .29)	-.02 (-.13 - .09)	.09 (-.05 - .23)	.00 (-.10 - .11)	.08 (-.19 - .34)	-.06 (-.19 - .08)
Attention for work stress	-.09 (-.23 - .05)	.06 (-.05 - .16)	-.02 (-.12 -.16)	.05 (-.05 - .15)	-.14 (-.40 - .12)	.03 (-.11 - .16)
Age	-.07 (-.15 - .02)	-.03(-.09 - .03)	.08* (.00 - .16)	.00 (-.06 - .06)	-.16* (-.31 - -.01)	.04 (-.04 - .12)
ICC	~.00	.08	.09	~.00	~.00	.01

Note: *p<0.05

Qualitative analyses

Preparation phase

At all schools, a working group was installed according to protocol, with the director, 1-3 workers, and the intervention facilitator.

Risk assessment phase

The response on the baseline questionnaire was quite high (response rates ranges 71%-89%). In the interviews, respondents mentioned that they appreciated that the questionnaire provided 'objective' data on this sensitive topic of work stress, which provided a good starting point for discussion in the focus group sessions. In the focus group sessions, the participants valued the fact that they could provide input regarding the risk assessment, and that their view on work stress risks was taken into account. The risk factors for work stress at the schools were relatively similar, although there were some differences in relation to unwanted

behaviour from external persons (e.g. parents) which was particularly a problem for two of the five schools (Table 4).

Action planning phase

At all schools, almost all personnel participated in the brainstorm session. At two schools the brainstorm sessions was combined with the focus group session. Participants valued the possibility to give their input regarding the measures which were considered needed. According to the intervention facilitator, the commitment of participants of the focus group meeting and the brainstorm sessions was high. Based on the results of the brainstorm session, the working group developed an action plan. The schools differed in relation to the measures identified as well as to the persons who were made responsible for the implementation of the measures (Table 5). At some schools the implementation of the action plan was delegated among several persons, at other schools only one or two persons were made responsible.

Implementation phase

The implementation phase was considered by the intervention facilitator as the most difficult phase. Different progress meetings were planned with the working groups to discuss progress, and to discuss drivers and barriers of the implementation. The most often mentioned barrier for the implementation of the action plan was lack of time and lack of priority. The progress meetings and regular talks between the project group and the intervention facilitator stimulated the project group to give priority to the implementation of the action plan. The working group members and the intervention facilitator mentioned that it was challenging to keep all personnel informed and involved. Several communication channels were used to inform personnel (e.g. newsletters, meetings, blogs, flip-overs in staff room).

Evaluation phase

Comparable to the baseline questionnaire the response of the follow-up questionnaire was high (response rate ranged from 72%-92% per school). In the interviews, the participants were asked whether they had noticed effects from the work stress prevention approach. The results were somewhat inconclusive. Participants valued some of the concrete measures (e.g. more efficiency in administration, meetings and checking students results). But some argued that important determinants of work stress are out of the reach from the primary schools (e.g. some of the administrative tasks are obliged). Participants explicitly mentioned the value of the participative approach and they mentioned that the dialogue on stress within the school helped to raise awareness and making stress prevention a shared responsibility.

Table 4: Identified causes of work stress at the 5 schools

	School A	School B	School C	School D	School E
High job demands	X			X	X
High administrative load	X	X	X	X	X
High time pressure	X	X	X	X	X
Work home interference		X			
Unwanted behaviour from external persons		X		X	
High burden of non-teaching tasks		X	X	X	X
Lack of support in non-teaching tasks			X		X
Lack of support in administrative tasks	X	X		X	
Level differences of students		X			
Combination groups (students from two different school years combined in one group)			X		
Inefficient meetings	X				X
Difficult student population				X	
Lack of management support					X
Working overtime					X

Table 5: Action plans of the 5 schools

Measures category	School A	School B	School C	School D	School E
Year Planning/ group plans/ work tasks	**Year planning:** Making framework for year planning Describing year tasks for each group Yearly evaluation and update of year planning **Work tasks:** Make list of current assignments, evaluate and update list Feedback training for teachers New colleagues are assigned to a mentor (the mentor	**Year planning:** Make a plan to reduce peak load Keep space in year planning to deal with peak load Cancel one meeting with parents Individual meetings between teachers and direction to discuss year planning	**Year planning:** Agreements with team about deadline of year planning, making adjustments throughout the year, be critical about what to include in year planning, arrange day for part-timers **Group plans:** Make, evaluate and adjust year plans, make sure teachers know how to use them **Work tasks:**	**Year planning:** Comparing year planning of different school years and align them	**Year planning:** Making format for year planning per group Uniformity in conducting year planning Evaluation and update format **Group plans:** 4 moments per year for conducting and evaluating group plans

Measures category	School A	School B	School C	School D	School E
	receives time for mentor tasks) Teachers from year groups make a list of all assignments, log in codes etc		Prioritizing work tasks and reduce unnecessary work tasks Divide work tasks based in teachers' skills and preferences Make proportionate distribution of work tasks Keep space for unforeseen tasks Log all agreements in document		
Administrative tasks	**Administrative tasks** Agreements on checking students work Investigating possibilities for digital tests to reduce task of checking students work Meetings with teachers to reduce double administration Improving data storage Make overview of administrators	**Administrative tasks** Evaluate and improve report form on student development (only reporting the necessary) Make appointments about informing colleagues that were absent at meeting Make format for scenario and adjust existing scenario's based on new format and collect scenario's	**Administrative tasks:** Make, evaluate and bundle agreements about how to work with Parnassys (digital report system) Make agreements on checking students work and discuss with teachers Outsource administrative tasks to administration officer	**Administrative tasks:** Adjusting group overview: containing only information that is not logged elsewhere) Change group plans, students are monitored in a different way Reducing 3 documents on group plan 'behaviour' into 1. Reducing checking students work Making clear the administrative tasks per function	**Administrative tasks:** Teachers plan 1 hour per week to work on group plans

Measures category	School A	School B	School C	School D	School E
ICT	**Improvements in ICT:** Letter to the direction to Meeting with ICT professional Making and implementing project plan to solve ICT issues				
Study days/ meetings	**Alternative program study days:** Explanation of the purpose of each educational activity Evaluation of study days and improving program based on evaluation Evaluation of other educational activities Discussion about planning parents meetings (afternoon of evening)	**Effective meetings:** Make agreements about effective meetings	**Effective meetings:** Make agreements on number of targets, number of meetings, content of meetings, involve teachers in meetings, making meetings more motivative		**Alternative program study days:** Study days will have practical and substantive component At least 45 minutes are available for practical issues **Effective meetings:** Conduct action list and use it at team meetings Team meetings will have practical component Education will be prepared in unit meeting that is already planned
Fit between education and student population		**Dealing with level differences of students:** Continuing existing program Execute and evaluate pilot 'calculation'	**Adjusting education to student population:** Long-term program (more practical classes, more continuency regarding substitution, etc)	**Adjusting education to student population:** Improving tailoring to students needs Plan energizers in between lessons to motivate children.	

Measures category	School A	School B	School C	School D	School E
Unwanted behaviour/ parents involvement	**Measures for unwanted behaviour from parents:** Raising awareness (information in school guide, newsletter and incidental personal talk) Conducting protocol for unwanted behaviour and discuss it in meeting with teachers Preparing hand-out with behavioural rules for teachers, students and parents	**Measures for unwanted behaviour:** Recap of skills that are obtained in earlier training Inform teachers on protocol in case of unwanted behaviour Publication of protocol in school guide and news letter **Improvement of parents involvement:** Conducting and using parent forms Inviting parents to theme meetings	**Proactive attitude in regards to parents:** Issues regarding unwanted behaviour from parents are inventoried, teachers can get assistance when wanted Agreements are made about contact with parents **Improvement of parents involvement**: Organising two parent meetings	**Measures for unwanted behaviour:** Protocol to deal with escalation Communicating protocol to parents	
Culture		**Empowerment teachers** Teachers can choose from educational activities in relation to time management and prioritization If teachers experience a problem, they are invited to propose a solution	**Investing in positive work climate:** Improve feedback culture among teachers Closing school day with students in positive manner	**Investing in positive work climate:** Teachers discuss school conduct rules with students Students are approached positively and are motivated to commit to school rules **Empowerment teachers:** Feedback training (to improve feedback culture among colleagues)	**Investing in positive work climate:** Make project plan to develop, implement culture card that presents the ideal work culture **Increasing employee commitment:** Teachers are asked to submit creative idea for division of work tasks During study day, tasks are divided by

Measures category	School A	School B	School C	School D	School E
				Time management training	means of task market
Leadership	**Leadership:** Communication on important decisions from direction to teachers Teambuilders assist at meetings Teamleaders make workplace rounds between 8.00-8.15 o clock				**Leadership:** Direction is visible at workplace – workplace rounds Development of employees is discussed in development meeting with direction

Discussion

The aim of the present study was to explore the effect of the work stress prevention approach on job demands, resources, work stress and job satisfaction in five primary schools and to investigate whether and how implementation factors were related to these effects. The study investigated the effects of the approach as a whole, rather than the school specific measures as described in the action plans of the schools. Despite the fact that the schools conducted different action plans, the analyses showed that differences between schools in relation to the effects of the work stress prevention approach were small or absent.

Quantitative analyses were performed to test whether there was a positive change between baseline and follow-up in job demands and resources (H1) and whether there was a decrease in the level of work stress and an increase in the level of job satisfaction (H2) after the intervention. Results of the analyses showed no significant changes for resources (autonomy, supervisor and co-worker support) and work stress, but there was a statistically significant decrease in job demands and an increase of the level of job satisfaction, partly confirming H1 and H2. From the literature it is known that job satisfaction is an important predictor of company performance (58), and high job satisfaction decreases turnover intention (59). This finding could form an argument for making a business case for stress management, encouraging employers to take action.

Although the study found a decrease in job demands and in job satisfaction, no significant changes in resources and work stress were found between baseline and follow up. A possible explanation is that the follow up questionnaire was conducted too early in time to be able to show any significant changes in these indicators since the implementation process may have been slow and actual changes might only have just started. In addition, the implementation of the interventions followed the same steps on each of the five schools, but the timing of the steps was not exactly the same. According to De Lange et al. (60) the time interval between baseline and follow up is ideally one year, and a similar time interval was applied in the present study. However, the cyclical character of the work stress prevention approach makes it difficult to determine a good timing for the follow up, since ideally the approach does not end, but will be adopted as part of the policy cycle within the organisation. At the time of the follow up questionnaire all schools were still implementing measures from their action plans, but some of the schools had already implemented more measures than others. Furthermore, the effects of some of the measures could be assumed to manifest themselves earlier than the effects of other measures. For example, reducing unnecessary work tasks may have had an immediate effect on job demands, but increasing social support and autonomy may take more time.

Looking at the means of the job demands, resources and outcomes at baseline and follow up, all changed in a favorable direction, however, the changes were not statistically significant with the exception of-as indicated before- job demands and job satisfaction (for work stress the effect was marginally significant, $p<0.1$). It is possible that, if there had been more time between baseline and follow up, more measures from the action plans could have been implemented, and possibly more effects of the measures on resources and work stress would have been found. On the other hand, it is also possible that by postponing the follow up, some of the effects may already have faded away.

To attribute changes between baseline and follow up to the intervention, the changes on the proximal and distal outcomes between baseline and follow up were related to the implementation factors: employee participation, communication and the dialogue on stress. The assumption was that, when employees participated in the intervention, were satisfied about the communication, and the dialogue on work stress had increased during the intervention, this would form a proxy of implementation success, and the intervention would be more likely to result in positive effects on job demands and resources (H3) and on work stress and job satisfaction (H4).

In line with these hypotheses, results of the quantitative analyses suggest that employees who are more satisfied with the communication about the intervention, appeared to have benefited more from the intervention. Results show that the level of satisfaction with the communication over the intervention did affect favorable changes between baseline and follow up in autonomy and job satisfaction.

The level of participation of employees in the intervention did not appear to affect changes on job demands, resources and outcomes. Regarding the dialogue on stress, the results were somewhat inconclusive. Although participants explicitly mentioned the dialogue on stress within the school as a key feature of the work stress prevention approach, the results of the analyses show that in fact the level in which the intervention increased the dialogue on work stress between employees and management, was related to less of an increase in job demands between baseline and follow up. Respondents who reported an increase regarding the dialogue between employees and management on work stress showed less of a decrease in job demands. A possible explanation is that the dialogue between the employees and management may have led to extra tasks, at least at short term. Discussing work stress and its causes, may result in actions that have to be carried out to improve the situation. This often requires a time investment before benefits can be experienced. An additional measurement, a second follow-up, could provide more insights into the development of job demands over time.

In sum, the results of the quantitative analyses suggest that the intervention was related to positive improvements in job demands and job satisfaction. In addition, results indicate that satisfaction with the communication about the intervention was related to improvements in autonomy and job satisfaction. Furthermore, results show that an increased dialogue between employees and management was related to less of a decrease in job demands.

The interviews provided more detailed information about the success of the implementation process. These results showed that working groups have put effort in the communication about the work stress prevention approach towards employees. However, the working group members and the intervention facilitator mentioned that it was challenging to keep employees involved and they believed that improvements could be made in relation to communication. Considering the results of the quantitative analyses, it is worthwhile to invest in good communication. For future interventions it is recommended to plan more meetings with all personnel to inform and involve them also during the implementation phase (Step 4), since the focus group (Step 2) and brainstorm sessions (Step 3) with all personnel were highly appreciated by employees.

Results from the interviews suggest that the intervention has increased the dialogue on stress between employees, as well as between employees and management and raised the attention for managing work stress. Participants explicitly mentioned the dialogue within the school on work stress as a key value of the work stress prevention approach. However, the effects of the increased dialogue between employees and management are somewhat inconclusive considering the fact that an increased dialogue between employees and management was related to less of a decrease in job demands.

Strengths and weaknesses

A strength of the present study is that it involved the evaluation of an intervention implemented at five different schools, each with its own organisational context, making it possible to draw more general conclusions about the work stress prevention approach as such. In addition, the mixed method design that was used, combining quantitative data based on questionnaires and qualitative data based on interviews, and the inclusion of process variables in the quantitative analyses, make it possible to get a more detailed insight into the implementation process and the results of the intervention as experienced by employees. Although the sample sizes of the different schools were too small to make a comparison between schools, the response rates at the schools were quite high (at pretest as well as posttest response rates were higher than 70%) and group analyses could be performed using multilevel techniques. It has to be noted that, like the schools that participated in this study, primary schools in the Netherlands are quite small in relation to other countries (e.g. US), which may have consequences for the generalisability of the results.

The absence of a control group makes it a bit more difficult to attribute changes between baseline and follow up to the intervention. Implementation factors were measured to get an indication of the success of the implementation and were added in the analyses to explain changes between baseline and follow up on the job demands, resources and outcomes. Although the results suggest that satisfaction with communication about the intervention, an important indicator for the implementation success, is related to intervention effects on autonomy and job satisfaction, additional research is needed to look further into the mechanisms of different implementation factors (e.g. participation, involvement, communication, dialog).

For future research it would be interesting to look again at effects of the intervention and at the influence of the implementation factors. Adding a third measurement moment might give more insight in the effects in time and the sustainability of the effects.

Conclusion

Despite the limitations that are discussed above, the study shows a decrease of job demands and an increase in job satisfaction in the schools that implemented the stress prevention approach. The study has provided valuable insights into the impact of the implementation of the work stress prevention approach linking the level of implementation of the intervention to improvements in autonomy and job satisfaction. Results of the study underline the importance of communication about the intervention as part of the implementation process, impacting the effectiveness of the intervention on autonomy and job satisfaction.

List of abbreviations

PRIMA-EF, European framework for psychosocial risk management; H1 – 4, hypothesis 1 – 4; JCQ, Job Content Questionnaire ;UWES, Utrecht Work Engagement Scale; ICC, intraclass correlation coefficient.

Ethics approval and consent to participate

All researchers are employed at TNO and perform their work in alignment with the corporate code for research integrity. At the time the study was conducted (2016-2017) in the Netherlands, a study needed ethical approval when it falls under the scope of the Medical Research Involving Human Subjects Act (WMO). Then it must undergo a review by an accredited MREC or the CCMO. As, in general, research with human subjects only falls under the WMO if there is an infringement of the physical and/or psychological integrity of the subject, this study did not require ethical approval at that time. The participants were a priori informed about the aims and design of the study. Moreover, they were informed that participation was completely voluntary and anonymous. Participants did not receive any monetary compensation for their contribution and could withdraw from the study whenever they wanted. A (written) digital informed consent was obtained from all participants though the questionnaire. In the questionnaire, participants received information about the study and were asked for their consent to participate via a button that started the questionnaire.

Consent for publication

Not applicable

Availability of data and material

Due to the privacy of the participants, the dataset generated and analysed during the study is not publicly available. On reasonable request data are available from the corresponding author.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

MBR conducted the study and was responsible for data collection and drafting the article. RS, NW, IH and PB provided intellectual input. All authors provided comments on the draft versions. All authors have read and approved the final version of the manuscript.

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References

1. European Foundation for the Improvement of Living and Working Conditions. Fourth European working conditions survey. European Foundation for the Improvement of Living and Working Conditions; 2006.
2. Smith A, Brice C, Collins A, McNamara R, Matthews V. Scale of occupational stress: a further analysis of the impact of demographic factors and type of job. HSE; 2000.
3. Hooftman W, Mars G, Janssen B, De Vroome E, Pleijers A, Michiels J. Nationale Enquête Arbeidsomstandigheden (NEA) 2016. Methodologie en Globale Resultaten [The Netherlands Working Conditions Survey 2016: Methodology and Overall Results]. Hoofddorp: TNO. 2016.
4. Backé E, Seidler A, Latza U, Rossnagel K, Schumann B. The role of psychosocial stress at work for the development of cardiovascular diseases: a systematic review. Int Arch Occup Environ Health. 2012;85(1):67-79.
5. Kivimäki M, Virtanen M, Elovainio M, Kouvonen A, Väänänen A, Vahtera J. Work stress in the etiology of coronary heart disease—a meta-analysis. Scand J Work Environ Health. 2006:431-42.
6. Kivimäki M, Nyberg ST, Batty GD, Fransson EI, Heikkilä K, Alfredsson L, et al. Job strain as a risk factor for coronary heart disease: a collaborative meta-analysis of individual participant data. The Lancet. 2012;380(9852):1491-7.
7. Kivimäki M, Kawachi I. Work stress as a risk factor for cardiovascular disease. Curr Cardiol Rep. 2015;17(9):74.
8. Da Costa BR, Vieira ER. Risk factors for work-related musculoskeletal disorders: a systematic review of recent longitudinal studies. Am J Ind Med. 2010;53(3):285-323.
9. Harvey SB, Modini M, Joyce S, Milligan-Saville JS, Tan L, Mykletun A, et al. Can work make you mentally ill? A systematic meta-review of work-related risk factors for common mental health problems. Occup Environ Med. 2017 Mar;74(4):301-10.
10. Duijts SF, Kant I, Swaen GM, van den Brandt, Piet A, Zeegers MP. A meta-analysis of observational studies identifies predictors of sickness absence. J Clin Epidemiol. 2007;60(11):1105-15.
11. Faragher EB, Cass M, Cooper CL. The relationship between job satisfaction and health: a meta-analysis. In: From Stress to Wellbeing Volume 1. Springer; 2013. p. 254-71.
12. Boles M, Pelletier B, Lynch W. The relationship between health risks and work productivity. Journal of Occupational and Environmental Medicine. 2004;46(7):737-45.
13. Karasek Jr RA. Job demands, job decision latitude, and mental strain: Implications for job redesign. Adm Sci Q. 1979:285-308.
14. De Jonge J, Dormann C. The DISC model: Demand-induced strain compensation mechanisms in job stress. In: Occupational stress in the service professions. CRC Press; 2003. p. 57-88.

15. Bakker AB, Demerouti E. The job demands-resources model: State of the art. J Manage Psychol. 2007.
16. Schaufeli WB, Bakker AB, Van Rhenen W. How changes in job demands and resources predict burnout, work engagement, and sickness absenteeism. Journal of Organisational Behaviour: The International Journal of Industrial, Occupational and Organisational Psychology and Behaviour. 2009;30(7):893-917.
17. Demerouti E, Bakker AB, Nachreiner F, Schaufeli WB. The job demands-resources model of burnout. J Appl Psychol. 2001;86(3):499.
18. Skaalvik EM, Skaalvik S. Teacher self-efficacy: conceptual analysis and relations with teacher burnout and perceived school context. Self-processes, learning, and enabling human potential. 2008:223-47.
19. Kokkinos CM. Job stressors, personality and burnout in primary school teachers. Br J Educ Psychol. 2007;77(1):229-43.
20. Hakanen JJ, Bakker AB, Schaufeli WB. Burnout and work engagement among teachers. J School Psychol. 2006;43(6):495-513.
21. Peeters MA, Rutte CG. Time management behaviour as a moderator for the job demand-control interaction. J Occup Health Psychol. 2005;10(1):64.
22. Skaalvik EM, Skaalvik S. Dimensions of teacher self-efficacy and relations with strain factors, perceived collective teacher efficacy, and teacher burnout. J Educ Psychol. 2007;99(3):611.
23. Skaalvik EM, Skaalvik S. Does school context matter? Relations with teacher burnout and job satisfaction. Teaching and teacher education. 2009;25(3):518-24.
24. Cano-García FJ, Padilla-Muñoz EM, Carrasco-Ortiz MÁ. Personality and contextual variables in teacher burnout. Personality and Individual differences. 2005;38(4):929-40.
25. LaMontagne AD, Keegel T, Vallance D, Ostry A, Wolfe R. Job strain—attributable depression in a sample of working Australians: Assessing the contribution to health inequalities. BMC Public Health. 2008;8(1):181.
26. Franco C, Mañas I, Cangas AJ, Moreno E, Gallego J. Reducing teachers' psychological distress through a mindfulness training program. The Spanish journal of psychology. 2010;13(2):655-66.
27. Gold E, Smith A, Hopper I, Herne D, Tansey G, Hulland C. Mindfulness-based stress reduction (MBSR) for primary school teachers. J Child Fam Stud. 2010;19(2):184-9.
28. Poulin PA, Mackenzie CS, Soloway G, Karayolas E. Mindfulness training as an evidenced-based approach to reducing stress and promoting well-being among human services professionals. International Journal of Health Promotion and Education. 2008;46(2):72-80.
29. Naghieh A, Montgomery P, Bonell CP, Thompson M, Aber JL. Organisational interventions for improving wellbeing and reducing work-related stress in teachers. Cochrane Database Syst Rev. 2015;4(4):CD010306.

30. Leka S, Cox T, Zwetsloot G. The European framework for psychosocial risk management. PRIMA-EF: a resource for employers and worker representatives. Geneva (Switzerland): World Health Organisation. 2008.
31. Kompier MAJ, Marcelissen FHG. Handboek werkstress: systematische aanpak voor de bedrijfspraktijk. Nederlands Instituut voor Arbeidsomstandigheden (NIA); 1995.
32. Cox T, Griffiths A, Randall R. A risk management approach to the prevention of work stress. The handbook of work and health psychology. 2003;191.
33. Leka S, Jain A, Cox T, Kortum E. The development of the European framework for psychosocial risk management: PRIMA-EF. Journal of occupational health. 2011;53(2):137-43.
34. Nielsen K, Randall R, Holten A, González ER. Conducting organisational-level occupational health interventions: What works? Work & Stress. 2010;24(3):234-59.
35. Demerouti E, Bakker AB. The Job Demands-Resources model: state of the art. J Manage Psychol. 2007 04/03; 2019/01;22(3):309-28.
36. Schelvis RM, Wiezer NM, Blatter BM, van Genabeek JA, Hengel KMO, Bohlmeijer ET, et al. Evaluating the implementation process of a participatory organisational-level occupational health intervention in schools. BMC Public Health. 2016;16(1):1212.
37. Murta SG, Sanderson K, Oldenburg B. Process evaluation in occupational stress management programs: a systematic review. American Journal of Health Promotion. 2007;21(4):248-54.
38. Havermans BM, Schelvis RMC, Boot CR, Brouwers EP, Anema JR, van der Beek, Allard J. Process variables in organisational stress management intervention evaluation research: a systematic review. Scand J Work Environ Health. 2016:371-81.
39. Westgaard RH, Winkel J. Occupational musculoskeletal and mental health: Significance of rationalization and opportunities to create sustainable production systems–A systematic review. Appl Ergon. 2011;42(2):261-96.
40. Nielsen K, Randall R. Opening the black box: Presenting a model for evaluating organisational-level interventions. European Journal of Work and Organisational Psychology. 2013;22(5):601-17.
41. Dollard MF, Bakker AB. Psychosocial safety climate as a precursor to conducive work environments, psychological health problems, and employee engagement. J Occup Organ Psychol. 2010;83(3):579-99.
42. Jimmieson NL, Terry DJ, Callan VJ. A longitudinal study of employee adaptation to organisational change: the role of change-related information and change-related self-efficacy. J Occup Health Psychol. 2004;9(1):11.
43. Havermans BM, Brouwers EP, Hoek RJ, Anema JR, van der Beek, Allard J, Boot CR. Work stress prevention needs of employees and supervisors. BMC Public Health. 2018;18(1):642.
44. Nytrø K, Saksvik PØ, Mikkelsen A, Bohle P, Quinlan M. An appraisal of key factors in the implementation of occupational stress interventions. Work & Stress. 2000;14(3):213-25.

45. Aust B, Rugulies R, Finken A, Jensen C. When workplace interventions lead to negative effects: learning from failures. Scand J Public Health. 2010;38(3_suppl):106-19.
46. Mikkelsen A, Gundersen M. The Effect of a Participatory Organisational Intervention on Work Environment, Job Stress, and Subjective Health Complaints. International Journal of Stress Management. 2003;10(2):91.
47. Campbell NC, Murray E, Darbyshire J, Emery J, Farmer A, Griffiths F, et al. Designing and evaluating complex interventions to improve health care. BMJ. 2007 Mar 3;334(7591):455-9.
48. Randall R, Griffiths A, Cox T. Evaluating organisational stress-management interventions using adapted study designs. European Journal of Work and Organisational Psychology. 2005;14(1):23-41.
49. Cox T, Karanika M, Griffiths A, Houdmont J. Evaluating organisational-level work stress interventions: Beyond traditional methods. Work & Stress. 2007;21(4):348-62.
50. Schelvis RMC, Oude Hengel KM, Burdorf A, Blatter BM, Strijk JE, van der Beek, Allard J. Evaluation of occupational health interventions using a randomized controlled trial: challenges and alternative research designs. Scand J Work Environ Health. 2015:491-503.
51. Huijs JJ, Houtman IL, Taris TW, Blonk RW. Effect of a participative action intervention program on reducing mental retirement. BMC Public Health. 2019;19(1):194.
52. Karasek R, Brisson C, Kawakami N, Houtman I, Bongers P, Amick B. The Job Content Questionnaire (JCQ): an instrument for internationally comparative assessments of psychosocial job characteristics. J Occup Health Psychol. 1998;3(4):322.
53. Schaufeli WB, van Dierendonck D. UBOS Utrechtse Burnout Schaal: Handleiding. Swets Test Publishers; 2000.
54. Maslach C, Jackson SE, Leiter MP, Schaufeli WB, Schwab RL. Maslach burnout inventory. Consulting Psychologists Press Palo Alto, CA; 1986.
55. Bakker AB, Demerouti E, Schaufeli WB. Validation of the Maslach burnout inventory-general survey: an internet study. Anxiety, Stress & Coping. 2002;15(3):245-60.
56. Schutte N, Toppinen S, Kalimo R, Schaufeli W. The factorial validity of the Maslach Burnout Inventory-General Survey (MBI-GS) across occupational groups and nations. J Occup Organ Psychol. 2000;73(1):53-66.
57. De Jonge J. Job autonomy, well-being, and health: A study among Dutch health care workers. Maastricht University; 1995.
58. Bakotić D. Relationship between job satisfaction and organisational performance. Economic research-Ekonomska istraživanja. 2016;29(1):118-30.
59. Griffeth RW, Hom PW, Gaertner S. A meta-analysis of antecedents and correlates of employee turnover: Update, moderator tests, and research implications for the next millennium. Journal of management. 2000;26(3):463-88.
60. De Lange AH, Taris TW, Kompier MA, Houtman IL, Bongers PM. The relationships between work characteristics and mental health: Examining normal, reversed and reciprocal relationships in a 4-wave study. Work & Stress. 2004;18(2):149-66.

PART 2

Exploring the relation between design, implementation and effects of occupational risk prevention and health promotion interventions

Chapter 3

Use of Intervention Mapping for Occupational Risk Prevention and Health Promotion:

A Systematic Review of Literature

Maartje. C. Bakhuys Roozeboom

Noortje M. Wiezer

Cécile R. L. Boot

Paulien M. Bongers

Roosmarijn M.C. Schelvis

Based on:

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Abstract

Aim: Intervention Mapping (IM) is a method to systematically design interventions that is applied regularly within the public health domain. This study investigates whether IM is effectively used within the occupational safety and health domain as well. Specifically, this study explores the relation between the fidelity regarding the use of the IM protocol for intervention development, the implementation process and the effectiveness of the occupational risk prevention and health promotion interventions.

Methods: A systematic review was conducted including articles on development, implementation and effects of occupational risk prevention and health promotion interventions that were developed according to the IM-protocol. By means of a checklist, two authors reviewed the articles and rated them on several indicators regarding the fidelity of the IM-protocol, the implementation process and the intervention effect.

Results: A literature search resulted in a total of 12 interventions as described in 38 articles. The fidelity to the IM-protocol was relatively low for participation throughout the development process and implementation planning. No relation was found between fidelity of the IM-protocol and the intervention effect. A theory-based approach (as one of the core elements of IM) appears to be positively related to a successful implementation process.

Conclusion: Results of the review suggest that organising a participative approach and implementation planning is difficult in practice. In addition, results imply that conducting matrices of change objectives as part of the intervention development, although challenging and time consuming, may ultimately pay off, resulting in a tailored intervention that matches the target group.

Keywords: Intervention Mapping, Occupational risk prevention, Occupational health promotion, Interventions

Introduction

Exposure of employees to safety and health risks at work is a major problem. Of all persons aged 15-64 that work or worked previously, 7,9% reported a work-related health problem in the preceding year (1). In 2016, in 3,182 fatal accidents were reported in the EU (1). These numbers illustrate the urgency for effective occupational risk prevention and health promotion interventions (ORP-HP interventions).

Despite the need for these type of interventions, meta-analyses show they often do not sort the intended effects (2-4). When an intervention is not effective, there are several explanations. Either the intervention was based on incorrect theoretical assumptions, the intervention did not consist of the effective ingredients to accomplish behavioural change on the intended outcomes, or the intervention was not implemented successfully (or a combination of the above).

ORP-HP interventions often entail multiple components and aim for behavioural change at different levels of the organisation (5). Due to this complexity, developing effective and successfully implemented ORP-HP interventions is difficult. According to the Medical Research Council, complex interventions are especially at risk for failure due to implementation problems (5). This implies that development and implementation of ORP-HP interventions asks for a thorough approach, with explicit focus on the implementation process.

Different frameworks have been used for intervention development, e.g. the RE-AIM model (6), the Behaviour Change Wheel (7) and the PRECEDE-PROCEED model (8). Another well-known framework for health program planning is Intervention Mapping (IM), a systematic planning protocol for the development of behavioural change interventions (9), that is well adopted within the general health domain (10, 11).

IM consists of six steps as described by Bartholomew et al (9) (see table 1). In Step 1 a needs assessment is conducted to identify the target behaviour and behavioural and environmental determinants that need to be changed. In Step 2 the program objective is formulated and performance objectives are identified (specific behavioural actions needed to reach program objective). To target the performance objectives, determinants are identified for each performance objective. By crossing performance objectives with behavioural determinants, matrices of change objectives are created. In Step 3 theory-based intervention methods are selected that target the determinants and help achieve the change objectives and translated into strategies or applications. In Step 4 the strategies are integrated into an intervention program. In Step 5 the implementation of the intervention program is planned. In the sixth step the process and effect evaluation are planned.

Table 1. Steps and activities of the IM protocol (based on Bartholomew et al (9)).

Step 1: Logic model of the problem
Establish and work with a planning group
Conduct a needs assessment to create a logic model of the problem
Describe the context for the intervention including the population, setting and community
State program goals
Step 2: Program Outcomes and Objectives; Logic Model of Change
State expected outcomes for behaviour and environment
Specify performance objectives for behavioural and environmental outcomes
Select determinants for behavioural and environmental outcomes:
Construct matrices of change objectives
Create a logic model of change
Step 3: Program design
Generate program themes, components, scope and sequence
Choose theory- and evidence based change methods
Select or design practical applications to deliver change methods
Step 4: Program Production
Refine program structure and organisation
Prepare plans for program materials
Draft messages, materials and protocols
Pretest, refine and produce materials
Step 5: Program Implementation Plan
Identify potential program users (implementers, adopters and maintainers)
State outcomes and performance objectives for program use
Construct matrices of change objectives for program use
Design implementation interventions
Step 6: Evaluation plan
Write effect and process evaluation questions
Develop indicators and measures for assessment
Specify the evaluation design
Complete the evaluation plan

There are four characteristics of IM that seem to make IM particularly appropriate for developing (complex) ORP-HP interventions. The first is the theory and evidence based approach (9, 12) which encourages explicit use of theory and empirical evidence in defining the problem, the intended behavioural changes and the mechanism to achieve these changes by making a logic model of the problem, conducting matrices of change objectives and choosing theory and evidence based change methods. The aim is to ensure that the intervention is targeted at the right determinants and that the intervention contains effective ingredients for the intended behaviour changes.

The second characteristic is the participative approach (9, 12) that encourages stakeholder involvement in decision-making, by forming a working group at the start of the project with different stakeholders, e.g. workers, managers, HR, experts, policy makers, and involving relevant stakeholders in all phases of intervention and implementation planning. The aim of

this approach is to ensure that the intervention fits in with the needs of the target group, the implementors, and the context of the organisation.

The third characteristic is the ecological approach (9, 12) which considers the complex and layered context in which the intervention is developed and implemented (by considering behaviour as well as environmental factors and targeting both with the intervention). To accomplish behaviour change at workers level, the intervention often has to target the broader context of the organisation or different actors in the organisation (e.g. the employer). The aim of the ecological approach is to ensure that the intended behaviour changes are supported by the different layers of the organisational context.

The fourth characteristic of IM is that implementation planning of the intervention is part of the intervention development (13). In the last decade, the focus on implementation of interventions has emerged rapidly, providing various implementation frameworks. However, despite the increasing attention for implementation, in practice, the planning of implementation strategies often starts after the intervention has already been developed. Planning the implementation process in the intervention development phase, may decrease the risk of unsuccessful implementation.

Because of these characteristics, IM appears to be an appropriate method for the development and implementation of ORP-HP interventions (12). Recently, Fassier et al (14) have systematically reviewed the fidelity (extent to which the IM-steps are followed according to protocol) of the use of the IM protocol, and the effects of the interventions in work disability prevention. Out of eight studies included, two were reported as effective and one as partially effective. The authors link the low number of effective interventions to issues in relation to the fidelity of the intervention development according to the IM protocol. However, issues in relation to implementation were not taken into account in their study.

In this study we will systematically review ORP-HP interventions on the fidelity of the application of the IM protocol and their effects. Additionally, we add to this review information on the implementation process, to get more insight into the occurrence of implementation issues. The objective of this study is to explore the relation between intervention development, implementation process and intervention effects. Based on this objective, the following research questions were formulated:

1. What is the fidelity of the use of the Intervention Mapping protocol regarding the core IM characteristics (participation, theory based approach, ecological approach, implementation planning)?
2. To what extent are interventions developed following the IM protocol successfully implemented?
3. To what extent are interventions developed following the IM protocol effective?

4. Is the level of fidelity to the IM-protocol related to the implementation success and to the effectiveness of the interventions?

Methods

Literature search

The selection criteria for study inclusion were based on the study objective. Studies on ORP-HP interventions developed by IM were included, that described intervention design, effect evaluation, and process evaluation. We specifically searched for intervention studies of which the intervention design, and the process and effect evaluation were published. This called for a semi-systematic approach, focusing on selecting intervention design articles in the first step, and searching for corresponding effect and process evaluation articles in the second step.

First, a search was conducted in the database of Intervention Mapping (www.interventionmapping.com/references) with the search term 'work' (25-07-2019). This database consists of 1000 references of peer-reviewed published articles that use IM. All titles matching the search term ‘work’ were reviewed to identify articles using the following inclusion criteria: 1) description of the development of ORP-HP interventions; 2) explicit use of the IM protocol. ORP-HP interventions were defined as interventions aimed at workers, to prevent them from work related illness, accidents or injuries, or promote their health and wellbeing. Excluded were interventions aimed at tertiary prevention (return to work). Additional searches were carried out in PubMed and Scopus with search terms ‘Intervention Mapping’ and ‘occupational’ and/or ‘risk prevention’ and/or ‘work’ and/or ‘intervention’, to check for any other IM design articles in the occupational domain that could be included.

An additional search was conducted to find effect and process evaluation articles of the studies of the included articles on intervention development. These articles were identified by searching reference lists of included articles and by specifically searching for other articles from authors of the design articles.

Data extraction and synthesis

To review the fidelity of the intervention development according to the IM protocol, an IM fidelity checklist was developed that contained a list of 13 items that correspond to a large extent to the activities of the IM steps (see Table 1), extracted from the third edition of the Intervention Mapping textbook (9) and crosschecked with the checklist of Fassier et al (14). The checklist contains the activities of the IM protocol that relate to the core characteristics of IM (participation, theory based approach, ecological approach, and implementation planning). Step 6 was not included in the checklist, since the planning of the evaluation is not

hypothesized to be related to the implementation process or the intervention effects. Two authors (MBR and RS) rated each activity as either + (executed) or +/- 'partially executed' or – 'not executed (or not measured/described)'.

To review the implementation process, a process implementation checklist was developed. Since in general the operationalization of process indicators differs substantially between articles, this checklist was used to rate the process indicators in a comparable manner. The checklist was based on the commonly used Steckler & Linnan framework for process evaluation (15), including reach, dose delivered, dose received and fidelity. 'Satisfaction' was added to gain extra information on the satisfaction and acceptance of the intervention by the target group. The process indicators were rated based on the data as presented in the articles, using the evaluation checklist. Two authors (MBR and RS) rated the implementation components as either ++ (excellent), + (satisfactory) or +/- (moderate) or – (unsatisfactory).

To review the effects of the interventions based on the effect evaluations, two authors (MBR and RS) rated the interventions as either ++ (all primary and secondary outcomes effective), + (all primary outcomes effective and secondary outcomes partially or not effective) or +/- (primary and/or secondary outcomes partially effective (but not all primary outcomes effective)) or – (all primary and secondary outcomes not effective).

To develop the checklists and rate the articles, first, rating criteria were chosen based on literature and expert opinions of the research team. Second, the checklists were tested by means of a pilot evaluation with two articles by two authors (MBR and RS), results were discussed and the checklist was adjusted. In addition, half of the articles were rated by two authors (MBR and RS), scores were compared and discussed, and the checklist was finalized. Then all articles were rated by two authors, and disagreements were discussed until consensus was reached. The checklists with rating criteria can be found in the appendix (supplementary table 1).

Analyses

After the IM fidelity of the intervention development, the implementation process and the intervention effects were reviewed and rated with either ++, +, +/- or –, each rating was quantified by scoring ++ = 3 (process indicators and effects), + = 2, +/- = 1 and- = 0. In addition, means were calculated (if no more than half of the scores was missing) for the fidelity of the activities related to participation, theory based approach, ecological approach, and implementation planning, as well as for the overall IM fidelity (step 1a – step 5d), the implementation process and the intervention effects. Scatterplots were built in Excel to visually map the relation between the IM fidelity, the implementation process and the intervention effects.

Results

Included articles

A search in the database of Intervention Mapping resulted in 193 'matches' (i.e. the term 'work' can be used several times in the same article) (Figure 1). In the next step, articles were identified on ORP-HP interventions, resulting in 60 records. In the following step articles were excluded that do not describe the development of the intervention (exclusion of 36 articles). In the next step articles were excluded that focused on tertiary occupational risk prevention (5 articles were excluded). In addition, three unique design articles were selected based on an additional search in PubMed and Scopus. This procedure led to the inclusion of 22 articles describing the intervention development (study design articles).

For each of the design articles included at this point, a search was carried out to find process and effect evaluation articles on the interventions as described in the design articles (by performing a search based on (co)authors names and the name of the intervention). The design articles of which a published process and effect evaluation could not be found were excluded (10 articles excluded). For each of the remaining design articles the process and effect evaluation were included, resulting in a total of 38 articles (11 design articles, 14 effect articles, 9 process articles, 1 article combining the intervention design and the process evaluation and 3 articles combining the effect and process evaluation) on 12 interventions.

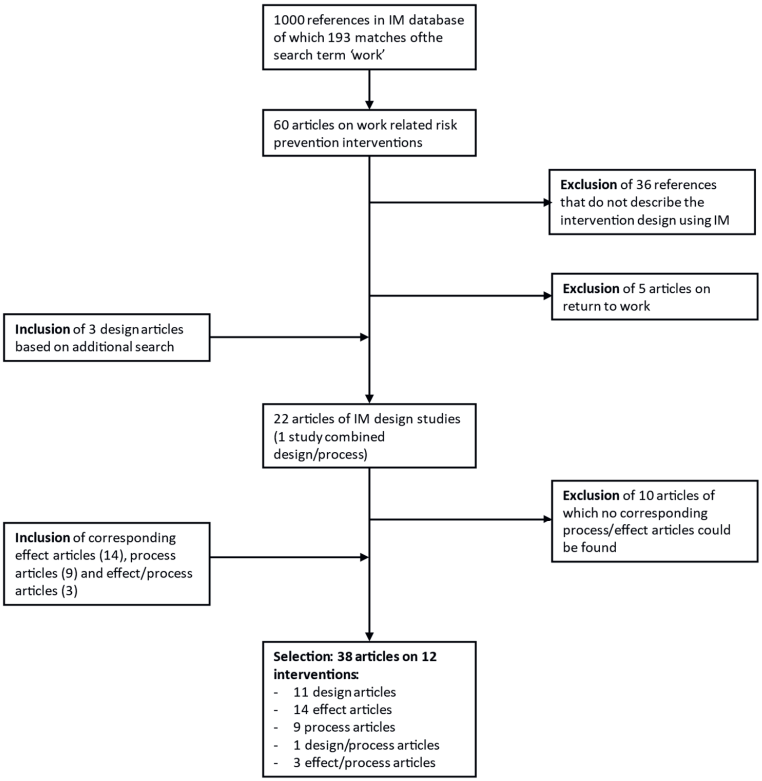

Figure 1. Flow-chart of included studies

The included studies and the characteristics of the interventions are summarized in the appendix (supplementary table 2). Eight of the interventions were aimed at (amongst others) weight gain prevention and/or physical activity promotion in the workplace (16-23), two studies focused on influenza vaccination of workers (24, 25), one intervention aimed at workers' safety (26), one intervention focused on reduction of quartz exposure (27). Three interventions focused on (amongst others) mental health related outcomes, e.g. workability (22), need for recovery and relaxation (21), work engagement and mental health (20). The interventions covered a variety of sectors, and some were targeted at specific sectors: construction sector (18, 22, 27), health care (17, 24, 25), metal industry (26), financial service sector (21) and research institutes (20).

Intervention design according to IM protocol

Results of the fidelity review can be found in table 2 for each of the IM (sub)steps (see appendix supplementary tables 3a, 3b, 4a, 4b and 5 for more detail). The scores that are used for the figures can be found in the appendix in supplementary table 6. Results are reported below in relation to the core IM characteristics: participation, theory based approach, ecological approach and implementation planning.

Table 2. Summary of fidelity assessment IM, implementation process and intervention effects

Studies:	1	2	3	4	5	6	7	8	9	10	11	12
IM fidelity *												
Step 1: Logic model of the problem												
1a. Formation of linkage group (participation)	–	–	–	–	–	+	–	–	+	–	–	–
1a. Conduct a needs assessment to create a logic model of the problem (theory-based approach)	+	+	+	+	+	+	+	+/–	+	+	+	+
Step 2: Program outcomes and objectives; Logic model of change												
2a. Construct matrices of change objectives (theory based)	+	–	–	–	+	+	+	–	+	–	–	–
7b. Participative approach (step 1 and/or step 2) (participation)	+	+	+	+	+/–	+	+	+/–	+	+/–	+/–	+
2c. Differentiation between behavioural and environmental factors (ecological approach)	+	+	+	+	+/–	+	+	+/–	+	+	+	+
Step 3: Program design												
3a. Choose theory and evidence-based change methods (theory-based approach)	+	+	+	+	+	+	+	+	+	+	+	+
Step 4: Program production												
4a. Participative approach (step 3 and/or step 4) (participation)	–	+	+	+/–	+	+	+	–	+	+/–	+/–	+
4b. Worker and workplace component of intervention (ecological approach)	+	+	+	+	+	+	+	+	+	+	+	+
Step 5: Program implementation plan												
5a. Identify potential program users (implementers, adopters, and maintainers) (implementation planning)	+/–	+/–	+/–	+/–	+/–	+/–	+/–	+/–	+/–	+/–	+	+/–
5b. State outcomes and performance objectives for	–	–	–	–	+/–	–	+	–	–	–	–	–

Studies:	1	2	3	4	5	6	7	8	9	10	11	12
program use (implementation planning)												
5c. Identify drivers and barriers for implementation (implementation planning)	+	+/−	+	+	+	+	+	+	−	−	−	+/−
Design implementation interventions (implementation planning)	+	+	+	+	+	+/−	+	+	+	+	+	+
5d. Participative approach (step 5) (participation)	+	+	+	+	+	−	+	−	−	+	+	+
Implementation process **												
Reach	++	−	−	−	++	n.m.	−	−	n.m.	n.m.	++	n.m.
Dose delivered	++	++	n.m.	+/−	+/−	++	++	++	n.m.	n.m	n.m	++
Dose received	++	+/−	+/−	−	+/−	+/−	+/−	+/−	n.m.	−	+/−	−
Fidelity	+/−	+/−	+/−	+	n.m.	+/−	+/−	+/−	n.m.	n.m.	+/−	n.m.
Satisfaction	+	+	+	+	n.m.	+	+	+	++	+/−	+	n.m.
Intervention effects ***												
Effects	−	+/−	−	+	+	+/−	−	+/−	+ (n.c.)	++	++	+

Studies: 1: Oude Hengel, 2011a ; 2012; 2013; 2011b [22, 28–30]; 2: Coffeng, 2012; 2014a; 2014b; 2013 [21, 31–33]; 3: Van Berkel, 2011; 2014a; 2014b; 2013 [20, 34–36]; 4: Oude Hengel, 2014; Van Deurssen, 2014b; 2014a [27,37,38]; 5: Mc Eachan, 2008; 2011, Lawton, 2014 [19,39,40]; 6: Verweij, 2009;2012; 2013; 2011; 2012 [23,41–44]; 7: Viester, 2012; 2015; 2014 [18,45,46]; 8: Strijk, 2009; 2012, 2013; 2011 [17, 47–49]; 9: Brosseau, 2007; Parker, 2009 [26,50]; 10: Riphagen 2013a; 2013b [25,51]; 11: Kwak, 2007; 2009; 2010 [16,52,53]; 12: Looijmans, 2011; 2010 [24,54]; ***** IM fidelity rating: + (executed), or +/− (partially executed), or—(not executed (or not measured/described)); ****** Implementation process rating: ++ (excellent), + (satisfactory), or +/− (moderate), or—(unsatisfactory); ******* Intervention effects rating: ++ (all primary and secondary outcomes effective), + (all primary outcomes effective and secondary outcomes partially or not effective) or +/− (at least one of the primary and/or secondary outcomes effective, but not all primary outcomes effective) or—(all primary and secondary outcomes not effective); **Note:** n.c.: no control group, n.m.: not measured/not described.

Participation

The first step of IM is to compose a participatory group of stakeholders (planning group) that is involved in all steps of the intervention design. Only two of the studies explicitly mentioned the formation of a planning group (step 1), however, most of the studies involved the target group, implementers, or other stakeholders at different phases of the process. In eight of the studies, the target group and other stakeholders participated during Step 1 and/or Step 2. In four of the studies, either the target group or other stakeholders participated in these steps. The majority of the studies (7 studies) involved the target group in the design of the intervention program (Step 3 and/or 4). In three studies, the target group was not involved directly, but other stakeholders participated in the design of the intervention program. In nine of the studies, the implementors were involved in the implementation planning (Step 5).

Theory-based

All studies conducted a needs assessment, and all but one of the studies mentioned causal pathways to describe the logic model of the problem (step 1). Five of the studies constructed

matrices of change objectives (step 2). All of the studies chose theory- and evidence-based change methods (step 3).

Ecological approach

Most of the studies (10 studies) differentiated between behavioural and environmental factors in conducting a logic model of change (step 3). All studies included in their interventions both components that targeted the worker as well as environmental context (e.g., the workplace) (step 4). Supplementary table 2 (see appendix) provides an overview of the interventions and program components.

Implementation planning

Only one of the studies explicitly identified all potential program users: adopters, implementers, and maintainers. All other studies identify adopters and implementers but did not identify maintainers. Only one of the studies explicitly formulated performance objectives for program use. However, seven studies identified drivers and barriers for implementation, and almost all of the studies (11 studies) designed interventions for implementing the intervention program, e.g., by developing manuals, protocols, communication plans, or taking other measures to ensure the fidelity and overcoming anticipated barriers for implementation.

Overall IM fidelity

Of the core IM characteristics, the fidelity of IM activities related to the ecological approach was highest, followed by the fidelity of activities related to the theory-based approach (see Figure 2). The fidelity of activities related to participation and implementation planning was considerably lower. The low score on participation was mainly due to a lack of a planning group in most of the studies. The low score on implementation planning was due to a lack of identifying implementors and maintainers as potential program users and a lack of specifying outcomes and performance objectives for program use.

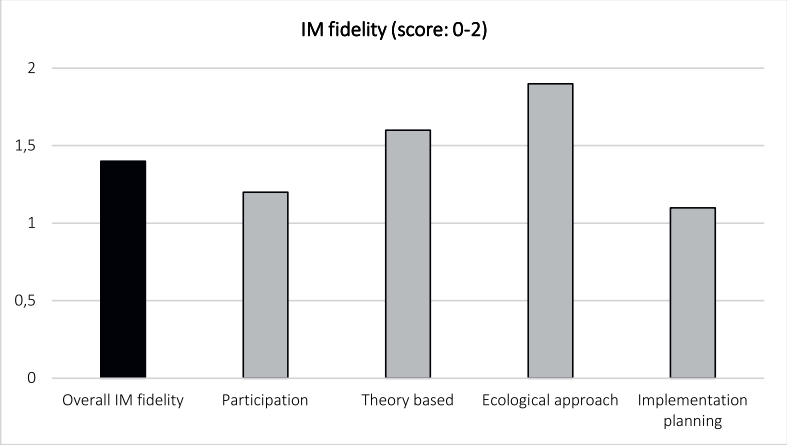

Figure 2: Overall IM fidelity (step 1a – 5d) and fidelity of IM characteristics

Evaluation of implementation process

Of the eight studies that calculated reach as a proportion of the participating workers, three studies reported an excellent reach (++), and five reported an unsatisfactory reach (−). Of the eight studies that reported information on the dose delivered, six reported an excellent dose delivered (++), and two reported a moderate dose delivered (+/−). All but one study provided information on the dose received. Only one of these studies reported an excellent dose received (++), seven reported a moderate dose received (+/−), and three reported an unsatisfactory dose received (−). Information on the fidelity was reported in eight of the studies, and only one reported satisfactory fidelity (+). Ten studies reported information in relation to participants' satisfaction with the intervention. One of the studies reported an excellent satisfaction (++), eight reported a satisfactory satisfaction (+), and one study reported a moderate satisfaction (+/−). More detailed information on the review of the implementation process can be found in supplementary table 4a and 4b (see appendix).

Evaluation of effects of the intervention

Six studies found the intervention to be effective in changing primary outcomes. Two of these studies reported significant changes in both primary and secondary outcomes, whereas four of these studies reported changes for the primary outcomes only. Three studies were found to be partially effective, and four as not effective. More detailed information on the review of intervention effects can be found in supplementary table 5 (see appendix).

Relation between intervention design, implementation, and effect

There appear to be no clear associations between either the overall IM fidelity and the implementation process (see appendix, supplementary figure 1) or the overall IM fidelity and the intervention effects (see appendix, supplementary figure 2).

Comparing fidelity scores of the core IM characteristics with the implementation process and intervention effects, there only appears to be an association between the fidelity of IM activities related to the theory-based approach and the implementation process (Figure 3). A high score on the fidelity of IM activities related to the theory-based approach, appears to be associated with a high score on the implementation process. For none of the other core IM characteristics, the fidelity appears to be associated with either the implementation process or the intervention effects.

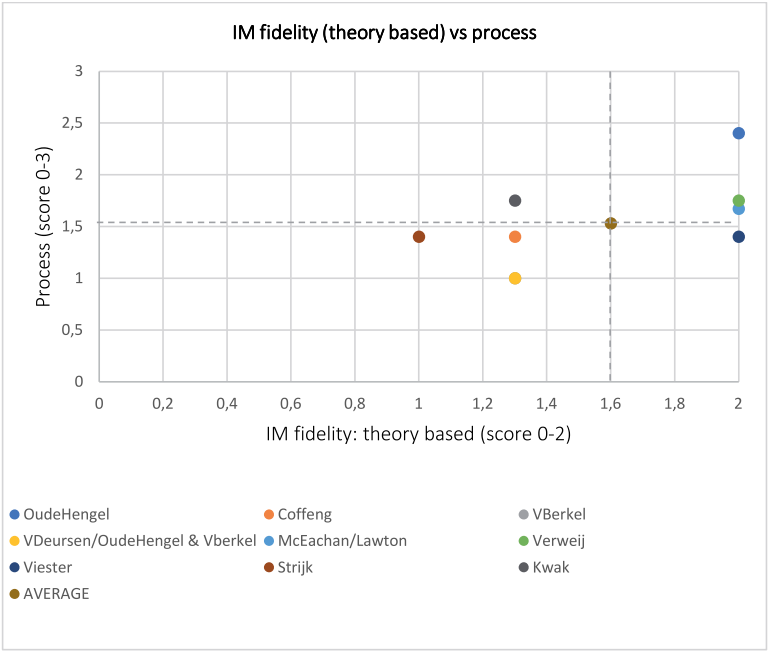

Figure 3: Scores of fidelity of the theory based approach (score: 0-2) and the implementation process (score 0-3) per study*

*The dotted lines show the average scores for the IM fidelity (theory based) and the implementation process. For three of the process evaluations, there was not enough data available to calculate a process score (24, 47, 51). McEachan/Lawton and Looijmans have identical scores on IM fidelity (theory based and process).

Discussion

The aim of this article was to explore the relationship between the fidelity regarding the use of the IM protocol in intervention development, implementation and effects of the ORP-HP interventions. First, this study investigated the fidelity of the use of the IM protocol for ORP-HP intervention development. Subsequently, this study investigated to what extent ORP-HP interventions developed following the IM protocol are successfully implemented and effective, and whether the level of fidelity to the IM-protocol is related to implementation success and intervention effects.

Fidelity of the IM protocol

Participation is considered an important aspect of the development, implementation and evaluation of ORP-HP interventions [55] to ensure that the intervention fits in with the needs of the target group (increasing the support base) and the context of the organisation (ensuring the feasibility of the intervention activities) [56]. However, consistent with the findings of Fassier et al. [14] and Bouché et al. [11] the included studies did not follow all steps of the participative approach as described in the IM-protocol. Of all the included studies, only two explicitly reported the formation of a working group including relevant stakeholders (e.g., target group, management, supervisors, policymakers, experts, implementors) at the start of the project. Although in most studies the target group, implementers, or other stakeholders were involved during different phases of the process, five of the studies did not involve the target group in the intervention design [16,17,22,25, 27]. Especially in this step, the participation of the target group is important to ensure the intervention design is suitable for the potential users [9]. In their discussions, several authors of the included studies stress the importance of the involvement of all stakeholders during the entire process of intervention design and implementation and consider the lack of support of different stakeholders (especially from management) during implementation as an important barrier for the implementation success of their interventions. Four studies recommended to further improve participation of all layers of the organisation for different reasons, to raise support from employees and management [33,36,46], to investigate preconditions for intervention success [36], and to use perspectives of the target group when choosing methods to deliver the intervention [49].

The theory-based approach is another core characteristic of IM is [9,12], to ensure that the intervention is targeted at the right determinants and the intervention contains effective ingredients for the intended behaviour changes. The theory-based approach of IM prescribes the use of theory and empirical evidence by making a logic model of the problem, conducting matrices of change objectives, and choosing theory and evidence-based change methods. This study shows that the included studies had difficulties following all the detailed steps of

the theory-based approach. Although all included studies conducted a logic model of the problem, and selected theory and evidence-based change methods, in contrary to the findings of Fassier et al. [14], the majority of the studies did not develop matrices of change objectives. This may imply that important substeps to make a theory based logic model of change are missed, because the matrices of change objectives help specify the behaviours the intervention actually has to target. One of the reasons, as mentioned by Kwak et al. [16] for not constructing a matrix of change objectives, is that the program outcomes involve several different behaviours, making matrices of change objectives (too) complex, extensive, and time-consuming [16]. Studies that did conduct matrices of change objectives, also commented in their discussion that it was a very time-consuming effort, and not always feasible in relation to planning and budget [18,19,22]. In addition, the studies differ in the level of detail they present regarding the information on why and how choices were made for the particular change strategies, tools, and materials (step 3). This is remarkable since, in this step of IM, the intervention gets its definite form and crucial choices are made. It would be helpful to collect more evidence on the relationship between methods from theory and practical strategies to support the decision on which strategy to use.

Another core characteristic of IM is the ecological approach [9,12], to ensure that the intended behaviour changes are supported by the different layers of the organisational context. The ecological approach considers the complex and layered context in which the intervention is developed and implemented. The included studies all followed the ecological approach by considering behavioural as well as environmental factors on which the interventions were targeted. All interventions contained elements targeted at workers as well as the workplace (e.g., supervisors, physical environment) to accomplish changes in the intended outcomes. However, in the discussion, some authors of the included studies recommend (even) more focus on contextual factors from the beginning of the intervention design to the very end of the implementation [30,38]. This would ensure the feasibility of the intervention and the fit of the intervention within the (changing) organisational context. In addition, the ecological approach could also benefit from more participation of actors from all layers of the organisation. Including more actors in the intervention's development may, however, increase the complexity and costs.

An additional important characteristic of IM is that planning of the intervention implementation is part of the intervention development to decrease the risk of unsuccessful implementation [13]. However, of all the IM steps, the fidelity of the implementation planning (Step 5) was lowest. Almost none of the included studies reported performance objectives for program use. Although the importance of the implementation of interventions is getting more and more attention, in practice for the included studies the development of the intervention design is described in far more detail compared to the planning of the implementation. Almost none of the studies included maintainers in the implementation process. This could be linked to the way these interventions are often financed: by a four-year

grant that ends after the evaluation has been completed. However, as some authors of the included studies conclude, by not including plans for maintenance during the intervention design, there is a high risk of the intervention not being maintained after the research project has finished [46]. Fernandez et al. [13] propose implementation mapping as an expansion of the IM intervention planning phase (Step 5) and provide additional details and examples for developing and selecting implementation strategies. Implementation mapping could be used by intervention planners to improve and expand the implementation planning of their interventions.

To summarize, the review of the fidelity of the application of the IM-protocol showed that all included studies had difficulties following the IM-protocol in one way or another. Studies had difficulties following the participative approach, conducting matrices of change objectives, and planning the implementation of the intervention. Practical tools for organising participation and planning the implementation process (e.g., based on implementation mapping (13)) may help intervention developers to tackle these problems.

Relation fidelity IM-protocol, implementation and intervention effect

There appears to be no clear relation between the fidelity of the IM-protocol and intervention effects. This study found that half of the ORP-HP interventions designed using IM, was effective on primary outcomes, a fourth was partially effective, and a fourth was not effective. Although the IM protocol (Step 6) encourages evaluation on changes in determinants and change objectives, and to explore mediating and moderating variables [9], the effect (and process) evaluation of the included studies often did not include behavioural and environmental determinants as secondary outcomes. Including behavioural and environmental determinants in the evaluations would provide more insights into reasons for (in)effectiveness of interventions and would provide insight into the mechanism of change [57,58].

Subsequently, there appears to be no clear relation between the overall fidelity of the IM-protocol and the implementation process. Regarding the implementation of the interventions, reach appeared to be unsatisfactory in a majority of the studies. Most of the design articles did not elaborate much on the recruitment procedure of participants in the planning phase of the intervention and its implementation. More attention for recruitment during the planning of the implementation could possibly improve the reach of the intervention. Results also show that the fidelity of the implementation process was relatively low. Although high fidelity is considered by many as an important indicator for implementation success, one could question whether a high fidelity actually indicates a successful implementation. Adapting the intervention during implementation in case of changes in the organisational context may often be necessary for a tailored approach. This is supported by a review by Durlak and Dupre [59] that shows that when fidelity does not reach

100%, adaptations could be a positive contribution to outcomes instead of labeling these adaptations as an implementation failure.

Although we found no relation between the overall fidelity of the IM-protocol and the implementation process, there appears to be a relation between the fidelity of the activities related to the theory-based approach (as one of the core elements of IM), and the implementation process, suggesting a high fidelity regarding the theory-based approach, to be related to a more successful implementation (especially to satisfaction and dose received). This may imply that conducting matrices of change objectives, although challenging and time-consuming, could ultimately pay off, resulting in a tailored intervention that matches the target group.

Strengths and limitations

Several strengths and limitations should be mentioned regarding the design of this study, that may have affected the overall results. First, relatively few intervention studies on ORP and HP have used the IM protocol, resulting in a small selection of (primarily Dutch) studies, making it difficult to quantitatively compare the fidelity of the IM protocol to the implementation process and the intervention effects.

In line with Fassier et al. [14], an effort was made to systematically identify and review ORP-HP interventions using the IM protocol, and the accompanying studies on implementation and effects. Since a validated protocol to review the studies was not available, the authors developed checklists and followed a structured method to review and rate the IM-steps, implementation process, and intervention effect. However, the selection of included studies consisted of a variety of heterogeneous interventions implemented in different contexts, and the studies differed in relation to the detail that was provided regarding the IM steps, which challenged the standardization of the assessment. Reviewing the process evaluations was particularly challenging. The studies differ regarding the ex-tension of the process evaluation that was conducted. For some of these studies, there was not enough information on the process indicators available to compute mean scores. The studies also differed in relation to the theoretical frameworks on which the process evaluation was based, and some studies did not use a theoretical framework at all, in line with earlier research [60]. Finally, the studies differed regarding the indicators that were taken into account, making comparability of the results of the process evaluation of all the studies challenging.

It should be noted that the evaluation planning (Step 6) was not part of the review of the fidelity of the IM protocol. However, the evaluation planning (e.g., the study design and timing of measurements) could impact the probability to find effects. For example, to measure intervention effects, the timing of the measures should match the timing of the hypothesized effects on the behavioural outcomes, taking into account the planning of the implementation and anticipating possible barriers during implementation. This information

was not included in this study, and therefore we cannot rule out that finding no intervention effects could be due to poor evaluation planning.

Despite the methodological limitations, this study has several strengths as well. To our knowledge, this is the first study that systematically compared the intervention design using IM, to the implementation process as well as the intervention effect. To increase our knowledge on the relationship between intervention design, implementation, and effect, this type of systematic review may provide valuable new insights. It would be even more valuable to link specific behavioural change methods (as part of the intervention design) to behavioural determinants (in an effect evaluation), and to more explicitly link the planning of the implementation (specifying performance objectives for implementation) to process indicators of implementation (in a process evaluation). However, this would request for studies making a standardized reporting of behaviour change methods, and consequently studying the effects of behaviour changes methods on performance objectives, for the intervention effects as well as the implementation process. This would broaden the evidence base on which behavioural change methods work best to change specific determinants in different contexts.

Conclusions

Based on the results of this review, some conclusions can be drawn regarding the use of the IM protocol for the development of ORP-HP interventions. The review of the fidelity of the application of the IM-protocol showed that all included studies had difficulties following the IM-protocol in one way or another. Studies had difficulties following the participative approach, conducting matrices of change objectives, and planning the implementation of the intervention.

Overall, this review did not find a relation between the fidelity of the IM-protocol and the intervention effects. However, results suggest that the implementation process may benefit from a logic model of change as part of the intervention design.

Practical tools for organising participation, and planning the implementation process (e.g., based on Implementation Mapping [13]) may help intervention developers during intervention development. Simplification or shortening of the IM protocol may also help increase the feasibility of the use of IM. However, this study suggests that the theory based approach, which is considered complex and time-consuming and (for this reason) is often simplified or lacking, can be considered an important part of the intervention development.

Author contributions:

M.B.R., R.S., N.W., C.B., and P.B. were involved in the conceptualization of the study, M.B.R. and R.S. carried out the formal analysis. M.B.R. was responsible for writing the original draft. R.S., N.W., C.B., and P.B. supervised and reviewed several versions of the manuscript. All authors have read and agreed to the published version of the manuscript.

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References

1. Heuvel, S.; Zwaan, L.; Dam L. van, Oude Hengel, K.D.L.O.; Eekhout, I.; van Emmerik, M. van; Oldenburg, C.; Brück, C; Janowski, P.; Wilhelm, C.; et al. Estimating the Costs of Work-Related Accidents and Ill-Health: An Analysis of European Data Sources; No.: 9292409975; European Agency for Safety and Health at Work (EU-OSHA); Luxembourg, 2017.
2. Richardson, K.M.; Rothstein, H.R. Effects of occupational stress management intervention programs: A meta-analysis. J. Occup. Health Psychol. 2008, 13, 69–93, doi:10.1037/1076-8998.13.1.69.
3. Biron, C.; Karanika-Murray, M. Process evaluation for organisational stress and well-being interventions: Implications for theory, method, and practice. Int. J. Stress Manag. 2014, 21, 85–111, doi:10.1037/a0033227.
4. Westgaard, R.; Winkel, J. Occupational musculoskeletal and mental health: Significance of rationalization and opportunities to create sustainable production systems—A systematic review. Appl. Ergon. 2011, 42, 261–296, doi:10.1016/j.apergo.2010.07.002.
5. Craig, P.; Dieppe, P.; Macintyre, S.; Michie, S.; Nazareth, I.; Petticrew, M. Developing and evaluating complex interventions: The new Medical Research Council guidance. BMJ 2008, 337, a1655.
6. Glasgow, R.E.; Vogt, T.M.; Boles, S.M. Evaluating the public health impact of health promotion interventions: The RE-AIM framework. Am. J. Public Health 1999, 89, 1322–1327, doi:10.2105/ajph.89.9.1322.
7. Michie, S.; Van Stralen, M.M.; West, R. The behaviourr change wheel: A new method for characterising and designing behaviourr change interventions. Implement. Sci. 2011, 6, 42, doi:10.1186/1748-5908-6-42.
8. Green, L.W.; Kreuter, M.; Deeds, S.G.; Partridge, K.B. Health education planning: A diagnostic approach. In Health Education Planning: A Diagnostic Approach; Mayfield Publishing Company, Palo Alto CA, 1980; p. 306.
9. Bartholomew, L.K.B.; Markham, C.M.; Ruiter, R.A.; Fernández, M.E.; Kok, G.; Parcel, G.S. Planning Health Promotion Programs: An Intervention Mapping Approach; John Wiley & Sons: San Francisco, 2016.
10. Garba, R.M.; Gadanya, M.A. The role of intervention mapping in designing disease prevention interventions: A systematic review of the literature. 2017, 12, e0174438, doi:10.1371/journal.pone.0174438.
11. Lamort-Bouché, M.; Sarnin, P.; Kok, G.; Rouat, S.; Péron, J.; Letrilliart, L.; Fassier, J.-B. Interventions developed with the Intervention Mapping protocol in the field of cancer: A systematic review. Psycho-Oncology 2018, 27, 1138–1149, doi:10.1002/pon.4611.
12. van Doorn, R.R.; Massar, K.; Kok, G. Gedragsverandering binnen organisaties: Kan intervention mapping een bijdrage leveren aan het ontwikkelen van effectieve

interventies? [Behavioural change within organisations: Can Intervention Mapping contribute to the development of effective interventions?]. Gedrag Organ. 2018, 31, 117–133.
13. Fernandez, M.E.; Hoor, G.A.T.; Van Lieshout, S.; Rodriguez, S.A.; Beidas, R.S.; Parcel, G.; Ruiter, R.A.C.; Markham, C.M.; Kok, G. Implementation Mapping: Using Intervention Mapping to Develop Implementation Strategies. Front. Public Health 2019, 7, 158, doi:10.3389/fpubh.2019.00158.
14. Fassier, J.-B.; Sarnin, P.; Rouat, S.; Péron, J.; Kok, G.; Letrilliart, L.; Lamort-Bouché, M. Interventions Developed with the Intervention Mapping Protocol in Work Disability Prevention: A Systematic Review of the Literature. J. Occup. Rehabil. 2019, 29, 11–24, doi:10.1007/s10926-018-9776-8.
15. Steckler, A.B.; Linnan, L.; Israel, B. Process Evaluation for Public Health Interventions and Research; Jossey-Bass: San Francisco, CA, USA, 2002.
16. Kwak, L.; Kremers, S.P.J.; Werkman, A.; Visscher, T.L.S.; Van Baak, M.A.; Brug, J. The NHF-NRG In Balance-project: The application of Intervention Mapping in the development, implementation and evaluation of weight gain prevention at the worksite. Obes. Rev. 2007, 8, 347–361, doi:10.1111/j.1467-789x.2006.00304.x.
17. Strijk, J.E.; Proper, K.I.; Van Der Beek, A.J.; Van Mechelen, W. The Vital@Work Study. The systematic development of a lifestyle intervention to improve older workers' vitality and the design of a randomised controlled trial evaluating this intervention. BMC Public Health 2009, 9, 408–415, doi:10.1186/1471-2458-9-408.
18. Viester, L.; Verhagen, E.; Proper, K.I.; Van Dongen, J.M.; Bongers, P.M.; Van Der Beek, A.J. VIP in construction: Systematic development and evaluation of a multifaceted health programme aiming to improve physical activity levels and dietary patterns among construction workers. BMC Public Health 2012, 12, 89, doi:10.1186/1471-2458-12-89.
19. McEachan, R.; Lawton, R.; Jackson, C.; Conner, M.; Lunt, J. Evidence, Theory and Context: Using intervention mapping to develop a worksite physical activity intervention. BMC Public Health 2008, 8, 326, doi:10.1186/1471-2458-8-326.
20. van Berkel, J.; Proper, K.I.; Boot, C.R.; Bongers, P.M.; van der Beek Allard, J. Mindful "Vitality in Practice": An intervention to improve the work engagement and energy balance among workers; the development and design of the randomised con-trolled trial. BMC Public Health 2011, 11, 736.
21. Coffeng, J.K.; Hendriksen, I.J.; Duijts, S.F.A.; Proper, K.I.; Van Mechelen, W.; Boot, C.R. The development of the Be Active & Relax "Vitality in Practice" (VIP) project and design of an RCT to reduce the need for recovery in office employees. BMC Public Health 2012, 12, 592, doi:10.1186/1471-2458-12-592.
22. Oude Hengel, K.M.O.; Joling, C.I.; Proper, K.I.; van der Molen Henk, F.; Bongers, P.M. Intervention mapping as a framework for developing an intervention at the worksite for older construction workers. Am. J. Health Promot. 2011, 26, e1–e10.

23. Verweij, L.M.; Proper, K.I.; Weel, A.; Hulshof, C.T.; Van Mechelen, W. Design of the Balance@Work project: Systematic de-velopment, evaluation and implementation of an occupational health guideline aimed at the prevention of weight gain among employees. BMC Public Health 2009, 9, 461, doi:10.1186/1471-2458-9-461.
24. Looijmans-van den Akker, I.; Hulscher, M.E.; Verheij, T.J.; Riphagen-Dalhuisen, J.; van Delden, J.J.; Hak, E. How to develop a program to increase influenza vaccine uptake among workers in health care settings? Implement. Sci. 2011, 6, 47.
25. Riphagen-Dalhuisen, J.; Frijstein, G.; Van Der Geest-Blankert, A.D.J.; Danhof-Pont, M.B.; De Jager, H.; Bos, N.; Smeets, E.; De Vries, M.; Gallee, P.; Hak, E. Planning and process evaluation of a multi-faceted influenza vaccination implementation strategy for health care workers in acute health care settings. BMC Infect. Dis. 2013, 13, 235, doi:10.1186/1471-2334-13-235.
26. Brosseau, L.M.; Parker, D.; Samant, Y.; Pan, W. Mapping Safety Interventions in Metalworking Shops. J. Occup. Environ. Med. 2007, 49, 338–345, doi:10.1097/jom.0b013e3180331828.
27. Oude Hengel, K.M.O.; Van Deurssen, E.; Meijster, T.; Tielemans, E.; Heederik, D.; Pronk, A. 'Relieved Working'study: Systematic development and design of an intervention to decrease occupational quartz exposure at construction worksites. BMC Public Health 2014, 14, 760.
28. Oude Hengel, K.M.O.; Blatter, B.M.; Joling, C.I.; Van der Beek Allard, J.; Bongers, P.M. Effectiveness of an intervention at construction worksites on work engagement, social support, physical workload, and need for recovery: Results from a cluster randomized controlled trial. BMC Public Health 2012, 12, 1008.
29. Oude Hengel, K.M.O.; Blatter, B.M.; van der Molen Henk, F.; Bongers, P.M.; van der Beek Allard, J. The effectiveness of a construction worksite prevention program on work ability, health, and sick leave: Results from a cluster randomized con-trolled trial. Scand. J. Work Environ. Health 2013, 39, 456–467.
30. Oude Hengel, K.M.O.; Blatter, B.M.; van der Molen Henk, F.; Joling, C.I.; Proper, K.I.; Bongers, P.M.; van der Beek, A.J. Meeting the challenges of implementing an intervention to promote work ability and health-related quality of life at construction worksites: A process evaluation. J. Occup. Environ. Med. 2011, 53, 1483–1491.
31. Coffeng, J.K.; Hendriksen, I.J.; Duijts, S.F.A.; Twisk, J.W.; Van Mechelen, W.; Boot, C.R.L. Effectiveness of a Combined Social and Physical Environmental Intervention on Presenteeism, Absenteeism, Work Performance, and Work Engagement in Office Employees. J. Occup. Environ. Med. 2014, 56, 258–265, doi:10.1097/jom.0000000000000116.
32. Coffeng, J.K.; Boot, C.R.L.; Duijts, S.F.A.; Twisk, J.W.R.; Van Mechelen, W.; Hendriksen, I.J.M. Effectiveness of a Worksite Social & Physical Environment Intervention on Need for Recovery, Physical Activity and Relaxation; Results of a Randomized Controlled Trial. PLoS ONE 2014, 9, e114860, doi:10.1371/journal.pone.0114860.

33. Coffeng, J.K.; Hendriksen, I.J.; Van Mechelen, W.; Boot, C.R. Process Evaluation of a Worksite Social and Physical Environ-mental Intervention. J. Occup. Environ. Med. 2013, 55, 1409–1420, doi:10.1097/jom.0b013e3182a50053.
34. van Berkel, J.; Boot, C.R.; Proper, K.I.; Bongers, P.M.; van der Beek Allard, J. Effectiveness of a worksite mindfulness-based multi-component intervention on lifestyle behaviours. Int. J. Behav. Nutr. Phys. Act. 2014, 11, 9.
35. van Berkel, J.; Boot, C.R.; Proper, K.I.; Bongers, P.M.; van der Beek, A.J. Effectiveness of a worksite mindfulness-related mul-ti-component health promotion intervention on work engagement and mental health: Results of a randomized controlled trial. PLoS ONE. 2014, 9, e84118.
36. van Berkel, J.; Boot, C.R.; Proper, K.I.; Bongers, P.M.; van der Beek, A.J. Process evaluation of a workplace health promotion intervention aimed at improving work engagement and energy balance. J. Occup. Environ. Med. 2013, 55, 19–26.
37. van Deurssen, E.; Meijster, T.; Oude Hengel, K.M.O.; Boessen, R.; Spaan, S.; Tielemans, E.; Heederik, D.; Pronk, A. Effectiveness of a multidimensional randomized control intervention to reduce quartz exposure among construction workers. Ann. Occup. Hyg. 2015, 59, 959–971.
38. van Deurssen, E.H.; Pronk, A.; Meijster, T.; Tielemans, E.; Heederik, D.; Oude Hengel, K.M. Process evaluation of an inter-vention program to reduce occupational quartz exposure among Dutch construction workers. J. Occup. Environ. Med. 2015, 57, 428–435.
39. McEachan, R.; Lawton, R.; Jackson, C.; Conner, M.; Meads, D.; West, R. Testing a workplace physical activity intervention: A cluster randomized controlled trial. Int. J. Behav. Nutr. Phys. Act. 2011, 8, 29, doi:10.1186/1479-5868-8-29.
40. Lawton, R.; McEachan, R.; Jackson, C.; West, R.; Conner, M. Intervention fidelity and effectiveness of a UK worksite physical activity intervention funded by the Bupa Foundation, UK. Health Promot. Int. 2014, 30, 38–49, doi:10.1093/heapro/dau088.
41. Verweij, L.M.; Proper, K.I.; Weel, A.N.H.; Hulshof, C.T.J.; Van Mechelen, W. The application of an occupational health guideline reduces sedentary behaviourr and increases fruit intake at work: Results from an RCT. Occup. Environ. Med. 2012, 69, 500–507, doi:10.1136/oemed-2011-100377.
42. Verweij, L.M.; Proper, K.I.; Weel, A.N.H.; Hulshof, C.T.J.; Van Mechelen, W. Long-term effects of an occupational health guideline on employees' body weight-related outcomes, cardiovascular disease risk factors, and quality of life: Results from a randomized controlled trial. Scand. J. Work. Environ. Health 2013, 39, 284–294, doi:10.5271/sjweh.3341.
43. Verweij, L.M.; Proper, K.I.; Hulshof, C.T.; Van Mechelen, W. Process Evaluation of an Occupational Health Guideline Aimed at Preventing Weight Gain Among Employees. J. Occup. Environ. Med. 2011, 53, 722–729, doi:10.1097/jom.0b013e318222af9b.
44. Verweij, L.M.; Proper, K.I.; Leffelaar, E.R.; Weel, A.N.; Nauta, A.P.; Hulshof, C.T.; Van Mechelen, W. Barriers and Facilitators to Implementation of an Occupational Health

Guideline Aimed at Preventing Weight Gain Among Employees in the Nether-lands. J. Occup. Environ. Med. 2012, 54, 954–960, doi:10.1097/jom.0b013e3182511c9f.

45. Viester, L.; Verhagen, E.; Bongers, P.M.; Van Der Beek, A.J. The effect of a health promotion intervention for construction workers on work-related outcomes: Results from a randomized controlled trial. Int. Arch. Occup. Environ. Health 2015, 88, 789–798, doi:10.1007/s00420-014-1007-9.
46. Viester, L.; Verhagen, E.A.L.M.; Bongers, P.M.; Van Der Beek, A.J. Process Evaluation of a Multifaceted Health Program Aiming to Improve Physical Activity Levels and Dietary Patterns Among Construction Workers. J. Occup. Environ. Med. 2014, 56, 1210–1217, doi:10.1097/jom.0000000000000250.
47. Strijk, J.E.; Proper, K.I.; van der Beek, A.J.; van Mechelen, W. A worksite vitality intervention to improve older workers' lifestyle and vitality-related outcomes: Results of a randomised controlled trial. J. Epidemiol. Community Health 2012, 66, 1071–1078.
48. Strijk, J.E.; Proper, K.I.; van Mechelen, W.; van der Beek Allard, J. Effectiveness of a worksite lifestyle intervention on vitality, work engagement, productivity, and sick leave: Results of a randomized controlled trial. Scand. J. Work Environ. Health 2013, 39, 66–75.
49. Strijk, J.E.; Proper, K.I.; van der Beek Allard, J.; van Mechelen, W. A process evaluation of a worksite vitality intervention among ageing hospital workers. Int. J. Behav. Nutr. Phys. Act. 2011, 8, 58.
50. Parker, D.L.; Brosseau, L.M.; Samant, Y.; Xi, M.; Pan, W.; Haugan, D. The Study Advisory Board A Randomized, Controlled Intervention of Machine Guarding and Related Safety Programs in Small Metal-Fabrication Businesses. Public Health Rep. 2009, 124, 90–100, doi:10.1177/00333549091244s111.
51. Riphagen-Dalhuisen, J.; Burgerhof, J.G.; Frijstein, G.; Van Der Geest-Blankert, A.D.; Danhof-Pont, M.B.; De Jager, H.J.; A Bos, A.; Smeets, E.E.; De Vries, M.J.; Gallee, P.M.; et al. Hospital-based cluster randomised controlled trial to assess effects of a mul-ti-faceted programme on influenza vaccine coverage among hospital healthcare workers and nosocomial influenza in the Netherlands, 2009 to 2011. Eurosurveillance 2013, 18, 20512, doi:10.2807/1560-7917.es2013.18.26.20512.
52. Kwak, L.; Kremers, S.P.J.; Visscher, T.L.S.; Van Baak, M.A.; Brug, J. Behavioural and Cognitive Effects of a Worksite-Based Weight Gain Prevention Program: The NHF-NRG In Balance-Project. J. Occup. Environ. Med. 2009, 51, 1437–1446, doi:10.1097/jom.0b013e3181bd895a.
53. Kwak, L.; Kremers, S.P.; Candel, M.J.J.M.; Visscher, T.L.; Brug, J.; Van Baak, M.A. Changes in skinfold thickness and waist circumference after 12 and 24 months resulting from the NHF-NRG In Balance-project. Int. J. Behav. Nutr. Phys. Act. 2010, 7, 26, doi:10.1186/1479-5868-7-26.
54. Looijmans-Van Den Akker, I.; Van Delden, J.; Verheij, T.J.; van der Sande, M.; Van Essen, G.; Riphagen-Dalhuisen, J.; Hulscher, M.E. Effects of a multi-faceted program to increase

influenza vaccine uptake among health care workers in nursing homes: A cluster randomised controlled trial. Vaccine 2010, 28, 5086–5092.
55. Goldenhar, L.M.; Lamontagne, A.D.; Katz, T.; Heaney, C.; Landsbergis, P. The Intervention Research Process in Occupational Safety and Health: An Overview From the National Occupational Research Agenda Intervention Effectiveness Research Team. J. Occup. Environ. Med. 2001, 43, 616–622, doi:10.1097/00043764-200107000-00008.
56. Nielsen, K.; Randall, R.; Holten, A.-L.; González, E.R. Conducting organisational-level occupational health interventions: What works? Work. Stress 2010, 24, 234–259, doi:10.1080/02678373.2010.515393.
57. Baranowski, T.; Cerin, E.; Cullen, K.W. Steps in the design, development and formative evaluation of obesity preven-tion-related behaviour change trials. Int. J. Behav. Nutr. Phys. Act. 2009, 6, 6, doi:10.1186/1479-5868-6-6.
58. MacKinnon, D.P.; Lockwood, C.M.; Hoffman, J.M.; West, S.G.; Sheets, V. A comparison of methods to test mediation and other intervening variable effects. Psychol. Methods 2002, 7, 83.
59. Durlak, J.A.; Dupre, E.P. Implementation Matters: A Review of Research on the Influence of Implementation on Program Outcomes and the Factors Affecting Implementation. Am. J. Community Psychol. 2008, 41, 327–350, doi:10.1007/s10464-008-9165-0.
60. Havermans, B.M.; Schelvis, R.M.; Boot, C.R.; Brouwers, E.P.; Anema, J.R.; van der Beek Allard, J. Process variables in organ-izational stress management intervention evaluation research: A systematic review. Scand. J. Work Environ. Health 2016, 42, 371–381.

Appendix

Supplementary table 1: IM fidelity, process implementation and intervention effect checklist

IM characteristics, process indicators & intervention effects	Operationalisation	Rating			
		-	+/-	+	++
IM characteristics	**IM steps**				
	Step 1: Logic model of the problem				
Participation	1a. Formation of planning group	No formation of a planning group/working group/project group was mentioned		Formation of planning group/working group/project group was mentioned	
Theory -based	1b.Conduct a needs assessment to create a logic model of the problem	No needs assessment performed	Needs assessment performed, determinants identified, but no causal pathways mentioned	Needs assessment performed, determinants identified and causal pathways mentioned	
	Step 2: Program Outcomes and Objectives; Logic Model of Change				
Theory -based	2a.Construct matrices of change objectives	No matrices of change objectives presented		Matrices of change objectives presented	
Participation	2b.Participative approach (step 1 and/or step 2)	No participation during Step 1 and/or 2	Participation in Step 1 and/or 2 of target group OR other stakeholders	Participation in Step 1 and/or 2 of target group AND other stakeholders	
Ecological approach	2c. Differentiation between behavioural and environmental factors	No behavioural or environmental factors mentioned	Only behavioural factors mentioned, no environmental factors mentioned	Behavioural and environmental factors mentioned	
	Step 3: Program design				
Theory -based	3a.Choose theory- and	No theory/evidence	Theory and evidence based	Theory/evidence based change	

IM characteristics, process indicators & intervention effects	Operationalisation	Rating			
		-	+/-	+	++
	evidence based change methods	based change methods mentioned	methods mentioned, BUT no behavioural change theory used	methods mentioned AND behavioural change theory used	
	Step 4: Program Production				
Participation	4a.Participative approach (step 3 and/or step 4)	No participation/ no participation mentioned	Participation of stakeholders other than target group	Participation of target group	
Ecological approach	4b. Worker and workplace component of intervention	Intervention consists of no workplace and no worker component	Intervention consists of workplace OR worker component	Intervention consists of workplace AND worker component	
	Step 5: Program Implementation Plan				
Implementation planning	5a.Identify potential program users: adopters/target group, implementers and maintainers	Potential program users not explicitly mentioned	Adopters/target group implicitly or explicitly mentioned, implementers OR maintainers explicitly mentioned	Adopters/target group implicitly or explicitly mentioned, implementers AND maintainers explicitly mentioned	
Implementation planning	5b.State outcomes and performance objectives for program use	No target behaviour for program use mentioned and not clear if target behaviour for program use was determined	Target behaviour of adopters or implementors not explicitly mentioned, but likely that target behaviour was determined	Target behaviour of adopters or implementors explicitly mentioned	
Implementation planning	5c.Identify drivers and barriers for implementation	No drivers/barriers for implementation mentioned, and not clear if they have been determined	No drivers/barriers for implementation mentioned, but likely that they have been determined	Drivers/barriers for implementation mentioned	
Implementation planning	5d.Design implementation interventions	No implementation interventions mentioned, and not clear if they have been determined	No implementation interventions mentioned, but likely that they have been determined	Implementation interventions mentioned	

IM character-istics, process indicators & intervention effects	Operatio-nalisation	Rating			
		-	+/-	+	++
Participation	5e.Participative approach (step 5)	No participation/ no participation mentioned	Participation of target group or other stakeholders (excluding implementors)	Participation of implementors	
Process indicators					
Reach (%)	The proportion of the eligible workers that participates in an intervention (% response to baseline questionnaire or % of signed informed consents)	<50%	50-59%	60-69%	70% or higher
Dose delivered (mean[a])	The proportion of intended intervention component delivered or provided.	<60%	60-69% (or major differences between intervention components: from – to ++)	70-79%	80% or higher
Dose received (mean[a])	The proportion of participants participating in/using intervention components.	<50%	50-59% (or major differences between intervention components: from – to ++)	60-69%	70% or higher
Satisfaction (scale 1-10 (%)	The extent to which the target group of the intervention is satisfied with the intervention	<5 (<50%)	5.0-5.9 (50-59%) (or major differences between intervention components: from – to ++)	6 – 7.9 (60-79%)	8 or higher (80% or higher)
Fidelity (yes/no)	The extent to which the intervention was delivered as planned (according to protocol).		adjustments are made to original protocol	no adjustments are made to original protocol	
Intervention effect					
Intervention effects		primary and secondary	primary and/or secondary	primary outcomes overall	All primary

IM characteristics, process indicators & intervention effects	Operationalisation	Rating			
		-	+/-	+	++
		outcomes not effective	outcomes partially effective (but primary outcomes not effective)	effective, secondary outcomes not or partially effective	and secondary outcomes effective

a If dose delivered or dose received was calculated for more than one intervention component, the authors computed a mean of these components.

Supplementary table 2: Included studies and characteristics of the interventions

Studies	Intended outcome	Target group	Sector	Intervention
1	Work ability (ORP)	Construction workers	Construction sector	Programme objective 1 (restore balance between physical load and need for recovery): protocol for two individual training sessions by a physical therapist (including assessment by therapist, 3 personal advices on pocket size card) and a Rest-Break tool. Programme objective 2 (increase range of influence at the worksite): 2 empowerment training sessions
2	Need for recovery Physical activity Relaxation (ORP and HP)	Office employees	Financial service sector	1. Group Motivational interviewing (GMI) is delivered by teamleaders of the departments allocated to the intervention. They conduct 3 GMI-sessions with employees in their teams, and a booster session. The aim of the session is to stimulate physical activity and relaxation. Teamleaders have 2 GMI-coachingsessies, supervised by a GMI professional to share experiences. The GMI-sessions are supported by a web-based social media platform. 2. Environmental modifications: changing coffee corners (add bar with bar chairs), open office environment (exercise balls, curtains to reduce background noise), meeting rooms (standing table and poster) and entrance hall (table tennis, lounge chairs), by creating Active and Relax zones. In addition, footsteps are placed to promote stair walking.
3	Work engagement Mental health Lifestyle behaviour (ORP and HP)	High educated workers	Research institutes	Mindfulness training (participatory focus group meetings were held to develop mindfulness training program). 8 sessions of 90 minutes by certified trainers. Cognitive components (enjoying here and now, count blessings etc.), behavioural components (home exercise-complementing colleagues), motivational components (goal setting, increasing resilience). Exercise behaviour, rest behaviour (EBRB) targeted components: exercises in mindfulness training aimed at determinants of EBRB (walking meditation, mindful eating), E-coaching to continue implementation of mindfulness principles learnt in training. Make Personal Energy Plan (PEP), supporting elements (providing fruit, providing routes for lunch walking and stimulation to find buddy for several activities.
4	Quartz exposure (ORP)	Dutch construction workers and managers	Construction sector	Intervention is called: 'Working Relieved' Baseline: Mailing to workers (invitation, information and feedback). Month 1: Toolbox 1, plenary sessions (video, introduction technical devices and interactive presentation, factsheets, posters). Month 3: Toolbox workers: group sessions at worksite, video, identifying barriers and solutions and tailored advice, assignment. Toolbox employers shared program for the four employers to demonstrate and practice technical control measures. Month 5: personal postcard. Month 6: Toolbox (employer & workers), plenary sessions, providing feedback, discussing assignment and presentation.
5	Physical activity (HP)	Employees in sedentary occupation	Variety of sectors	Key components of AME for ACTIVITY intervention: launch week, interactive leaflets, posters, knowledge quiz, setting personal targets, making plans, self-monitoring, team challenges, management support, newsletters and reminders.
6	Weight gain (HP)	Occupational physicians (to	Variety of sectors	The Balance@Work intervention consisted of an occupational health guideline, consisting of three sections a) prevention at the environmental level (advice for employers based on environment scan)

Stu-dies	Intended outcome	Target group	Sector	Intervention
		facilitate health promotion activities for employees)		b) prevention at the individual level (advice for employees; Ops were trained in an adapted form of motivational interviewing and provided 5 counselling sessions to promote employees' healthy lifestyle; Employees were provided with tools to monitor their behaviour), and c) evaluation and maintenance.
7	Physical activity & dietary patterns (HP)	Blue collar workers (i.e. constructio n site and production workers)	Construc-tion sector	The VIP in construction intervention programme consists of tailored information, face-to-face and telephone counselling, exercises and materials designed for the intervention (circumference measuring tape, pedometer, BMI-card, calorie guide, cookbook, knowledge tests, Personal Energy Plan forms) and an overview of the company health promoting facilities.
8	Lifestyle & vitality (HP)	Older workers (45+) of an academic hospital	Health care sector	The Vital@Work intervention insisting of two parts. 1. The Vitality Exercise Programme (VEP): yoga group sessions, workout groups sessions (once a week) and aerobic exercises Free fruit was provided at the guided group sessions of the VEP. 2. Three visits to a Personal Vitality Coach (PVC).
9	Safety (ORP)	Owners and employers of small metal fabrication businesses	Metal industry	Presentation and discussion of report on machine and shop safety audits and employee surveys; presentation and demonstration of compact disc with checklists, tailored programs for lock-out, hazard recognition; list of resources; information about Minnesota OSHA grant process; Placards for 23 machines; guidelines for a model safety committee; training materials; Further assistance if requested by owner; Building skills and knowledge of a health and safety committee.
10	Influenz a vaccinati on (ORP)	Health care workers of University Medical Centers	Universit y Medical Centers	A transparent influenza vaccination intervention implementation strategy, consisting of educational tools, influenza vaccination campaign (website, badges folders, video, posters, information meeting)
11	Weight gain preventi on (HP)	Workers	Different sectors	Individual component: feedback on body composition measures, ''in balance-box with self-monitoring devices, website with general information, two CD-ROMs (awareness of weight status and assisting participants with changing WGPBs. Environmental components: handbook serving as guide for the worksite linkage board to assist them through different stages of environmental interventions (e.g. change food assortment, workshops, info wall, prompts for stair use promotion etc.)
12	Influenz a vaccinati on (ORP)	Health care workers	Nursing homes	Three program components: 1. Visit to all nursing homes 2. Plenary information meetings, and 3. Appointment of a program coordinator in each home

Studies: 1: Oude Hengel, 2011a ; 2012; 2013; 2011b [22, 28–30]; 2: Coffeng, 2012; 2014a; 2014b; 2013 [21, 31–33]; 3: Van Berkel, 2011; 2014a; 2014b; 2013 [20, 34–36]; 4: Oude Hengel, 2014; Van Deurssen, 2014b; 2014a [27,37,38]; 5: Mc Eachan, 2008; 2011, Lawton, 2014 [19,39,40]; 6: Verweij, 2009;2012; 2013; 2011; 2012 [23,41–44]; 7: Viester, 2012; 2015; 2014 [18,45,46]; 8: Strijk, 2009; 2012, 2013; 2011 [17, 47–49]; 9: Brosseau, 2007; Parker, 2009 [26,50]; 10: Riphagen 2013a; 2013b [25,51]; 11: Kwak, 2007; 2009; 2010 [16,52,53]; 12: Looijmans, 2011; 2010 [24,54]

Supplementary table 3a: Data extraction IM fidelity studies 1-6

Studies:	1	2	3	4	5	6
1a. Formation of planning group (participation)	Planning group is not explicitly mentioned Rating:-	Planning group is not explicitly mentioned Rating:-	Planning group is not explicitly mentioned Rating:-	Planning group is not explicitly mentioned Rating:-	Planning group is not explicitly mentioned Rating:-	An expert group was formed consisting of target group and lifestyle experts. Rating: +
1b.Conduct a needs assessment to create a logic model of the problem (theory based approach)	Needs assessment performed, determinants identified and causal pathways mentioned Rating: +	Needs assessment performed, determinants identified and causal pathways mentioned Rating: +	Needs assessment performed, determinants identified and causal pathways mentioned Rating: +	Needs assessment performed, determinants identified and causal pathways mentioned Rating: +	Needs assessment performed, determinants identified and causal pathways mentioned Rating: +	Needs assessment performed, determinants identified and causal pathways mentioned Rating: +
2a.Construct matrices of change objectives (theory based approach)	Matrices of change objective were made Rating: +	Matrices of change objective were not made Rating:-	Matrices of change objective were not made Rating:-	Matrices of change objective were not made Rating:-	Matrices of change objective were made Rating: +	Matrices of change objective were made Rating: +
2b.Participative approach (step 1 and/or step 2) (participation)	Round table discussions (target group) & interviews HRM (stakeholders) Rating: +	Questionnaires and focus group interviews (target group), interviews (stakeholders). Rating: +	Interviews (stakeholders_, questionnaire and focus groups (target group) Rating: +	Survey (target group) Focus groups and interviews (stakeholders) Rating: +	Focus groups (target group) Rating: +/-	Interviews (target group, stakeholders) Rating: +
2c. Differentiation between behavioural and environmental factors (ecological approach)	Personal and environmental determinant are mentioned Rating: +	Personal and environmental determinant are mentioned Rating: +	Personal and environmental determinant are mentioned Rating: +	Behavioural and organisational determinant are mentioned Rating: +	Behavioural determinants are mentioned Rating: +/-	Personal and environmental determinant are mentioned Rating: +
3a.Choose theory- and evidence based change methods (theory based approach)	Table with theory based methods Rating: +	Table with theory based methods Rating: +	Table with theory based methods Rating: +	Table with theory based methods Rating: +	Table with theory based methods Literature review to determine most	Table with theory based methods Rating: +

Studies:	1	2	3	4	5	6
					effective strategies Rating: +	
4a.Participative approach (step 3 and/or step 4) (participation)	Not mentioned in this stage Rating:-	Strategies based on focus group (target group) advice of project group, and feedback from experts in the field (other stakeholders) Rating: +	Focus groups (target group) to develop mindfulness program Rating: +	First version was subjected to commentary by researchers, managers and sector organisations (stakeholders) Rating: + /-	Focus group (target group), expert steering group, contacts within participating organisations(stakeholders) Rating: +	Interview data (target group) Experts in the field of lifestyle commented on first draft Rating: +
4b. Worker and workplace component of intervention (ecological approach)	Components target personal and environmental determinant Rating: +	Components target individual behaviour and physical environment Rating: +	Components target individual behaviour and physical environment Rating: +	Intervention components are aimed at workers and managers, materials are made available. Rating: +	Intervention components are aimed at awareness, motivation and environment. Rating: +	Intervention components are aimed at individual behaviour and environment Rating: +
5a.Identify potential program users: adopters/target group, implementers and maintainers (implementation planning)	Adopters/ target group and implementers are mentioned Rating: +/-	Adopters/ target group and implementers are mentioned Rating: +/-	Adopters/ target group and implementers are mentioned Rating: +/-	Adopters/ target group and implementers are mentioned Rating: +/-	Adopters/ target group and implementers are mentioned Rating: +/-	Adopters/ target group and implementers are mentioned Rating: +/-
5b.State outcomes and performance objectives for program use (implementation planning)	Not mentioned Rating:-	Not mentioned Rating:-	Not mentioned Rating:-	Not mentioned Rating:-	Target behaviour of adopters or implementors not explicitly mentioned, but steps taken to determine them Rating: +/-	Not mentioned Rating:-
5c.Identify drivers and barriers for implementa	Several barriers for the intervention	Strengths and limitations are not	Possibilities for success and potential	Drivers and barriers for adoption	Drivers and barriers for adoption	Barriers for adoption were mentioned

Studies:	1	2	3	4	5	6
tion (implement ation planning)	are mentioned Rating: +	literally mentioned in the paper, but discussion about strengths and limitations had taken place and resulted in adaptations. Rating: +/-	challenges for implementat ion were discussed Rating: +	were mentioned Rating: +	were mentioned Rating: +	Rating: +
5d.Design implementa tion intervention s (implement ation planning)	Measures were taken to optimise adoption/ implementat ion Rating: +	Measures were taken to optimise adoption/ implementat ion Rating: +	Measures were taken to optimise adoption/ implementat ion Rating: +	Measures were taken to optimise adoption/ implementat ion Rating: +	Measures were taken to optimise adoption/ implementat ion Rating: +	No concrete measures are described except a passage in the OP guideline to emphasize confidentialit y and resolve resistance from employees Rating: +/-
5e.Participa tive approach (step 5) (participatio n)	Implementat ion plan was written together with implementer s (implemente rs) Rating: +	Test with intended users (target group and implementer s) Rating: +	Focus group meetings to design implementat ion plan (implemente rs) Rating: +	Meeting with managers to discuss barriers and solutions (implemente rs) Rating: +	Focus groups to discuss barriers and solutions (target group and implementer s) Rating: +	Not mentioned Rating:-

Studies: 1: Oude Hengel, 2011a ; 2012; 2013; 2011b [22, 28–30]; 2: Coffeng, 2012; 2014a; 2014b; 2013 [21, 31–33]; 3: Van Berkel, 2011; 2014a; 2014b; 2013 [20, 34–36]; 4: Oude Hengel, 2014; Van Deurssen, 2014b; 2014a [27,37,38]; 5: Mc Eachan, 2008; 2011, Lawton, 2014 [19,39,40]; 6: Verweij, 2009;2012; 2013; 2011; 2012 [23,41–44]

Supplementary table 3b: Data extraction IM fidelity studies 7-12

Studies:	7	8	9	10	11	12
1a. Formation of planning group (participation)	Planning group is not explicitly mentioned Rating:-	Planning group is not explicitly mentioned Rating:-	Advisory board which consisted target group and other stakeholders Rating: +	Planning group is not explicitly mentioned Rating:-	Planning group is not explicitly mentioned Rating:-	Planning group is not explicitly mentioned Rating:-
1b.Conduct a needs assessment to create a logic model of the problem (theory based approach)	Needs assessment performed, determinants identified and causal pathways mentioned Rating: +	Needs assessment performed, causal relations are not mentioned literally Rating: +/-	Needs assessment performed, determinants identified and causal pathways mentioned Rating: +	Needs assessment performed, determinants identified and causal pathways mentioned Rating: +	Needs assessment performed, determinants identified and causal pathways mentioned Rating: +	Needs assessment performed, determinants identified and causal pathways mentioned Rating: +
2a.Construct matrices of change objectives (theory based approach)	Matrices of change objective were made Rating: +	Matrices of change objective were not made Rating:-	Matrices of change objective were made Rating: +	Matrices of change objective were not made Rating:-	Matrices of change objective were not made Rating:-	Matrices of change objective were not made Rating:-
2b.Participative approach (step 1 and/or step 2) (participation)	Focus group interviews (target group, stakeholders) Rating: +	Focus group interviews (target group) Rating: +/-	Consultation of advisory board (representation of target group and other stakeholders) Rating: +	Discussion research team and other stakeholders. Not clear if target group was involved directly. Rating: +/-	Focus groups (not clear with whom) Rating: +/-	Interviews and focus group sessions (target group and stakeholders) Rating: +
2c. Differentiation between behavioural and environmental factors (ecological approach)	Personal and environmental determinant are mentioned Rating: +	In this stage environmental determinants/ factors not mentioned. In step 3, methods involved environmental changes. Rating: +/-	Personal and environmental determinant are mentioned Rating: +	Personal and environmental determinant are mentioned Rating: +	Personal and environmental determinant are mentioned Rating: +	Behavioural organisational and demographical determinants are mentioned Rating: +
3a.Choose theory- and evidence based change methods	Table with theory based methods Rating: +	Table with theory based methods Rating: +	Theory based methods are mentioned in the text Rating: +	Theory based methods are mentioned in the text Rating: +	Table with theory based methods Rating: +	Table with theory based methods Rating: +

Studies:	7	8	9	10	11	12
(theory based approach)						
4a.Participative approach (step 3 and/or step 4) (participation)	Feedback from key contacts within the organisation (stakeholders) and focus group data (target group) Rating: +	Not mentioned in this stage Rating:-	Input from advisory board (stakeholders). Pilot test with target group Rating: +	Collaboration with UMC (stakeholders) Rating: +/-	Brainstorm session with experts. Rating: +/-	Collaboration with UMC, pretested by target group Rating: +
4b. Worker and workplace component of intervention (ecological approach)	Intervention components are aimed at personal and external determinant Rating: +	Intervention components are aimed behavioural determinants, and require some environmental changes Rating: +	Intervention program was targeted at employees and business owners. Rating: +	Intervention components are aimed at personal and external determinants Rating: +	The intervention was arranged into two components, an individual component and a worksite component Rating: +	Methods and strategies were aimed at management and HCW level Rating: +
5a.Identify potential program users: adopters/target group, implementers and maintainers (implementation planning)	Adopters/ target group and implementers are mentioned Rating: +/-	Adopters/ target group and implementers are mentioned Rating: +/-	Adopters/ target group and implementers are mentioned Rating: +/-	Adopters/ target group and implementers are mentioned Rating: +/-	Adopters/ target group, implementers and maintainers are mentioned Rating: +	Adopters/ target group and implementers are mentioned Rating: +/-
5b.State outcomes and performance objectives for program use (implementation planning)	Target behaviour of adopters or implementors explicitly mentioned Rating: +	Not mentioned Rating:-	Not mentioned Rating:-	Not mentioned Rating:-	Not mentioned Rating:-	Not mentioned Rating:-
5c.Identify drivers and barriers for implementation (implementa	Managers and users were interviewed to gain insight into	Drivers and barriers for adoption were mentioned Rating: +	not mentioned Rating:-	Not mentioned Rating:-	not mentioned Rating:-	Not mentioned literally, but stakeholders were approached

Studies:	7	8	9	10	11	12
tion planning)	facilitating factors and barriers Rating: +					to give feedback on and to support the program. Feedback was used to finetune program elements Rating: +/-
5d.Design implementation interventions (implementation planning)	Measures were taken to optimise adoption/ implementation Rating: +	Measures were taken to optimise adoption/ implementation Rating: +	Measures were taken to optimise adoption/ implementation Rating: +	Measures were taken to optimise adoption/ implementation Rating: +	Measures were taken to optimise adoption/ implementation Rating: +	Measures were taken to optimise adoption/ implementation Rating: +
5e.Participative approach (step 5) (participation)	Interviews with potential users (target group) HRM involved in program development (implementers) Rating: +	Not mentioned Rating:-	Not mentioned Rating:-	UMC contacts and communication staff were visited (implementers) Rating: +	Linkage board with research team, potential users and implementers Rating: +	Stakeholders were approached to provide feedback and support the program (stakeholders and implementers) Rating: +

Studies: 7: Viester, 2012; 2015; 2014 [18,45,46]; 8: Strijk, 2009; 2012, 2013; 2011 [17, 47–49]; 9: Brosseau, 2007; Parker, 2009 [26,50]; 10: Riphagen 2013a; 2013b [25,51]; 11: Kwak, 2007; 2009; 2010 [16,52,53]; 12: Looijmans, 2011; 2010 [24,54]

Supplementary table 4a: Data extraction process evaluation studies 1-6

Studies:	1	2	3	4	5	6
Process evaluation framework	Linnan & Steckler	Linnan & Steckler	Linnan & Steckler & RE-AIM	Linnan & Steckler	No framework, but following similar approach as Dane and Schneider, 1998	Linnan & Steckler
Methods	Questionnaires, logs and checklists, interviews	Registration, program records, observations, question-naire	data from questionnaires, and semi-structured interviews with participants (high and low compliers were selected to maximize variety of views) (Glasgow et al)	Logs, company records, checklists, attendance registration forms, questionnaire	Different data sources (minutes, logs, observations, follow-up surveys, archives, study records)	Questionnaires (two levels: Ops and employees)
Reach	85% response baseline questionnaire (293/347) (293 workers, of which 171 in intervention group) Rating:++	35% response rate (412/1182) Rating: -	14% response rate (257/1820) Rating: -	29% response rate (116/404) Rating: -	99% response baseline questionnaire Rating:++	N.M.
Dose delivered	90-100% Rating:++	88%-92% 'acceptable' Rating: ++	N.M.	sessions: >95% worksite visits: 20% relatively low Rating: +/-	Adherence: Local council: 81% (7,3/9) Hospital: 84% (7,6/9) Bus company: 28% (2,5/9) Government organisation: 84% (7,6/9) University: 56% (5/9) Rating :+/-	86% of counseling sessions Rating: ++
Dose received (Participati	63%-79% ('*satis-factory*')	45-67% Rating: +/-	At least once: 30%-81%	28%-54% ('*lower than expected*')	Received according to questionnair	20%-72%

Studies:	1	2	3	4	5	6
on intervention component -(range)	Session therapist 1: 74% Empowerment training 1: 79% Session therapist 1: 63% Empowerment training 1: 73% Rating:++		High compliant (75% of intended use): 6%-54% (*'compliance to training was high, but to e-coaching low'*) Rating: +/-	Session 1: 28% Worksite visit: 20% Session 2: 54% At least one: 58% All: 11% Rating: -	es by workers Exposure to intervention components: Local council: 78% (7,1/9) Hospital: 76% (6,9/9) Bus company: 29% (2,6/9) Government organisation: 78% (7/9) University: 27% (3/9) Rating: +/-	72% counselling session 60% read flyer 42% used measure tape 34% used pedo meter 20% used diary Rating: +/-
Fidelity	Modifications had to be made, rest-break tool not implemented as intended Rating: +/-	Improvements had to be made regarding the physical environment to improve implementation Rating: +/-	Differences between trainers in how they dealt with buddy system/home work. Rooms were not well equipped. Rating: +/-	Compared to previous studies fidelity was high, only 2nd session was not implemented as intended since the assignment was not completed by construction workers. All other parts were implemented according to protocol Rating: +	N.M.	Guideline was partly implemented by OPS as intended. Guideline adherence was assessed as moderate Rating: +/-
Satisfaction	64% recommends implementation. 'Content was rated moderate.' Rating: +	Social environment intervention: 6.0 Physical environment intervention: 7.0 Rating: +	Overall intervention: 7.0 Training: 7.9 E-coaching: 6.8 Fruit: 7.9 Rating: +	Overall intervention: 7.5 (workers) 6.5 (managers) Rating: +	N.M.	Workers rated Balance@Work intervention: 7.1 Rating: +

Studies: 1: Oude Hengel, 2011a ; 2012; 2013; 2011b [22, 28–30]; 2: Coffeng, 2012; 2014a; 2014b; 2013 [21, 31–33]; 3: Van Berkel, 2011; 2014a; 2014b; 2013 [20, 34–36]; 4: Oude Hengel, 2014; Van Deurssen, 2014b; 2014a [27,37,38]; 5: Mc Eachan, 2008; 2011, Lawton, 2014 [19,39,40]; 6: Verweij, 2009;2012; 2013; 2011; 2012 [23,41–44]; **Note:** Implementation process rating: ++ (excellent), + (satisfactory) or +/- (moderate) or – (unsatisfactory). N.M.=not measured

Supplementary table 4b: Data extraction process evaluation studies 7-12

Studies:	7	8	9	10	11	12
Process evaluation framework	RE-AIM	Linnan & Steckler	No framework	No framework	Rogers' diffusion theory	Compliance
Methods	web based registration system, follow-up questionnaire, interviews	Attendance registration forms, follow up questionnaire	Process evaluation survey	Qualitative (checklist, annual communication reports) and quantitative (web based questionnaire) process evaluation	two post-test questionnaires, observations and registrations of activities	Registration of visits to nursing homes, questionnaire
Reach	1021 workers invited, 314 included in the study (31%) Rating: -	3756 invited, 730 workers were included as they completed baseline (19%) Rating: -	N.M.	N.M.	Response to baseline questionnaire: 88% (487/553) Rating: ++	N.M.
Dose delivered	coaching appointment: 98% materials: 99% ('satis-factory') Rating: ++	Yoga session: 72% Work out session: 96% PVC visits: 100% ('as planned') Rating: ++	N.M.	N.M.	N.M.	All intervention homes were visited and received the materials, all homes organised information meetings Rating: ++
Dose received **(Participation intervention component - range)**	15%-61% All coaching sessions: 61% Using forms: 26% Pedometer: 52% Measuring tape: 43% BMI card: 30% Calorie card/ cookbook: 15% Exercise card: 62% 84% (at least one	52% attendance rate yoga sessions 45% attendance rate work out sessions 58% attendance rate PVC visits Rating: +/-	N.M.	2009/2020: attendance rate to information session: 24% 2010/2011 attendance rate to information session: 9% Rating: -	5%-87% Read personal feedback: 87% Website visit: 75% Carry out advise (energy balance): 21% Carry out advice (physical activity): 29% Take stairs: 50%	attendance rate to information session: 7% At nursing home level we found a variation in compliance with the intervention Rating: -

Studies:	7	8	9	10	11	12
	coaching sessions) Rating: +/-				Take bike: 5% Rating: +/-	
Fidelity	Adjustments to the program should be made to improve fidelity; 'fidelity was moderate' Rating: +/-	'The intervention protocol with respect to the time schedule of the yoga and work out sessions were partly followed by the providers' Rating: +/-	N.M.	N.M.	Only two out of six workplaces formed a linkage group Rating: +/-	N.M.
Satisfaction	Intervention: 7.6 Rating: +	Yoga: 7.5 Work out: 7.7 PVC visits: 6.9 Rating: +	Program helped improve knowledge: 94% Program improved safety practice: 76% Rating: ++	2009/2010: Rated as appealing (1-10): Badge: 3.2 Poster:9.6 Folder:9.2 Video: 2.8 Rating: +/-	Intervention components were rated interesting by: 58%-65% and comprehensive by: 79%-89% Rating: +	N.M.

Studies: 7: Viester, 2012; 2015; 2014 [18,45,46]; 8: Strijk, 2009; 2012, 2013; 2011 [17, 47–49]; 9: Brosseau, 2007; Parker, 2009 [26,50]; 10: Riphagen 2013a; 2013b [25,51]; 11: Kwak, 2007; 2009; 2010 [16,52,53]; 12: Looijmans, 2011; 2010 [24,54]; **Note:** Implementation process rating: ++ (excellent), + (satisfactory) or +/- (moderate) or – (unsatisfactory). N.M.=not measured

Supplementary table 5: Summary of assessment intervention effect

Studies	Study design	Sample size	Primary outcomes	Secondary outcomes	Rating
1	RCT	n=297	Work ability: - Physical and mental health status: - Musculoskeletal symptoms: - Long term sickness absence: -	work engagement: - social support: - Physical workload: - need for recovery: -	-
2	2X2 factorial study design	n=412	Presenteeism: - Absenteeism,: - Contextual performance: + (opposite direction ; combined intervention) Dedication: + (opposite direction; combined intervention) Task performance: + (social environmental intervention) Absorption: + (physical environmental intervention)	need for recovery: - exhaustion: + (combined intervention) vigorous physical activities: + (combined intervention) small breaks: + (combined intervention) active commuting: + (combined intervention/ physical environmental intervention) exhaustion: + (social environmental intervention) sedentary behaviour: + (social environmental intervention/ physical environmental intervention)) small breaks: + (social environmental intervention) leisure activities: + (social environmental intervention) stair climbing: + (physical environmental intervention)	+/-
3	RCT	n=257	work engagement: - mental health: - need for recovery: - mindfulness: -	vigorous physical activity in leisure time: - sedentary behaviour: - fruit and vegetable intake: - behavioural determinants: -	-
4	RCT	n=282	quartz exposure: +	Use of technical control measures: +/- (only effect for subgroup)	+
5	RCT	n=1260	systolic blood pressure: + resting heart rate: + body mass index: + (opposite direction)	minutes of activity: - *Subgroup analyses: association between intervention participation and weight gain prevention*	+
6	RCT	n=523	body weight: - body weight related outcomes: - CVD-risk factors: - Quality of life: -	sedentary behaviour at work: + fruit intake: + physical activity: - sedentary behaviour in leisure time: - snack intake: -	+/-
7	RCT	n=314	musculoskeletal symptoms: - physical functioning: - work ability: - work-related vitality: -		-

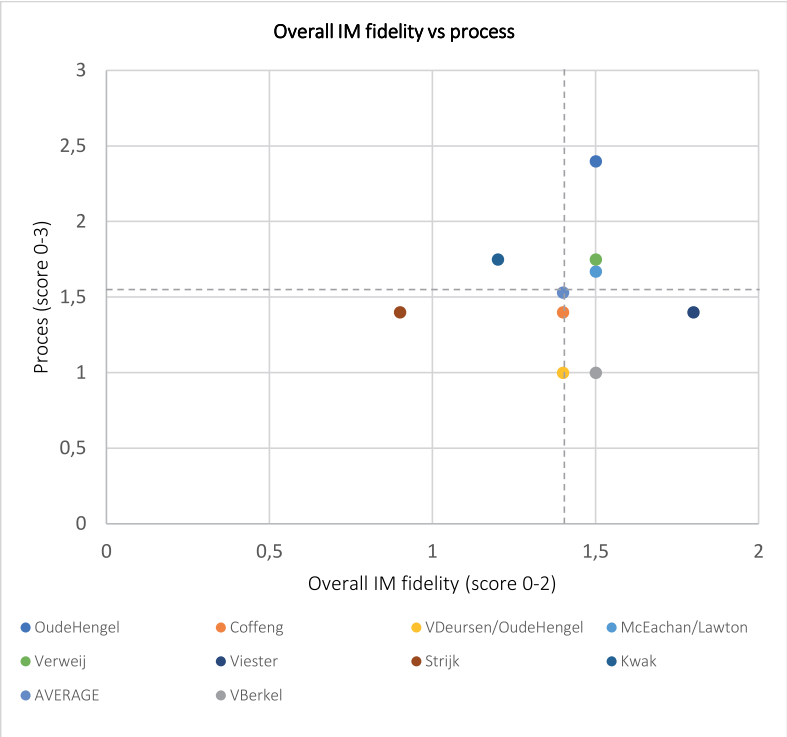
Studies	Study design	Sample size	Primary outcomes	Secondary outcomes	Rating
			work performance: - sickness absence: -		
8	RCT	n=730	vitality: - work engagement: - work performance: - sick leave: -	sport activities: + fruit intake: + Need for recovery: + Vigorous intensity physical activities: - aerobic capacity: - mental health: - *subgroup analyses: favourable effects on vitality among high yoga compliers*	+/-
9	RCT – no control group	n=40	devices or adequate guarding of machine safety: + presence of required safety programs and practices: + Difference between T0 and T1 is significant for both outcomes.		+ (no control group)
10	Pragmatic RCT	n=3367	Vaccination uptake: +	Nosocomial influenza and/ or pneumonia among health care workers: + In-hospital patient morbidity: +	++
11	quasi-experimental pre-test multiple post control group design	n=487	Skinfold: + Waist circumference: +	Dietary intake: + Physical activity: + Motivational stage: + Cognitive determinants: -	++
12	RCT	n=6636	Vaccination uptake: + *Higher compliance with program elements was associated with higher vaccine uptake.*		+

Studies: 1: Oude Hengel, 2011a ; 2012; 2013; 2011b [22, 28–30]; 2: Coffeng, 2012; 2014a; 2014b; 2013 [21, 31–33]; 3: Van Berkel, 2011; 2014a; 2014b; 2013 [20, 34–36]; 4: Oude Hengel, 2014; Van Deurssen, 2014b; 2014a [27,37,38]; 5: Mc Eachan, 2008; 2011, Lawton, 2014 [19,39,40]; 6: Verweij, 2009;2012; 2013; 2011; 2012 [23,41–44]; 7: Viester, 2012; 2015; 2014 [18,45,46]; 8: Strijk, 2009; 2012, 2013; 2011 [17, 47–49]; 9: Brosseau, 2007; Parker, 2009 [26,50]; 10: Riphagen 2013a; 2013b [25,51]; 11: Kwak, 2007; 2009; 2010 [16,52,53]; 12: Looijmans, 2011; 2010 [24,54];
Note: Intervention effects rating: ++ (all primary and secondary outcomes overall effective), + (all primary outcomes overall effective and secondary outcomes partially or not effective) or +/- (at least one of the primary and/or secondary outcomes partially effective, but not all primary outcomes effective) or – (all primary and secondary outcomes not effective).

Supplementary table 6: Results of the IM fidelity review, implementation process review and effect review translated into scores [used for the figures]

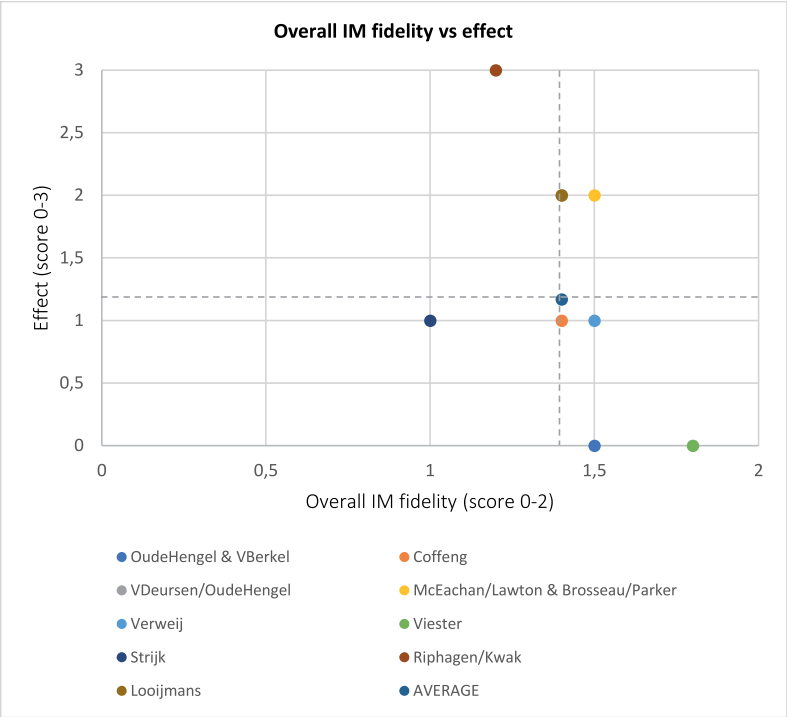
Studies:	1	2	3	4	5	6	7	8	9	10	11	12	To-tal
IM Fidelity score (Step 1-5)(score ranged from 0-2)	1,5	1,4	1,5	1,4	1,5	1,5	1,8	0,9	1,5	1,2	1,2	1,4	1,4
Participation	1,0	1,5	1,5	1,3	1,3	1,5	1,5	0,3	1,5	1,0	1,0	1,5	1,2
Theory-based approach	2,0	1,3	1,3	1,3	2,0	2,0	2,0	1,0	2,0	1,3	1,3	1,3	1,6
Ecological model	2,0	2,0	2,0	2,0	1,5	2,0	2,0	1,5	2,0	2,0	2,0	2,0	1,9
Implementation	1,3	1,0	1,3	1,3	1,5	1,0	1,8	1,3	0,8	0,8	1,0	1,0	1,1
Implementation process (score ranged from 0-3)	2,4	1,4	1	1	1,7	1,8	1,4	1,4	-	-	1,8	-	1,5
Reach	3	0	0	0	3	-	0	0	-	-	3	-	1,1
Dose delivered	3	3	-	1	1	3	3	3	-	-	-	3	2,5
Dose received	3	1	1	0	1	1	1	1	-	0	1	0	0,6
Fidelity	1	1	1	2	-	1	1	1	-	-	1	-	1,1
Satisfaction	2	2	2	2	-	2	2	2	3	1	2	-	2
Intervention effect (score ranged from 0-3)	0	1	0	2	2	1	0	1	2	3	3	2	1,2

Studies: 1: Oude Hengel, 2011a ; 2012; 2013; 2011b [22, 28–30]; 2: Coffeng, 2012; 2014a; 2014b; 2013 [21, 31–33]; 3: Van Berkel, 2011; 2014a; 2014b; 2013 [20, 34–36]; 4: Oude Hengel, 2014; Van Deurssen, 2014b; 2014a [27,37,38]; 5: Mc Eachan, 2008; 2011, Lawton, 2014 [19,39,40]; 6: Verweij, 2009;2012; 2013; 2011; 2012 [23,41–44]; 7: Viester, 2012; 2015; 2014 [18,45,46]; 8: Strijk, 2009; 2012, 2013; 2011 [17, 47–49]; 9: Brosseau, 2007; Parker, 2009 [26,50]; 10: Riphagen 2013a; 2013b [25,51]; 11: Kwak, 2007; 2009; 2010 [16,52,53]; 12: Looijmans, 2011; 2010 [24,54]



Supplementary figure 1: Scatterplot of scores on overall IM fidelity (score 0-2) and implementation process (score 0-3) per study*

*the dotted lines show the average scores for the overall IM fidelity and the implementation process. For three of the process evaluations, there was not enough data available to calculate a process score (Looijmans, 2010 (54), Riphagen, 2013 (25) and Parker, 2009 (50).



Supplementary figure 2. Scatterplot of scores on IM fidelity (score 0-2) and intervention effect (score 0-3) per study*

*the dotted lines show the average scores for the overall IM fidelity and the effects. Oude Hengel & VBerkel and Riphagen/Kwak have identical scores on IM fidelity and effect.

PART 3

Design, process and effect of an organisational-level work stress intervention to decrease work stress in primary schools

Chapter 4

Design of a Participatory Organisational-Level Work Stress Prevention Approach in Primary Education

Maartje C. Bakhuys Roozeboom

Roosmarijn M.C. Schelvis

Irene M. Niks

Noortje M. Wiezer

Cécile R. L. Boot

Based on:

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Abstract

Background: Work stress is a serious problem in primary education. Decades of research underline the importance of participatory, organisational-level work stress prevention approaches. In this approach measures are planned to tackle causes of work stress in a participatory manner and implemented by a working group consisting of members of the organisation. This approach can only be effective if the measures contain effective ingredients to decrease work stress risks, and are successfully implemented. The aim of this paper is to present an outline of a work stress prevention approach that is evaluated in primary education. To ensure the appropriateness of measures, a logic model of change is built as part of the risk assessment to facilitate the selection of appropriate measures. Progression on target behaviours as well as implementation factors are real-time monitored during implementation and fed back to the working groups, to provide the opportunity to adjust action plans when needed to optimise implementation.

Methods: The approach consists of five steps: 1) preparation: installing an advisory board and working groups, 2) risk assessment: inventory of work stress risks (questionnaires and focus groups). In addition, a behavioural analysis is performed to build a logic model of change to facilitate selection of measures, 3) action planning: conducting an action plan with appropriate measures (focus groups), 4) implementation: implementing the action plan. During implementation progression on target behaviours and implementation factors are monthly monitored and fed back to the working groups. And 5) evaluation: effects of the approach are studied in a quasi-experimental study with measurements at baseline (T0), one-year (T1) and two-year (T2) follow-up. A process evaluation is carried out using quantitative (questionnaires and real-time monitoring data) and qualitative (interviews and data logs) data to study the implementation process of all steps of the work stress approach.

Discussion: We believe that building a logic model of change and real-time monitoring of implementation could be of added value to improve the success of the work stress prevention approach. With this study we aim to provide more insights into work stress intervention research, especially in primary education.

Keywords: participatory organisational-level work stress prevention approach, primary education, intervention research, logic model, implementation

Introduction

Work stress in primary education

Work stress is a serious problem among workers throughout the globe. Especially workers in primary education are at risk to suffer from work stress. Data from the Netherlands Working Condition Survey (1) show that the highest proportion of employees that report work stress are employed in the educational sector. From research it is known that work stress can have severe consequences for workers' health by causing cardiovascular diseases (2), musculoskeletal disorders (3) and mental health problems (4). Work stress among teachers can also have negative consequences for schools, leading to decreased commitment (5) and increased sickness absence (6) and also for students, leading to low quality of education (7). In addition, there is a substantial shortage of teachers in primary education in the Netherlands and high levels of work stress make working in this sector less appealing, and may also increase the risk of turnover (8, 9). These results underline the urgency to combat work stress in education.

Causes of work stress

Several theoretical models describe the potential causes of work stress (e.g. Job Demands Control (Support)-model (JDC(S)model) (10), the Demand-Induced Strain Compensation-model (DISC-model) (11) and Job Demands Resources-model (JDR-model) (12)). These models focus on a balance principle: work stress is caused by an imbalance between high job demands and low resources. Job demands are organisational, social and physical aspects of the job that require effort (13). Resources refer to aspects of the job that reduce job demands, help achieve work goals and stimulate personal development (14). Resources can be divided into organisational resources (e.g. supervisor support, co-worker support, autonomy) and personal resources (e.g. resilience, optimism). Research on teachers' causes of work stress identified several specific job demands and organisational and personal resources that are related to (1) the workload, e.g. time pressure, difficult students, being confronted with continuous change, administrative tasks (15-19) , (2) social interrelations, e.g. lack of social support from colleagues or management (15, 17) and (3) personal characteristics, e.g., coping mechanism (15).

Participatory, organisational-level stepwise approach for work stress prevention

Given the previously mentioned scarcity of teachers, the high prevalence of work stress and the severe consequences, there is a need for effective work stress interventions in education. However, research shows that work stress interventions in primary education are lacking or

not effective. International meta-analyses showed only limited, low quality studies (20) or small effects (21). Most of the studied interventions aimed at teachers' work stress or burnout are person-directed interventions that target secondary risk prevention (e.g. relaxation training, mindfulness, cognitive behavioural theory) (22). However, scholars question whether these types of interventions are the most sustainable approach to work stress prevention (23). According to the 'hierarchy of control' principle, interventions are most (cost)effective if they target work stress risks at their source (e.g. job demands and resources).

An approach in this respect that received an increasing interest in the past decades, is the participatory, organisational-level stepwise work stress prevention approach (24-27). In this approach actions are planned to remove or modify causes of work stress in a participatory manner and implemented by a working group consisting of workers and management from the organisation (implementors). In general, the approach consists of five steps: 1) *preparation:* preparation and planning of the practical aspects of the approach, 2) *risk assessment:* inventory of work stress risks, 3) *action planning:* planning measures to target risks, 4) *implementation:* implementing measures by means of an action plan, and 5) *evaluation:* evaluation of the approach.

Although these organisational-level approaches hold the potential to sustainably reduce work stress since they target work stress risks at their source, in practice these interventions often fail to bring about the expected outcomes (28). There can be several explanations for this: the selected measures do not consist of the *effective ingredients* to decrease causes of work stress (measures are not appropriate) (29), the measures are not *implemented successfully* (26), or a combination of both factors. In this paper we outline the planning of a work stress prevention approach that is implemented and evaluated in primary education. To diminish the risks mentioned above (not selecting appropriate measures and/or implementation failure), for this study the work stress prevention approach is expanded with 1) building a logic model of change to facilitate action planning and 2) real-time monitoring of the implementation process.

Logic model of change

When it comes to the underlying mechanism of work stress, reducing job demands and increasing organisational and personal resources often requires behavioural actions of different actors within the organisation. Examples of such behaviours are: managers prioritizing work tasks, managers providing feedback to employees, employees taking work breaks, etc.

Traditional risk assessments often focus on common risk factors as described in dominant work stress theories (29). These risk assessments may for example reveal that a particular department suffers from work stress due to high job demands. However, they often do not

specify what kind of behavioural change is needed from whom to reduce these job demands. Making more explicit what behavioural change the measures should aim for, would facilitate the selection of measures and secure that measures contain appropriate and effective behavioural change methods.

Frameworks for the development of behavioural change interventions that are well adopted in the general health domain, stress the importance of conducting a logic model of change to better define the active ingredients of measures that are needed to accomplish the intended outcomes (e.g. Intervention Mapping (30)). This requires a behavioural analysis to 1) formulate the program objective and performance objectives (specific behavioural actions needed to reach the program objective), 2) identify determinants for each performance objective, and 3) propose theory-based intervention methods that target the determinants and help achieve the performance objectives. The result of this behavioural analysis is a logic model of change, which represents pathways of the work stress prevention approach's effects, and points out the behavioural changes necessary to achieve the intended health outcome (reduce work stress). Building this logic model of change could be of added value to the work stress prevention approach because it provides guidance for selecting and planning appropriate measures that contain effective behaviour change methods.

Real-time monitoring implementation

Even when appropriate measures are planned, they need to be successfully implemented to accomplish the intended effects. As Nielsen, Randall, Holten and Rial Gonzalez (26) pointed out, in practice the implementation of work stress prevention approaches often is hindered by factors related to the implementation process. Implementation factors that are considered important for successful implementation are management commitment, participation of employees or support from employees, tailored and timely communication, and/or mental models of the workers (readiness for change) (26).

In their study Lien & Saksvik (31) monitored attitudes towards organisational change through monthly assessments and results were communicated to the change managers via feedback loops during the organisational change. This approach of real-time monitoring during the implementation process and providing feedback to implementors holds potential to reduce the risk of implementation failure. Monitoring important implementation factors (management commitment, employee participation, communication and readiness for change) during implementation and providing feedback to implementors, may stimulate implementors to take behavioural actions the moment when hindrances are identified. This may reduce the risk of implementation failure.

In a similar manner, monitoring progress on outcomes (work stress), risk factors and target behaviours and providing feedback to implementors provides the opportunity to adjust and optimise measures when needed. According to the Goal Setting Theory (32, 33) monitoring

and receiving feedback on the progression of goals appears to be positively related to goal pursuit. In addition, this type of feedback could provide more guidance to adjust action plans during implementation by changing existing measures or introducing new ones when needed.

Another advantage of real-time monitoring during the implementation process is that data on the implementation process is collected as the implementation evolves. A weakness of most process evaluations is that the evaluation often takes place after the implementation of the intervention (retrospective) (26). This can challenge identification of implementation hinderances due to recall bias. Data collected with real-time monitoring of the implementation process may facilitate the process evaluation, by providing a picture on changes in implementation factors over time.

Aim of this paper

To summarize, the aim of this paper is to present an outline of a work stress prevention approach that is evaluated in primary education. To ensure the appropriateness of measures, a logic model of change is built as part of the risk assessment to facilitate the selection of appropriate measures. During implementation, progression on outcomes, risk factors and target behaviours as well as implementation factors are real-time monitored and fed back to the working groups, to provide the opportunity to adjust action plans when needed and reduce the risk of implementation failure.

Methods and analysis

This paper outlines a work stress prevention approach that will be conducted in in primary education in the Netherlands and evaluated in a controlled trial. The approach consists of five steps: 1) preparation, 2) risk assessment, 3) action planning, 4) implementation, and 5) evaluation (see Figure 1). As part of the risk assessment (step 2) a behavioural analysis is carried out to build a logic model of change. This logic model is used to select measures for action planning (step 3). During implementation (step 4) progression on target behaviour and implementation factors are monitored and feedback is provided to implementors. After implementation, the effect of the approach and the implementation process are evaluated (step 5).

Following the conceptual model of participation in work environment interventions (34), the work stress prevention approach is participatory in the sense that during risk assessment, action planning and implementation employees have direct and indirect (via working group) influence over the focus, content and implementation of the intervention activities.

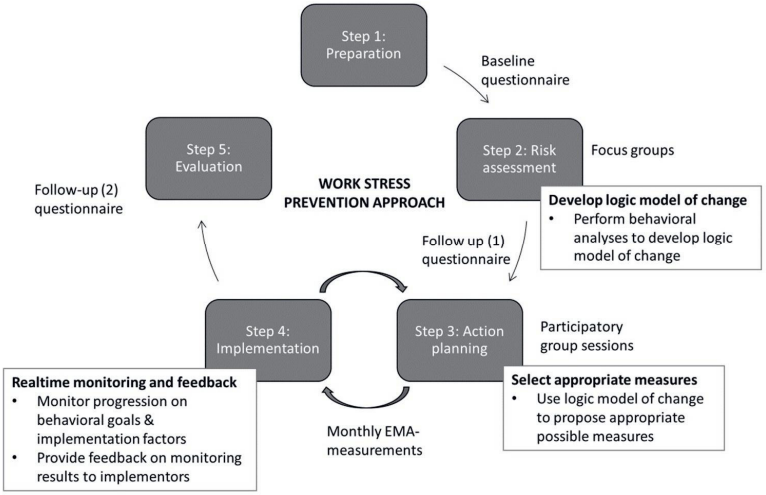

Figure 1: Schematic overview of work stress prevention approach

Study population

The study population (intervention and control group) consists of teaching and non-teaching staff (i.e. managers, support staff) from 30 schools in primary education (N=739) that fall under the scope of two school cooperations. The schools differ in size, and include small, medium and large schools, and are located in the middle of the Netherlands.

All schools received an invitation to participate in the intervention group. Of both school cooperations a large and a small school that were willing to participate were appointed as intervention schools (N=102). These four schools follow the five steps of the work stress prevention approach. All other 26 schools (N=637) are appointed as control schools and only take part in the questionnaire measurements at baseline, one year and two year follow-up (see Figure 1).

Step 1 Preparation

The study protocol is tested and approved by an ethical committee. All employees receive information about the study and sign an informed consent for the study activities. An advisory board to the intervention project is installed that consists of the management of the school cooperation and members of the research team. Regular meetings are planned with the advisory board to discuss preliminary results and progression of the project. In addition, regular meetings are planned between the research team and the principal of the

intervention schools, to discuss progress, preliminary results and collect feedback. At each of the four intervention schools a working group is installed consisting of 2-3 employees and the school principal. The working group is responsible to conduct and implement a school specific action plan.

Step 2 Risk assessment

The risk assessment is aimed at the identification of causes of work stress for teachers in primary education. As part of the risk assessment, focus group meetings are carried out (two focus group meetings with 3-5 employees per school). In the focus group meetings, participants are asked to think of factors that cause, contribute to and buffer work stress and to think about the interrelations between these factors. Post-its are used to organise factors into one schematic model that reflects the interrelations of risk factors and the dynamic nature of work stress development for the participants. The results of the different workshops are combined into one schematic model, that covers all factors that are mentioned in the workshops. This model is used by the researchers to identify the most important risk factors to reduce work stress among workers in primary education by selecting factors that are often mentioned in the different workshops, and factors that are related to many other factors.

Behavioural analysis

Based on the identified risk factors, a behavioural analysis is carried out by the research team to develop a logic model of change that reflects the situation for all four schools (see Figure 2). First, the intended outcome of the intervention is formulated (e.g. work stress reduction among primary school workers). Second, this intended outcome is translated in terms of behaviour by determining what behaviour is needed to prevent work stress among workers in primary education (e.g. keep a healthy energy balance, carry out work tasks within regular working hours). These are the behavioural program goals the measures (that are selected in step 3 action planning) should focus on. Third, behavioural actions (performance objectives) that are needed from different actors to accomplish the behavioural program goals are specified (e.g. monitor workload, exchange expectations with colleagues). Fourth, behavioural and external determinants of these behavioural actions are identified that are a precondition for the behavioural actions to occur (e.g. motivation, self-efficacy, awareness). Last, the research team selects suitable theory- and evidence-based change methods (e.g. guided practice, goal setting) aimed at the identified determinant, based on behavioural change literature (30). The advisory board and the school principals are consulted to check the (preliminary) results of the behavioural analyses (e.g. do they reflect practice?).

Figure 2: Steps of behavioural analyses resulting in logic model of change

Step 3 Action planning

As part of the action planning (Step 3) possible work stress measures are inventoried by means of participatory focus group sessions with employees. At each school, sessions are 119ptimize119 with all employees to collect and discuss possible measures that match with the needs based on the risk assessment and that fit the context of the school. This inventory of measures combined with the results of the behavioural analysis are used by the research team to make one general action plan including a logic model of change. This general action plan includes several appropriate possible measures and the rationale behind these measures (logic model of change). This general action plan is handed over to the working groups at the schools.

At each school, a kick-off meeting is 119ptimize119 with the working group to select and specify measures from the general action plan into a school-specific action plan. The action planning and implementation of measures follows an iterative action approach, meaning that the school-specific action plans are constantly evolving during the implementation period, measures can be changed, and new measures can be introduced overtime, until an optimum is reached.

Step 4 Implementation

The working groups at the schools are responsible for the implementation of measures of the school-specific action plans. During implementation, the working groups regularly meet and discuss progression of the action plan and make changes if needed. The frequency of meetings is decided upon by the working group members based on their needs and preferences. When needed, schools can get in contact with the other intervention schools to learn from each other's experiences (buddy system).

Real-time monitoring

The working groups receive feedback from monitoring data, collected by monthly Ecological Momentary Assessment (EMA) measurements (pulse surveys) among all employees of their schools. EMA involves repeated sampling of subjects' current feelings, states, behaviours and experiences, in real-time and in subjects' natural environment (35, 36). Results of the

monthly EMA-measurements at school level are fed back to the working groups to reflect on the progression on work stress, risk factors, target behaviours and on the implementation process and take behavioural actions if needed. During the implementation period with a duration of 10 months (excluding 2 months of summer holidays) all employees receive 8 short surveys that they can fill in with an app they need to install on their mobile phones (the EMA measurements). Within the app, participants can view a graph with their individual work stress level overtime, based on the monthly measurements.

Results are presented to the working groups in a monthly report that contains graphs of the mean scores of all items at school level. With every new EMA-measurement, a new report is conducted with additional scores added to the existing graphs. This way the report presents an overview of trends over time. In addition to the graphs with the mean scores, the report contains reflection questions for the working groups to answer, to reflect on the effectiveness of measures and the implementation process. Examples of reflection questions are: "*Are there any changes on [work stress risk/ behavioural goals/implementation factors] as compared to last months' measurement*?", "*Are changes on [work stress risk/ behavioural goals/implementation factors] in the expected direction?*", "*Are additional/other measures needed?", "Are additional actions needed to 120ptimize implementation?*". To reduce the risk of loss to follow-up, the monthly surveys are as short as possible and provide participants with feedback on their work stress levels within the app. This could work as an incentive to participate

Measurements real-time monitoring

Items are selected that are deemed relevant to monitor work stress, work stress risks, progression on target behaviour and implementation factors. The number of items is limited to reduce the risk of response loss and minimize the efforts asked of participants. The following items are included in the monthly EMA-measurements (pulse surveys).

Work stress:

Work stress is measured by a single item stress question (SISQ) (37). (*Stress is a state where you feel tense, restless, nervous, anxious or can't sleep at night because you are worried. Have you experienced this type of stress in the past month?*). Response scales range from 1 = low stress to 100 = high stress.

Work stress risks:

Work stress risks are measured by single item questions that are selected based on the outcomes of the risk assessment (E.g. *administrative tasks, difficult students, high expectations from colleagues*). Response scales range from 1 = not at all to 10 = to a very large extent.

Target behaviour:

Target behaviours are measured by single item questions that are selected based on the behavioural analyses (*To what extent did this statement apply to you considering the last month?* E.g. *I was working on personal goals, I was prioritizing my work tasks*). Response scales range from 1 = not at all to 10 = to a very large extent.

Implementation factors:

Communication is measured by two items "*I am aware of the objectives of [the project]*" and "*I am informed about the progress of [the project]*". *Commitment* is measured by three items based on the IPM-Q (38) "*I have the feeling that the team is positive about [the project]*", "*I have the feeling that the our principal is positive about [the project]*" and "*I have the feeling that the school cooperation is positive about [the project]*". *Participation* is measured by two items based on the IPM-Q (38) "*I am involved in [the project]*", "*I can think along with the measures that are taken as part of [the project]*". *Readiness for change* is measured by three items based on the Questionnaire Climate of change Processes and readiness (39): "*I am willing to actively contribute to [the project] (intentional readiness for change)*, "*I expect that [the project] will help to reduce my work stress*" (cognitive readiness for change) and "*I have a positive feeling about [the project]*" (emotional readiness for change). Response scales range from 1 = not at all to 10 = to a very large extent.

Step 5 Evaluation

The effects of the work stress prevention approach are evaluated in a quasi-experimental study (see Figure 3). As part of the effect evaluation online questionnaires are sent out at baseline (after preparation), one-year (after needs assessment) and two-year follow up (after implementation) to all workers of the intervention and control schools.

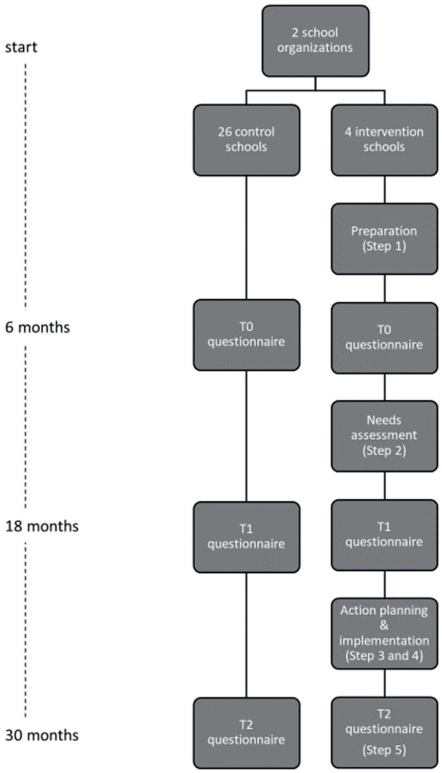

Figure 3: Schematic overview of study design for effect evaluation

Measurements baseline, one year and two year follow-up questionnaires

Since the baseline questionnaire (T0) is sent out to the respondents before the logic model of change is developed, we aim to measure several potential job demands and organisational and personal resources that are known to contribute to work stress. This way, we optimise the possibilities to include moderating and mediating factors (based on the logic model of change) when performing the analyses for effect evaluation.

Work stress:

Work stress was measured with 5 items of the Utrecht Burnout Scale (UBOS) (40), a slightly adjusted Dutch version of the Maslach Burnout Inventory-General Survey (MBI-GS) (41). The

selected subset of items primarily measure the emotional exhaustion component of burnout complaints (e.g. *"I feel emotionally exhausted by my work"*). Response scales range from 0 = never to 6 = every day.

Job demands:

Quantitative demands are measured by 3 items based on the Dutch version of the Job Content Questionnaire (JCQ) (10, 43) (e.g. "*Do you have a lot of work to do?")*. Response scales range from 1 = never to 4 = always.

Emotional demands are measured by 3 items based on the Copenhagen Psychosocial Questionnaire (44) (e.g. "*Does your work put you in emotionally disturbing situations?"*). Response scales range from 1 = never to 4 = always.

Unnecessary work tasks are measured by 4 items based on The Danish Psychosocial Work Environment Questionnaire (DPQ) (42) (e.g. *"Do you spend time on work tasks that you have difficulty seeing the purpose of?").* Response scales range from 1 = to a very large extent to 5 = to a very small extent.

Time pressure is measured by 3 items based on the Copenhagen Psychosocial Questionnaire (44) (e.g. *"Is it necessary to keep working at a high pace?").* Response scales range from 1 = never to 5 = always.

Technostress is measured by 5 items based on the instrument on Techno-stressors (45) (e.g. "*Due to the increased technological complexity I have a higher workload".)* Response scales range from 1 = Totally disagree to 5 = Totally agree.

Organisational resources:

Autonomy is measured by 4 items based on the Dutch version of the Job Content Questionnaire (JCQ) (10, 43) (e.g. "*Can you decide for yourself how you do your work?"* Response scales range from 1 = yes regularly to 3 = no.

Co-worker support is measured by 3 items of the Dutch 'Weerbaarheidsmonitor' (46). The items are originally based on the Dutch 'Moreelsvragenlijst van Defensie' (47). Items are slightly adjusted to reflect the work context (e.g. *"I can rely on my colleagues in difficult times*"). Response scales range from 1 = totally disagree to 5 = totally agree (α=0.92).

Leadership is measured by two scales. *Quality of leadership* is measured by 4 items based on the DPQ (42) (e.g. "*Does your immediate supervisor give high priority to the wellbeing of employees in the workplace?*"). Response scales range from 1 = to a very large extent to 5 = to a very small extent. *Participatory leadership* is measured by 4 items of the Dutch 'Weerbaarheidsmonitor' (46) (e.g. "*The one who supervises me lets me have a say in things*

that have to do with my work"). Response scales range from 1 = totally disagree to 5 = totally agree.

Safe team culture is measured by 3 items from the Dutch 'Weerbaarheidsmonitor' (46). The items are based on the Psychological Safety Scale (48) (e.g. "*Employees in our team can be vulnerable*"). Response scales range from 1 = totally disagree to 5 = totally agree.

Personal factors/ resources:

Basic Needs Satisfaction at Work is measured by a selection of 6 items based on the Basic Needs Satisfaction at Work scale (49-51), that measures three dimensions competence (2 items e.g. *"I do not feel very competent when I am at work"*), autonomy (2 items, e.g. "*When I am at work, I have to do what I am told*") and belonging (2 items e.g. "*There are not many people at work that I am close to*"). Response scales range from 1 = Not at all true to 7 = Very true.

Self-efficacy about functioning under stress (stress resistance), and *recovery after stress* (resilience) are measured by 6 items selected from the Connor-Davidson Resilience Scale (CD-RISC) (52), Brief Resilience Scale (BRS) (53) and Mental Toughness Scale (54). Stress resistance is measured by 3 items (e.g. "*Even when I'm under a lot of pressure, I stay calm*"). Response scales range from 1 = Totally disagree to 5 = Totally agree. Recovery after stress is measured by 3 items (e.g. "*I recover quickly from setbacks*").

Optimism is measured by 3 items based on the Life Orientation Test (55, 56) (e.g. "*I'm optimistic about my future*"). Response scales range from 1 = Totally disagree to 5 = Totally agree.

Job crafting behaviour is measured by 6 items selected from the Job Crafting Survey (JCS) (57) (e.g. "*I make sure that I make optimal use of my capacities")*. Response scales range from 1 = Totally disagree to 5 = Totally agree.

Analyses

To study the effect of the work stress prevention approach, per protocol analyses will be performed on the data of the 30 participating primary schools. To adjust for clustering of schools multilevel mixed model analyses are performed. The data from the current study contains three levels; the first level of the data contains the individual scores of the participants on the determinants and outcome (within-subjects level), the second level of the data contains the schools in which the individual participants are nested (between-schools level), the third level of the data contains the school cooperations in which the schools are nested (between-school cooperation level). However, we expect that differences at this third level are limited, and due to the variety of schools any clustering will manifest itself at school level. Adjustments for each level are considered and evaluated at the start of the analysis.

Multivariate analyses are carried out (for each of the primary and secondary outcomes) with the difference scores of the primary and secondary outcomes as dependent variable, and the centered score of this variable at baseline and condition (intervention versus control) as independent variables. To obtain the amount of variance explained by the differences between the schools the intraclass correlation coefficient (ICC) is calculated for each analysis. For all hypotheses a p-value of <0.05 is indicated as statistically significant.

Power analysis

The power calculation is based on the sample size needed for the effect evaluation of the work stress prevention approach, including two groups, the intervention schools and control schools with respectively 4 and 26 clusters (schools). The estimated average cluster size (considering loss to follow up) is 15 participants (intervention schools: N=60, control schools N=390). Assuming a significance level (α) of 0.05, two-sided tests and power (1-β) of 0.80 and an ICC for schools of 0.01, we will be able to detect an effect of Cohen's d=0.43. In their review on burnout prevention programs Awa, Plaumann & Walter (58) found effect sizes between d=0.29 and d=1.2. Note that we did not consider the ICC for school cooperation in the power calculation, because we expect that adjustments for this level are not necessary.

Process evaluation

In addition to the effect evaluation, a process evaluation is conducted according to the model for evaluating organisational-level interventions of Nielsen and Randall (59). The process evaluation in this study uses quantitative data collected with the T0, T1 and T2 questionnaires as well as monthly EMA-measurements. In addition, qualitative data are collected by means of interviews and data logs (see Table 1 and paragraphs Interviews and Data Logs).

Table 1: Process factors and type of data collection

Process factor*	Research question	Questionnaire	EMA measurements	Interviews	Data logs
Intervention design and implementation					
Initiation	Who initiated the intervention and for what purpose?				X
Developing intervention activities	Did the intervention activities target the problems of the workplace?			X	
Implementing intervention activities (exposure to components of the intervention)	Did the intervention reach the target group?	T2		X	X
Implementation strategy					
Drivers of change and the roles of key stakeholders	Who were/are the drivers of change?			X	X

Process factor*	Research question	Questionnaire	EMA measurements	Interviews	Data logs
Employee involvement	Did employees participate significantly in decision making and how many were involved?	T2	X	X	
Management support/ commitment	What was the role of senior/middle managers?	T2	X	X	
Information and communication	What kind of information was provided to participants during the study?	T2	X		
Context					
Omnibus context	How did the intervention fit in with the culture and conditions of the intervention group?			X	
Discrete context	Which events took place during the intervention phase?			X	X
Mental models					
Readiness for change	To what extent are/were participants ready for change?	T0	X		
Shared mental models	To what degree do participants have shared mental models?	T0	X		
Appraisal of the intervention and its activities (e.g. satisfaction)	How did participants perceive the intervention and its activities? To what extent are participants satisfied with the intervention?	T2		X	
Changes in mental models	Did the intervention bring about a change in participants' mental models?	T0, T1, T2	X		

Questionnaires

The following items were included in the T0, T1 and T2 questionnaire:

The concept of *Mental models* is measured by 2 items: "*Work pressure of employees at our school is a problem that should be addressed*" and "*I am confident that [the project] will bring me something*".

The following items were included in the T2 questionnaire:

Exposure to components of the intervention is measured by 1 item based on the IPM-Q (38): "*I have noticed that measures and/or changes have been implemented as a consequence of [the project]*".

Information and communication is measured by 2 exploratory items: "*I am aware of the objectives of [the project]"* (information) *and "I was informed about the progress of [the project]*" (communication).

Commitment is measured by 3 items based on the IPM-Q (38): "*I have the feeling that the school principal is positive about [the project]*"; *"I have the feeling that the team is positive about the [the project]", "I have the feeling that the school organization is positive about [the project]".*

Employee involvement is measured by 2 items based on the IPM-Q (38) "*I have been involved in [the project]*", "*I could think along with the measures that are taken as part of [the project]*".

Satisfaction is measured by 1 exploratory item: "*To what extent are you satisfied with [the project]?*"

EMA-measurements (pulse surveys)

Data on the implementation factors that are measured by the EMA-measurements as part of the real-time monitoring are used to evaluate changes in readiness for change, communication, commitment, and participation. Items that are included in the EMA-measurements are described earlier (see paragraph real-time monitoring).

Interviews

To collect additional data on the intervention design and implementation, the implementation strategy, the context and mental models, two interviews are conducted per intervention school: one interview with the school principal, and one interview with an employee. Interviews are conducted according to a semi-structured interview protocol, by telephone (n=8) and will last between 30-60 minutes. Minutes are made by a research assistant and interview transcripts are coded according to the following topics: intervention design and implementation, implementation strategy, context and mental models.

Data logs

During the work stress approach data is logged by the research team regarding the initiation of the approach, and the exposure to components of the intervention (e.g. number of participants taking part in interviews and EMA-measurements, division of roles within the schools). In addition the division of roles is logged within the schools and based on regular contacts with the working group and schools principals, major events during implementation are logged.

Discussion

This paper outlines the design of an organisational-level participatory work stress prevention approach that will be implemented and evaluated in primary education. In this approach

measures are planned and implemented to remove or modify causes of work stress, and evaluated in a controlled trial. Since this type of approach targets work stress risks at their source, it holds potential to sustainably decrease work stress. However, as Nielsen, Taris and Cox pointed out (26), this type of approach can only be effective if the planned measures are appropriate to target the work stress risks, and if the approach is successfully implemented. To diminish the risks of selecting inappropriate effective measures, and/or implementation failure, as compared to other work stress prevention approaches, the approach in our study is expanded in two ways.

First, a logic model of change is built as part of the risk assessment to facilitate the selection of appropriate measures. A logic model of change represents the pathways of the work stress prevention approach's effects. By building a logic model of change it is made explicit what behavioural change the measures should aim for per stakeholder involved, but also what determinants the measures should target, and thus what change methods the measures should contain. Providing working groups with the rationale behind potential measures by providing a logic model of change, may facilitate working groups to select and plan appropriate measures.

Second, during implementation, progression on outcomes, risk factors, target behaviours as well as implementation factors are real-time monitored and fed back to the working groups. Feeding back monthly progression on outcomes, risk factors and target behaviours is assumed to contribute to goal pursuit, and to motivate working groups to adjust action plans when needed. Feeding back monthly monitoring data on implementation factors (employee participation, communication, commitment, and readiness for change) provides working groups with the opportunity to take action to optimise implementation and reduce the risk of implementation failure. The working groups are in charge of translating the monitoring results into actions, measures or interventions (e.g. Is more communication needed? When? In what form? To whom?). This provides opportunities for the working groups to experiment with actions to optimise implementation, resulting in active learning in the project, but also for the longer term.

Although we propose that these additions to the common work stress prevention approach could increase its' potential success, there are some challenges to this approach as well that have to be taken into account. Work stress prevention approaches require effort from all members of the organisation (26), often in situations where demands already are high. Adding additional activities to this approach will even further increase the effort needed from participants.

First, the approach requires extra time and effort from employees within the intervention schools. Participating in monthly EMA-measurements requires time and effort of participants, which already are confronted with high job demands. To reduce the risk of response loss, the monthly surveys are as short as possible and provide participants with feedback on their work

stress levels within the app. This could work as an incentive to participate and could actually help in monitoring employees' stress levels and take appropriate action.

Second, the approach requires extra time and effort of the working groups. Although the monthly reports on outcomes, risk factors, target behaviours and implementation are aimed to facilitate the working groups during implementation and ultimately save time, the reports also require extra time and effort of the working group members to read and reflect on them. From earlier research (60) it is known that lack of time or priority of different stakeholders (e.g. working group, management) are important barriers for implementation. For this reason, it is important for the working groups to find the right frequency of working group meetings (enough meetings to ensure commitment and priority, and not taking too much time). To facilitate this, the working groups can tailor the frequency of meetings to fit with their needs and work schedules. On the other hand, the regular feedback reports can also work as a cue for working group members to keep on prioritizing the project in daily working life.

There are some strengths and limitations in relation to the overall study design as well. A strength of the study is that effects are evaluated using a controlled trial design with two years of follow-up. This makes it possible to evaluate changes over time, and draw conclusions on the effects of the approach. In addition, monthly monitoring of the implementation process provides quantitative data that can be used to draw a dynamic picture of the implementation process over time. Together with qualitative data (interviews, data logs) this offers a unique insight into how the implementation develops over time.

A limitation of the study design is that the control group is relatively larger than the intervention group. Based on the power calculation the effect evaluation is not expected to be hindered by power issues, and efforts are made by the research team to encourage participants to take part in the measurements and optimise response, particularly in the intervention schools.

Although the work stress prevention approach will require efforts from the participants within the schools, we expect the benefits to outweigh the costs. Given the scarcity of teachers, the high prevalence of work stress and the severe consequences, we believe that there is a great urgency to sustainably reduce work stress in this sector. We aim for our study to contribute to solvation of this important issue by developing a new approach and providing more insights into work stress intervention research in primary education.

List of abbreviations

EMA: Ecological Momentary Assessment

ICC: intraclass correlation coefficient

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Authors' contributions

MBR conducted the study and was responsible for data collection and drafting the article. RS, NW, IN and CB provided intellectual input. All authors provided comments on the draft versions. All authors have read and approved the final version of the manuscript.

Ethics statement

The study protocol is reviewed by the Medical Ethics Review Committee of VU University Medical Center and the committee concludes that the Medical Research Involving Human Subjects Act (WMO) does not apply to the study and that an official approval of this study by the committee is not required.

Trial registration

The study is registered in the Netherlands Trial Register (NL9797, 18 October 2021)

Conflicts of interests

The authors declare that they have no competing interests.

References

1. Hooftman WE, Mars G, Knops J, van Dam L, de Vroome E, Ramaekers M, et al. Nationale Enquête Arbeidsomstandigheden 2020. Methodologie. Leiden/Heerlen. 2021.
2. Kivimäki M, Nyberg ST, Batty GD, Fransson EI, Heikkilä K, Alfredsson L, et al. Job strain as a risk factor for coronary heart disease: a collaborative meta-analysis of individual participant data. The Lancet. 2012;380(9852):1491-7.
3. Da Costa BR, Vieira ER. Risk factors for work-related musculoskeletal disorders: a systematic review of recent longitudinal studies. Am J Ind Med. 2010;53(3):285-323.
4. Harvey SB, Modini M, Joyce S, Milligan-Saville JS, Tan L, Mykletun A, et al. Can work make you mentally ill? A systematic meta-review of work-related risk factors for common mental health problems. Occup Environ Med. 2017 Mar;74(4):301-10.
5. Klassen R, Wilson E, Siu AF, Hannok W, Wong MW, Wongsri N, et al. Preservice teachers' work stress, self-efficacy, and occupational commitment in four countries. European journal of psychology of education. 2013;28(4):1289-309.
6. Duijts SF, Kant I, Swaen GM, van den Brandt, Piet A, Zeegers MP. A meta-analysis of observational studies identifies predictors of sickness absence. J Clin Epidemiol. 2007;60(11):1105-15.
7. Varghese R, Kurian J. A Study on the Impact of Occupational Stress on the Performance of School Teachers in the State of Kerala. European Journal of Molecular & Clinical Medicine. 2020;7(11):100-9.
8. Weiss EM. Perceived workplace conditions and first-year teachers' morale, career choice commitment, and planned retention: A secondary analysis. Teaching and teacher education. 1999;15(8):861-79.
9. Perrachione BA, Rosser VJ, Petersen GJ. Why Do They Stay? Elementary Teachers' Perceptions of Job Satisfaction and Retention. Professional Educator. 2008;32(2):n2.
10. Karasek Jr RA. Job demands, job decision latitude, and mental strain: Implications for job redesign. Adm Sci Q. 1979:285-308.
11. De Jonge J, Dormann C. The DISC model: Demand-induced strain compensation mechanisms in job stress. In: Occupational stress in the service professions. CRC Press; 2003. p. 57-88.
12. Bakker AB, Demerouti E. The job demands-resources model: State of the art. J Manage Psychol. 2007.
13. Schaufeli WB, Bakker AB, Van Rhenen W. How changes in job demands and resources predict burnout, work engagement, and sickness absenteeism. Journal of Organisational Behaviour: The International Journal of Industrial, Occupational and Organisational Psychology and Behaviour. 2009;30(7):893-917.
14. Demerouti E, Bakker AB, Nachreiner F, Schaufeli WB. The job demands-resources model of burnout. J Appl Psychol. 2001;86(3):499.

15. Kyriacou C. Teacher stress: Directions for future research. Educational review. 2001;53(1):27-35.
16. Hakanen JJ, Bakker AB, Schaufeli WB. Burnout and work engagement among teachers. J School Psychol. 2006;43(6):495-513.
17. Roeser RW, Schonert-Reichl KA, Jha A, Cullen M, Wallace L, Wilensky R, et al. Mindfulness training and reductions in teacher stress and burnout: Results from two randomized, waitlist-control field trials. J Educ Psychol. 2013;105(3):787.
18. Fitchett PG, Lineback S, McCarthy CJ, Lambert RG. Examining the relationship among teachers' working conditions, stress, and professional trajectory. In: Handbook of research on professional development for quality teaching and learning. IGI Global; 2016. p. 573-94.
19. McCarthy KE. An Analysis of the Formal and Informal Professional Learning Practices of Middle and High School Mathematics Teachers. 2016.
20. Naghieh A, Montgomery P, Bonell CP, Thompson M, Aber JL. Organisational interventions for improving wellbeing and reducing work-related stress in teachers. Cochrane Database Syst Rev. 2015;4(4):CD010306.
21. Iancu AE, Rusu A, Măroiu C, Păcurar R, Maricuțoiu LP. The effectiveness of interventions aimed at reducing teacher burnout: A meta-analysis. Educational psychology review. 2018;30(2):373-96.
22. von der Embse N, Ryan SV, Gibbs T, Mankin A. Teacher stress interventions: A systematic review. Psychology in the Schools. 2019;56(8):1328-43.
23. Lamontagne AD, Keegel T, Louie AM, Ostry A, Landsbergis PA. A systematic review of the job-stress intervention evaluation literature, 1990–2005. International journal of occupational and environmental health. 2007;13(3):268-80.
24. Kompier MA, Cooper CL, Geurts SA. A multiple case study approach to work stress prevention in Europe. European Journal of Work and Organisational Psychology. 2000;9(3):371-400.
25. Cox T, Griffiths A, Randall R. A risk management approach to the prevention of work stress. The handbook of work and health psychology. 2003;191.
26. Nielsen K, Randall R, Holten A, González ER. Conducting organisational-level occupational health interventions: What works? Work & Stress. 2010;24(3):234-59.
27. Leka S, Jain A, Cox T, Kortum E. The development of the European framework for psychosocial risk management: PRIMA-EF. Journal of occupational health. 2011;53(2):137-43.
28. Semmer NK. Job stress interventions and organisation of work. Handbook of occupational health psychology. 2003:325-53.
29. Nielsen K, Taris TW, Cox T. The future of organisational interventions: Addressing the challenges of today's organisations. Work & stress. 2010;24(3):219-33.

30. Bartholomew Eldredge LK, Markham CM, Ruiter RAC, Fernández ME, Kok G, Parcel GS. Planning health promotion programs: an intervention mapping approach. John Wiley & Sons; 2016.
31. Lien M, Saksvik PØ. Healthy change processes—A diary study of five organisational units. Establishing a healthy change feedback loop. Stress Health. 2016;32(4):258-69.
32. Latham GP, Locke EA. Increasing productivity and decreasing time limits: A field replication of Parkinson's law. J Appl Psychol. 1975;60(4):524.
33. Locke EA, Latham GP. The development of goal setting theory: A half century retrospective. Motivation Science. 2019;5(2):93.
34. Abildgaard JS, Hasson H, von Thiele Schwarz U, Løvseth LT, Ala-Laurinaho A, Nielsen K. Forms of participation: The development and application of a conceptual model of participation in work environment interventions. Economic and Industrial Democracy. 2020;41(3):746-69.
35. Shiffman S, Stone AA, Hufford MR. Ecological momentary assessment. Annu.Rev.Clin.Psychol. 2008;4:1-32.
36. Kirchner TR, Shiffman S. Ecological momentary assessment. The Wiley-Blackwell Handbook of Addiction Psychopharmacology. 2013:541-65.
37. Arapovic-Johansson B, Wåhlin C, Hagberg J, Kwak L, Björklund C, Jensen I. Participatory work place intervention for stress prevention in primary health care. A randomized controlled trial. European Journal of Work and Organisational Psychology. 2018;27(2):219-34.
38. Randall R, Nielsen K, Tvedt SD. The development of five scales to measure employees' appraisals of organisational-level stress management interventions. Work & Stress. 2009;23(1):1-23.
39. Bouckenooghe D, Devos G, Van den Broeck H. Organisational change questionnaire–climate of change, processes, and readiness: Development of a new instrument. J Psychol. 2009;143(6):559-99.
40. Schaufeli WB, van Dierendonck D. UBOS Utrechtse Burnout Schaal: Handleiding. Swets Test Publishers; 2000.
41. Maslach C, Jackson SE, Leiter MP, Schaufeli WB, Schwab RL. Maslach burnout inventory. Consulting Psychologists Press Palo Alto, CA; 1986.
42. Clausen T, Madsen IE, Christensen KB, Bjorner JB, Poulsen OM, Maltesen T, et al. The Danish Psychosocial Work Environment Questionnaire (DPQ): Development, content, reliability and validity. Scand J Work Environ Health. 2019 Jul 1;45(4):356-69.
43. Karasek R. Job content questionnaire and user's guide. Department of Industrial systems Engineering, University of Southern California, Los Angeles. 1985.
44. Kristensen TS, Hannerz H, Høgh A, Borg V. The Copenhagen Psychosocial Questionnaire-a tool for the assessment and improvement of the psychosocial work environment. Scand J Work Environ Health. 2005:438-49.

45. Ragu-Nathan TS, Tarafdar M, Ragu-Nathan BS, Tu Q. The consequences of technostress for end users in organisations: Conceptual development and empirical validation. Information systems research. 2008;19(4):417-33.
46. Delahaij R, Binsch O, Kamphuis W. Weerbaarheidsmonitor voor de politie. Soesterberg: TNO; 2012.
47. van Boxmeer L, Verwijs C, Bruin Rd, Duel J, Euwema MC. A direct measure of morale in the Royal Netherlands Armed Forces Morale survey: Theoretical puzzle, emperical testing and validation. Paper presented at the International Military Testing Association (IMTA) Annual Conference, Gold Coast, Australia; ; 2007.
48. Baer M, Frese M. Innovation is not enough: Climates for initiative and psychological safety, process innovations, and firm performance. Journal of Organisational Behaviour: The International Journal of Industrial, Occupational and Organisational Psychology and Behaviour. 2003;24(1):45-68.
49. Kasser T, Davey J, Ryan RM. Motivation and employee-supervisor discrepancies in a psychiatric vocational rehabilitation setting. Rehabilitation Psychology. 1992;37(3):175.
50. Ilardi BC, Leone D, Kasser T, Ryan RM. Employee and supervisor ratings of motivation: Main effects and discrepancies associated with job satisfaction and adjustment in a factory setting 1. J Appl Soc Psychol. 1993;23(21):1789-805.
51. Deci EL, Ryan RM, Gagné M, Leone DR, Usunov J, Kornazheva BP. Need satisfaction, motivation, and well-being in the work organisations of a former eastern bloc country: A cross-cultural study of self-determination. Person Soc Psychol Bull. 2001;27(8):930-42.
52. Connor KM, Davidson JR. Development of a new resilience scale: The Connor-Davidson resilience scale (CD-RISC). Depress Anxiety. 2003;18(2):76-82.
53. Smith BW, Dalen J, Wiggins K, Tooley E, Christopher P, Bernard J. The brief resilience scale: assessing the ability to bounce back. Int J Behav Med. 2008;15(3):194-200.
54. Clough P, Earle K, Sewell D. Mental toughness: The concept and its measurement. Solutions in sport psychology. 2002:32-43.
55. Scheier MF, Carver CS. Optimism, coping, and health: assessment and implications of generalised outcome expectancies. Health psychology. 1985;4(3):219.
56. Scheier MF, Carver CS, Bridges MW. Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): a reevaluation of the Life Orientation Test. J Pers Soc Psychol. 1994;67(6):1063.
57. Tims M, Bakker AB, Derks D. Development and validation of the job crafting scale. J Vocat Behav. 2012;80(1):173-86.
58. Awa WL, Plaumann M, Walter U. Burnout prevention: A review of intervention programs. Patient Educ Couns. 2010;78(2):184-90.
59. Nielsen K, Randall R. Opening the black box: Presenting a model for evaluating organisational-level interventions. European Journal of Work and Organisational Psychology. 2013;22(5):601-17.

60. Bakhuys Roozeboom MC, Schelvis R, Houtman IL, Wiezer NM, Bongers P. Decreasing employees' work stress by a participatory, organisational-level work stress prevention approach: a multiple-case study in primary education. BMC Public Health. 2020;20(1):676.

Chapter 5

Process Evaluation of a Work Stress Prevention Approach in Primary Education:

Exploring the Added Value of Real-Time Feedback During Implementation

Maartje C. Bakhuys Roozeboom

Irene M. W. Niks

Marianne H. J. van Zwieten

Cécile R. L. Boot

Noortje M. Wiezer

Roosmarijn M. C. Schelvis

Based on:

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Abstract

Objective: Participatory organisational-level interventions carry a risk of implementation failure. The current study evaluates the implementation of a work stress prevention approach in primary education and reflects on the use of real-time feedback as implementation strategy to prevent this risk.

Methods: The process evaluation was conducted at four primary schools in the Netherlands. A framework for evaluating organisational-level interventions was applied using mixed methods.

Results: Results show the implementation level varied between schools and was hindered by the intervention context, school size, and planning of the approach. Management commitment and employee involvement appeared important factors for successful implementation. Real-time feedback appeared valuable to further improve implementation, but not to prevent implementation failure.

Conclusions: Collecting data on implementation factors before the active phase of the approach, may provide the possibility to anticipate on implementation problems earlier.

Key words: implementation, process evaluation, organisational-level intervention, monitoring

Introduction

Work stress is considered a common problem among teachers (1). In 2021 in the Netherlands, 21% of the workers in (primary) education reported work stress (2). At the same time there is a scarcity of teachers, and high levels of stress may increase the risk of turnover (3, 4). Considering the high prevalence of work stress, its potentially severe consequences by causing e.g. mental health problems (5) and the scarcity of teachers, effective work stress interventions in education are needed.

Participatory development and implementation of organisational interventions is the recommended approach to manage psychosocial risks at work (6-9). An example of such an approach that holds potential to sustainably decrease work stress, is the participatory organisational-level work stress prevention approach (10, 11). In this approach, work stress risks are identified and organisational measures to reduce these risks are planned and implemented by a working group consisting of representatives of all employees within the organisation. There are several ways by which this approach can contribute to decreasing work stress. First, planning and implementing appropriate measures that target work stress risks at their source will eliminate these risks and consequently decrease work stress (10). In addition, the participatory approach is believed to empower employees to actively improve their working conditions (12, 13) and secures that planned measures fit in with the organisational culture (14, 15). Finally, the cyclical nature of the approach is supposed to contribute to the self-learning ability of organisations to improve working conditions and to manage work stress in the long term (16, 17).

Despite all potential benefits, the implementation process of these type of approaches is notoriously difficult and effects of the approach rely on the success of the implementation process (11), which according to Nielsen & Randall (16), is determined by the design and realisation of action plans (Is the approach executed according to plan? Are planned measures implemented?), the implementation strategy (Is management committed? Are employees informed and involved?), the intervention context (Does the context facilitate of hinder the approach?) and participants' mental models (Are employees ready for change?).

An important step of these type of approaches is the implementation of action plans (18). During this 'active phase' action plans are implemented and regularly discussed among members of the organisation and reviewed to make adaptations when needed. According to Nielsen et al (19) this step is essential to achieve sustainable change as it provides opportunities to integrate learning into practice. A study by Tafvelin et al (20) showed that employee participation and (perceived) management commitment during this phase is critical to achieve the targeted outcomes. However, in practice especially during the active

phase it is often difficult to keep employees and management committed, informed and involved (11).

A possible solution suggested by Tafvelin et al (20) is to continuously measure the implementation process to identify needs for adjustments in order to ensure successful implementation. Similarly, Nielsen et al (19) suggest to provide feedback to the organisation based on data collected during the intervention to enhance implementation and optimise potential effects of the intervention. Providing feedback on important aspects of the implementation process to implementors during implementation of the approach provides the opportunity to tailor measures as well as their implementation when necessary. This could reduce the risk of implementation failure and lead to more successfully implemented approaches.

The current study describes a process evaluation of a work stress prevention approach that was implemented in primary education. As part of the implementation strategy of the studied approach, real-time feedback in relation to (perceived) management commitment, employee involvement, communication and readiness for change was provided to schools to facilitate the working groups during the implementation phase. The study aims to answer two research questions:

(RQ1) How successful is the implementation of the work stress prevention approach in primary education?

The implementation success is determined regarding the design and realisation of action plans, the implementation strategy, the intervention context and participants' mental models. On each of these aspects requirements are formulated that have to be met for the approach to be considered successfully implemented.

(RQ2) What is the value of real-time feedback as part of the implementation strategy of the work stress prevention approach?

The value of the real-time feedback as part of the implementation strategy is determined based on the collection of real-time monitoring data, change in implementation factors over time, value of feedback according to implementors, and actions taken by implementors based on real-time feedback.

Materials and methods

This process evaluation was conducted alongside a quasi-experimental study on the effectiveness of a work stress prevention approach among employees in primary education. The study protocol is reviewed by the Medical Ethics Review Committee of VU University

Medical Center. The requirement for approval was waived by the ethics committee, as the Medical Research Involving Human Subjects Act (WMO) does not apply to the current study. All employees received information about the study and signed an informed consent for the study activities. Detailed information on the methods and intervention can be found elsewhere (21).

Study population

The study population for the process evaluation consists of teaching and non-teaching staff (i.e. managers, support staff) from four schools in primary education in the Netherlands that fall under the scope of two school foundations. All schools of the two school foundations received an invitation, and a maximum of four schools (2 large schools and 2 small schools) could participate in the approach. The first schools that applied were in fact a large school and a small school from each school foundation. After their application the recruitment procedure was closed. These four schools (total number of employees working at baseline: N=102) followed the five steps of the work stress prevention approach.

Work stress prevention approach

The work stress prevention approach consists of five steps (see Figure 1).

During step 1 (2 months) at each school a working group was formed consisting of the school principal and 2 to 3 employees, that was responsible for action planning (step 3) and implementation (step 4).

During step 2 (12 months), causes of work stress at the schools were identified by means of focus group meetings (two focus group meetings with 3 to 5 employees per school). In addition, a logic model of change was developed by the research team based on Intervention Mapping (19), by: (i) setting a program objective, (ii) identifying performance objectives ((behavioural) actions needed to accomplish the program objective), (iii) identifying determinants for the performance objectives and (iv) selecting (behavioural change) methods to target the determinants.

During step 3 (6 months) possible measures were inventoried by means of participatory focus group meetings at each school with all employees. Based on the results of the focus group meetings and the logic model of change the research team developed a general action plan for all schools. This general action plan included several appropriate possible measures and the rationale behind these measures. At each of the schools, the working groups selected and specified measures from the general action plan into a school specific action plan.

During step 4 (12 months), the measures from the action plan (intervention activities) were implemented by the working groups. During implementation, action plans could be changed if deemed necessary. Working groups received monthly input on the implementation process

from feedback reports based on real-time monitoring data collected by monthly pulse surveys (see data collection) among all employees of their schools. During their recurrent meetings, working groups could reflect on the feedback reports and use them to optimise implementation and tailor the action plan if needed.

During step 5 (2 months), the implementation of the work stress prevention approach was evaluated in a process evaluation.

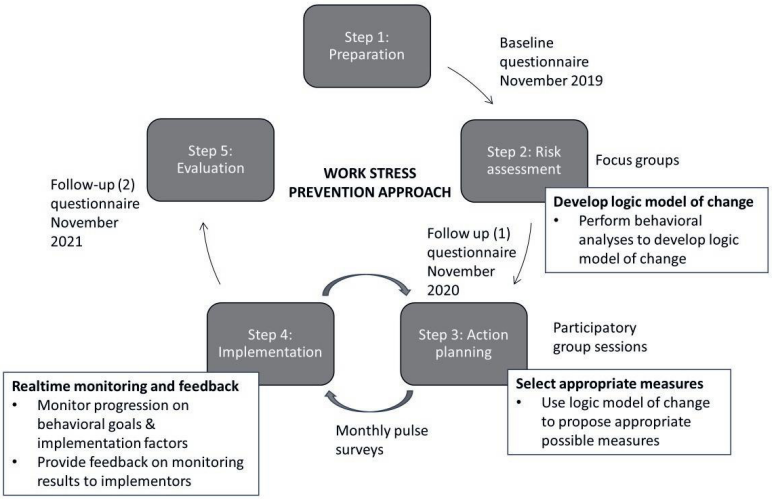

Figure 1: Schematic overview of work stress prevention approach

Framework for process evaluations of organisational-level interventions

In the current study, Nielsen & Randall's framework for process evaluations of organisational-level interventions was applied (22). This framework describes different aspects to be considered in a process evaluation. The general process factors as described in the framework were specified and tailored to the specific objectives of the approach and translated into requirements for successful implementation. Since monitoring and feedback was an important part of the implementation strategy of the studied approach, the framework was expanded with an extra implementation factor 'monitoring and feedback'.

Data collection

Table 1 provides an overview of implementation factors based on the framework of Nielsen & Randall (22) that were measured, requirements that have to be met for the approach to be

successful and measurements used to answer RQ1. To answer RQ2, the response on the pulse surveys was tracked and changes in implementation factors over time and differences between schools during the implementation phase were measured with monthly pulse surveys during the realisation of action plans. Interviews during Step 5 contained questions on the use of the feedback reports. Actions taken by working groups as a result of the feedback reports were logged in the research log.

Table 1: Implementation factors, requirements for successful implementation and data source

		Data source		
Implementation factor	**Requirements for successful implementation**	**Questionnaire** (employees)	**Interview** (principal & employee)	**Research logs** (researchers)
Design and realisation of action plans				
Fidelity	Main activities of the approach are executed according to plan (i.e. installing working group, participation in focus group meetings, behavioural analyses, developing of action plans, regular meetings working groups and implementing measures)		X	X
Appropriateness of measures	Measures as part of the action plans target the main work stress risks and are considered appropriate		X	X
Realisation of action plans	All measures as part of the action plans are implemented		X	X
Implementation strategy				
Monitoring and feedback	Feedback regarding the implementation of measures is provided to working groups and resulted into actions to improve implementation		X	X
Management commitment	There was commitment and support from managers during the approach	X	X	X
Employee involvement	Employees participated in decision making during the approach	X	X	X
Information and communication	Information was provided to participants during the implementation of the approach	X	X	X
Context				
Omnibus context	The intervention did fit in with the culture and/or conditions of the school		X	X
Discrete context	No events took place that hindered the implementation of the approach		X	X

Implementation factor	Requirements for successful implementation	Data source: Questionnaire (employees)	Data source: Interview (principal & employee)	Data source: Research logs (researchers)
Mental models				
Readiness for change	Participants were ready for change during the approach	X		X
Appraisal of the intervention and its activities (e.g. satisfaction)	Participants were satisfied with the approach	X	X	X

Questionnaires

All employees received an invitation by email to participate in a web-based questionnaire at T0 (baseline), T1, before the implementation of actions (one year follow-up) and T2, after implementation of actions (two year follow-up). Time lags of 12 months were chosen because effects were expected to occur within this time frame (23). The items listed below were included for the process evaluation, with response scales of all items ranging from 1 = not at all to 5 = to a very large extent, except for the item on Satisfaction, which response scale ranged from 1= poor to 10=excellent.

Implementing measures was measured at T2 by 1 item based on the Intervention Process Measure (IPM) (24): *"I have noticed that measures and/or changes have been implemented as a consequence of [the project]*".

Management commitment was measured at T2 by 1 item based on the IPM (24): "*I have the feeling that the school principal is positive about [the project]*".

Employee involvement was measured at T2 by 2 items based on the IPM (24): "*I have been involved in [the project]", "I could contribute ideas about the measures that are taken as part of [the project]*".

Information and communication was measured at T2 by 2 exploratory items: "*I am aware of the objectives of [the project]" and "I was informed about the progress of [the project]*".

Mental models was measured at T0, T1 and T2 by 2 items: "*Work stress of employees at our school is a problem that should be addressed*" and "*I am confident that [the project] will bring me something*".

Satisfaction was measured at T2 by 1 exploratory item: "*To what extent are you satisfied with [the project]"*?

Interviews

As part of Step 1 of the approach two interviews were conducted per school with the school principal and an employee, to collect background information about the school organisation and culture (omnibus context). The face-to-face interviews (n=8) were conducted according to a semi-structured interview protocol (see annex 1) and lasted between 30 and 45 minutes. To collect data on the design and realisation of action plans, the discrete context, and the use of feedback reports as part of the implementation strategy two interviews were conducted per school as part of Step 5: one interview with the school principal, and one interview with an employee. Interviews were conducted according to a semi-structured interview protocol (see annex supplementary table 1), by video call (n=8) and lasted between 30-60 minutes.

Research Logs

In the logbook, planned and unplanned events were registered alongside the impressions of the researchers based on observations during focus groups, working group meetings and periodic telephonically updates between researchers and school principals and meetings with the advisory board.

Real-Time Monitoring (Pulse Surveys)

During the implementation of measures (step 4) with a duration of 9 months from March to November 2021 (excluding summer holidays in August) all employees of the schools received 8 short surveys that they could fill in with an app they had to install on their smartphones. The following items were included in the monthly pulse surveys for the process evaluation, with response scales of all items ranging from 1 = not at all to 10 = to a very large extent.

Management commitment, Employee Involvement and *Information and Communication* were measured with the same items as included in the T2 questionnaire.

Readiness for change was measured by three items based on the Questionnaire Climate of change Processes and readiness (25): "*I am willing to actively contribute to [the project]* (intentional readiness for change), "*I expect that [the project] will help to reduce my work stress*" (cognitive readiness for change) and "*I have a positive feeling about [the project]*" (emotional readiness for change). Response scales range from 1 = not at all to 10 = to a very large extent.

Data Analyses

Questionnaires and pulse surveys data were analysed with SPSS 25 (26) using statistic descriptives (mean, standard deviation). Due to the limited number of employees at the schools and a high level of turnover in between measurements, data from new respondents at T1 and T2 were included in the analyses. Interviews were analysed following a deductive approach of thematic analysis (27). During all interviews minutes were made by a researcher

and processed into transcripts that were analysed. Interview transcripts were thoroughly read through and textual segments were coded according to the themes from Nielsen and Randall (22) theoretical framework for process evaluations. The extracted segments were digitally tracked in Microsoft Excel.

Data from research logs were used to analyse events that occurred regarding the discrete context. Data collected with questionnaires, interviews and research logs were analysed at aggregated level (data of the schools combined) and school level, to provide a picture of the level of implementation overall and per school.

Pulse surveys data were analysed at school level to conduct feedback reports for the working groups and provide a picture of changes in implementation factors overtime. Due to privacy agreements with the schools, questionnaire and pulse surveys data were only reported from groups with a minimum of 10 participants.

Results

Descriptives (RQ1)

The total number of employees employed at the primary schools fluctuated between the baseline, one-year and two year follow-up questionnaires (see table 2). In total, 89 (87%), 85 (79%) and 54 (48%) employees responded to respectively the baseline, one-year and two-year follow-up questionnaires. The number of respondents varied between the schools (see table 2). Given the criterion of at least 10 participants per group, no T2 questionnaire data can be reported for school B and D.

Table 2: Response to questionnaires

	T0 Total N	T0 Response n (%)	T1 Total N	T1 Response n (%)	T2 Total N	T2 Response n (%)
All schools	102	89* (87%)	106	85* (79%)	113	54* (48%)
School A	36	34 (94%)	37	32 (87%)	36	23 (64%)
School B	14	11 (79%)	15	10 (67%)	14	>10
School C	33	29 (88%)	32	23 (72%)	29	13 (35%)
School D	19	13 (68%)	22	17 (77%)	24	>10

*Unspecified schools: at T0 n=2, at T1 n=3, at T2 n=1; Missing values on implementation measures: at T2 n=2

Overall results (RQ1)

Per school for each implementation factor it was assessed to what extent it met the conditions for successful implementation (see table 3; for detailed results see annex supplementary table 2). The implementation of the approach was most successful in school A, least successful in school D, and partly successful in school B and C.

Table 3: summary of level of implementation per school

Implementation factor	Requirements for successful implementation	School A	School B	School C	School D
Design and realisation of action plans					
Fidelity	Main activities of the approach are executed according to plan (i.e. installing working group, participation in focus group meetings, behavioural analyses, developing of action plans, regular meetings working groups and implementing measures)	yes	yes	partly	no
Appropriateness of measures	Measures as part of the action plan target the main work stress risks and are considered appropriate	yes	yes	partly	no information
Implementing intervention activities	All measures as part of the action plan are implemented	yes	partly	partly	no
Implementation strategy					
Monitoring and feedback	Feedback regarding the implementation of measures is provided to working groups and resulted into actions to improve implementation	yes	partly	partly	no
Management commitment	There was commitment and support from managers during the approach	yes	yes	partly	no
Employee involvement	Employees participated in decision making during the approach	partly	partly	partly	no
Information and communication	Information was provided to participants during the implementation of the approach	yes	yes	partly	no
Context					
Omnibus context	The intervention did fit in with the culture and/or conditions of the school	yes	yes	yes	yes
Discrete context	No events took place that hindered the implementation of the approach	no	no	no	no
Mental models					
Readiness for change	Participants were ready for change during the approach	partly	partly	partly	partly
Appraisal of the intervention and its activities (e.g. satisfaction)	Participants were satisfied with the approach	yes	no information	partly	no information

Design and realisation of action plans (RQ1)

Fidelity: Overall the requirements for fidelity of the approach were partly met. According to interview data and research logs, at three of the four schools (school A, B and C) the main activities of the approach were executed according to plan. At school D the school principal did not succeed in installing a working group due to a high work load of the employees. During the implementation phase, school D withdrew from active participation in the research project and decided from that moment onwards to only participate in the T2 questionnaire measurement, but not to implement measures. The reason for this decision was that the pace of the approach was too slow and did not match with the planning of the school. Due to a change in management at school C at the time of the action planning, the selection of school specific measures at this school was delayed with a month. At school A and B, periodic meetings were held with the working group on a regular basis. At school C, meetings with the working group were held sporadically.

Appropriateness of measures: At all schools, the interviewed school principals and employees indicated that the identified work stress risks did reflect the most important issues. Work stress risks that were identified during the risk assessment were related to job demands (e.g. high administrative load, high demands from parents), organisational resources (e.g. social support, team culture) and personal resources (e.g. feelings of incompetence, difficulties to prioritise tasks or set personal boundaries). At school A, B and C the school principals and employees indicated that the selected measures were appropriate to target the most important work stress risks. Examples of measures are: training to communicate with parents (to decrease demands from parents and increase setting boundaries), team building activities (to increase social support and team culture), individual coaching sessions (to decrease feelings of incompetence), reduce overlap in administrative tasks (to reduce administrative load), redivide tasks based on ambitions and competences (to support prioritizing tasks) (see table 4). However, interview data revealed that there were doubts among the interviewees whether these type of measures could completely solve work stress at the schools. In their view, some of the most important work stress issues (e.g. administrative burden, too many children per class) cannot be fixed at school level.

Realisation of action plans: The number of measures from the action plan that was carried out varied between the schools. At school A, all intended measures were carried out , whereas at school B and C, due to a lack of time and other priorities (primarily caused by the Covid-19 pandemic), most measures were carried out, but not all.

Table 4: Measures as part of the action plans at the schools

School	Action plans
A	New format progress interviews with employees
	Monitoring overload with wearable
	Training communication with parents
	Proactive offering individual coaching sessions
	Providing compliments
	Document with taken measures/ policies to prevent work stress
	Possibility of scheduled days off for administrative tasks
B	Limiting accessibility outside working hours
	Communication guideline for parents
	Monitoring overload with wearable
	Facilitating time for administrative tasks
	Making appointments about administrative tasks
	Colleague consultation
	Determining school vision to prioritize work tasks
	Improving physical working environment
C	Rearranging work tasks based on capabilities and ambitions
	Monitoring overload with wearable
	Team building activities (sporting together)
	Exploring preparation of lessons together
	Quality card with guidelines for communication
D	Exploring change in school time table
	Document with taken measures/ policies to prevent work stress
	Management present at evenings with parents
	Sharing successes
	Changes in communication year calendar

Implementation strategy (RQ1)

Management commitment: Results of the T2 questionnaire show that 77% of the employees believed their school principal was positive about the approach (school A: 100%, school C: 54%). Interview data also show that school principals differed in their level of commitment towards the approach. The principals of school A and B were very committed towards the approach from start to end. Since a change in management took place during the action planning phase, the principal of school C was less committed to the approach because the principal was not involved from the start of the project and it was not a top priority during the onboarding period. The principal of school D was committed at start, but the commitment decreased when the planning of the approach lacked behind the school schedule and did no longer match with the school planning.

Employee involvement: Results of the T2 questionnaire show that overall 50% of the employees felt involved in the approach (School A: 70%, school C: 38%), whereas 31% of the employees felt they had been able to think along with the measures (school A: 30%, school C: 31%). Interview data showed that employees at school A and B felt involved in the approach, whereas employees at school C felt less involved, and employees at school D felt not involved at all. At school C, the switch in management impacted the priority that was

given to the approach which consequently might have impacted the employee involvement. At school D, a lack of communication about the approach towards employees decreased the level of involvement. According to employees, taking part in the monthly monitoring increased their awareness of the approach and their level of involvement overall.

Information and communication: Results of the T2 questionnaire show that 75% of the employees felt informed about the objectives of the approach (school A: 87%, school C: 54%), and 67% felt informed about the progress of the approach (school A: 91%, school C: 38%). Interview data reveal that the frequency of communication about the approach was high at school A. At this school, regular information updates were provided from the school principal and the working groups to the rest of the team by means of emails, newsletters or updates during team meetings. At school B and C the communication about the approach towards employees was less frequent. At school D the level of communication about the approach towards employees was considered insufficient.

Intervention context (RQ1)

Omnibus context: The four schools differed in size. School B and D were considerably smaller than school A and C. Interview data reveal that the small schools had more difficulties to form a working group (school D did not succeed), because there was not enough capacity to perform the working group tasks. At school A there already was an existing, good functioning working group at the start of the research project, which facilitated the functioning of the working group at that school.

Discrete context: The implementation phase coincided with the outbreak of the Covid 19 pandemic. During the pandemic, schools were under strong pressure to continue the provision of education to students by teaching from home. At the start of the implementation phase (January 2021), the Netherlands was in lock-down, and schools provided education remotely. In April 2021 schools opened again, but the schools had to deal with sick children and employees, forcing schools to improvise to ensure the provision of education. In October and November 2021 the number of Covid-19 infections in the Netherlands was rising again, putting even more pressure on schools to continue their classes. Interview data and research logs reveal that the Covid-19 pandemic played a hindering role in implementing measures from the action plans. The switch to home schooling, staff dropout, sick parents and children and continuously changing policy measures from the Dutch government had schools to constantly improvise to ensure the provision of education, pushing the active implementation of the approach in some schools to the background, especially at school B and C.

Mental models (RQ1)

Readiness for change: Questionnaire results show that the urgency to tackle work stress risks among employees was high, and relatively stable across all measurements (T0: 85%, T1: 87%,

T2: 83%). School A and C showed a somewhat different pattern. At school A this percentage was 85% at T0, and increased to 91% at T1, and decreased to 78% at T2. At school C this percentage was 83% at T0, decreased to 74% at T1 and decreased further to 69% at T2. At school B and D the urgency to address work stress risks remained relatively stable between T0 and T1 (school B T0: 91%, T1: 90%, and school D T0: 92%, T1: 94%; no data are available at T2).

Questionnaire results show that overall the perceived benefits of the approach fluctuated overtime (T0: 48%, T1: 61%, T2: 48%). School C showed a pattern similar to the overall pattern (T0: 48%; T1: 65%; T2: 38%), whereas school A showed a somewhat different pattern. At school A the number of respondents that perceived benefits of the approach was relatively high at T0 (65%), remained relatively stable at T1 (69%) and decreased at T2 (57%). At school B, the percentage of employees that believed they would benefit from the approach at T0 was 50%, and this remained relatively stable at T1 (50%) (no data are available at T2). At school D the percentage of employees that believed to benefit from the approach at T0 was low (8%), but this increased to 53% at T1 (no data are available at T2).

Appraisal of the approach: Employees rated their satisfaction with the approach with M=6.3 (on a scale from 1=very unsatisfactory to 10=very satisfactory). Employees from school A were more satisfied with the approach (M=6.8, range: 3-10) than employees from school C (M=5.9, range: 2-8). Strengths of the approach that were mentioned in the interviews were dialogue on work stress risks within the schools and the continuously planning, monitoring and evaluating of measures to address work stress risks.

Value of real-time feedback (RQ2)

During the realisation of measures from the action plans, monthly feedback reports were provided to the working groups when at least 10 employees participated in the pulse surveys. Table 5 shows the response per school. Since at school D no measures were carried out, no relevant pulse survey data are available. Due to a delay in the planning, only two of the schools (school A and B) participated in the first pulse survey. The number of respondents that participated in the pulse surveys varied greatly between the schools (see table 5) and impacted the number of feedback reports that could be provided to the working groups.

Figure 2 provides a picture of implementation factors (management commitment, employee involvement, communication and readiness for change) over time at school A and C, based on the pulse surveys data with more than ten respondents per time point. Results show that during the action planning and implementation phase of the approach school the scores on the implementation factors differed between the schools. School A scored higher on all implementation factors as compared to school C. Differences between schools were especially high for management commitment, and considerably lower for readiness for change. Overall no major changes in implementation factors occurred during the action

planning and implementation phase of the approach. At school A, for most of the implementation factors there was a small drop after the summer holiday (September), at school B most implementation factors dropped one month later (October).

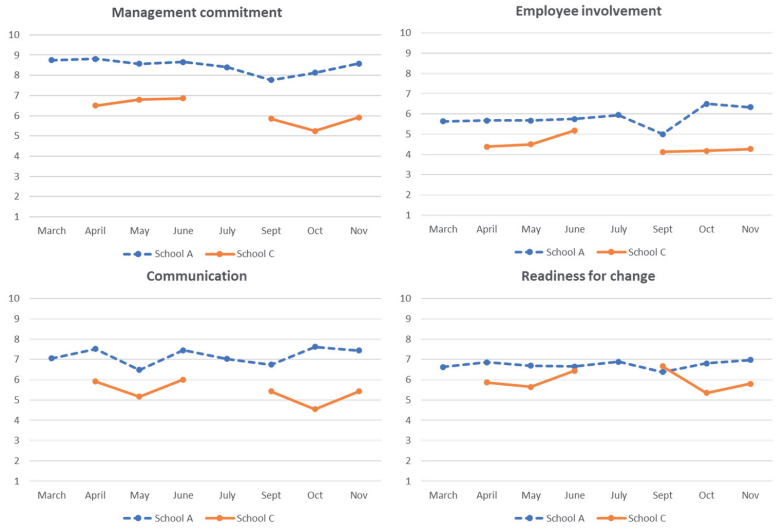

Figure 2: Management commitment, employee involvement, communication and readiness for change during action planning and implementation phase of the approach based on pulse surveys*

* Given the criterion of at least 10 participants per group, no pulse surveys data can be reported for school B and D, and the July measurement of school C.

At school A the working group received monthly feedback reports of each of the measurements. At school B, the working group only received a feedback report of the first measurement. At school C the working group received monthly feedback reports of each of the measurements except the one in July (only 6 respondents).

Based on the interviews, at school A, the monthly feedback reports were considered valuable and provided input for reflection on the action plan. One time the report provided insight into a new issue that occurred on which action was promptly taken by the working group. Two times the report showed a decrease in employees' perception of the communication on the approach. As a result extra attention was provided to the approach in newsletters, emails and meetings. At school B the monthly monitoring was considered less valuable: since it was a relatively small school, the minimum of 10 participants was difficult to accomplish and the

working group only received one feedback report with results of the first measurement. At school C, the reports of the first measures were considered valuable, but over time the response decreased and the reports were not discussed within the working group anymore.

Table 5: Monthly pulse surveys data

	School A (N=37 at T1)	School B (N=15 at T1)	School C (N=32 at T1)
Number of unique participants (response %)	29 (78%)	13 (87%)	19 (59%)
Max. number of participants per measurement (response %)	26 (70%)	10 (66%)	16 (50%)
Min. number of participants per measurement (response %)	17 (46%)	5 (33%)	6 (19%)
Average number of times of participation per participant	6.0	5.0	4.7
Mean number of participants per measurement (response %)	21.6 (58%)	8.1 (54%)	12.7 (40%)

Discussion

The first aim of this paper was to describe the results of a process evaluation of a work stress prevention approach that was implemented in four primary schools in the Netherlands and to identify drivers and barriers for implementation. Regarding RQ1, the results of the process evaluation reveal that there are remarkable differences between the schools in the level of implementation of the approach. At one school the implementation was successful, at two schools the implementation was partly successful and one school completely withdrew from active participation during the action planning phase, and did not implement measures as part of the approach. Therefore the implementation at this school was not successful.

Based on the results of the process evaluation, there are several factors that are assumed to have hindered or facilitated the implementation of the approach. For all schools the context impacted the implementation of the approach. Although the outbreak of the Covid 19 virus contributed to the urgency to address work stress risks, the pandemic hindered the implementation of the action plans. Dealing with acute stressors caused by the Covid 19 pandemic pushed the planning of organisational measures to the background. Whereas the Covid 19 pandemic placed an extra burden on all schools, some schools had more difficulties to implement measures than other schools. At the schools where management commitment was high, more measures were implemented and the implementation of measures was less hindered by the Covid 19 pandemic.

The school size may have impacted the success of the implementation of the approach as well. Small schools had difficulties installing a working group and planning and implementing measures, since at these schools the capacity to carry out tasks related to the approach was

limited. In addition, for small schools it was difficult to reach the threshold of 10 respondents on the monthly measurements and therefore these schools did not receive feedback reports. For this reason small schools did not benefit much from the monthly monitoring. This may imply that for small organisations monthly pulse surveys are not a suitable method and alternative forms of monitoring and feedback may be more appropriate. It could also be argued that small organisations might be in less need of such a tool at all, since communication is often easier in smaller teams.

Regarding the level of employee involvement, results were somewhat inconclusive. More than half of the employees from the schools felt involved during the approach, whereas only one third of the employees felt they were able to think along with the measures. This finding was consistent across all schools. This is an interesting finding because at each school a majority of employees participated in focus group sessions in which they could propose measures. The fact that in practice a large proportion of employees did not feel involved in thinking along with the measures may imply that their suggestions were not sufficiently taken into account, or employees were not sufficiently informed about the way their proposed measures were included in the action plan, or that they did not recognize their proposed measures in the action plan. Difficulties with informing and involving employees during all steps of the approach were also found in previous research (11). Considering the importance of direct involvement of participants in intervention decision making (28), the form and frequency of involvement of participants could be reconsidered (e.g. by involving more employees in the selection of proposed measures). In addition, if managers provide more information on how and why proposed measures are (not) included in the action plan, this might increase the employees' feelings of involvement and consequently their commitment towards the approach.

The level of perceived management commitment appeared to have impacted the implementation of the approach as well. Schools where the management was very involved realised most measures, and at these schools the employees were also the most informed and satisfied with the approach. In schools where the approach (and in particular the action plan) was given less priority by the management, fewer measures were realised and communication about the approach towards employees was less frequent. At these schools, employees experienced less positive results of the approach. These findings are in line with the mechanism of senior management support impacting the level of employee participation, intervention adherence and outcomes, as described by others (15, 20). These findings once again stress the importance of managers as drivers of change in these kind of approaches (29). Since in primary education in the Netherlands, the level of turnover by management is quite high, additional interventions might be needed to secure the commitment of new managers to the approach (e.g. by investing in employee involvement, for example by making employees lead of the working group, as a means to force new

managers to prioritize the approach). This requires more research on ways to secure management commitment in case of management changes during interventions.

The planning of the approach may also have impacted the implementation of the approach. Within this study, the timing of the steps of the approach in terms of activities and planning (e.g. planning of the measurements) were more or less fixed and the same for all four schools for reasons of practical feasibility. As a result, schools sometimes had to wait until they could move on to the next step resulting in a loss of support and momentum at times. For one of the schools, a loss of momentum due to the fact that the pace of the approach was too slow for the urgent need to make rapid changes in relation to the school planning, resulted in a decision to withdraw from active participation in the approach. Connecting or tailoring the activities of the approach to existing processes within the school could possibly facilitate the planning of the approach. By ensuring that the steps follow each other smoothly and that they can be continued if the support is high, the chance of a successful approach can be increased. Nevertheless, it can make the application of a rigorous evaluation study more difficult. It is a common area of tension to ensure a research design that makes it possible to draw reliable conclusions based on objective data, and that at the same time also fits the reality of often changing circumstances within organisations.

The second aim of the study was to reflect on the use of real-time feedback of the implementation process to facilitate working groups to optimise implementation when needed. Based on previous research (20, 30), the authors were interested to explore if real-time monitoring and feedback could be a valuable method to signal implementation problems the moment they occur and take timely action, preventing implementation failure.

The value of the real-time feedback was considered to depend (amongst others) on the pulse surveys' response, and the insights on changes in implementation factors that the monitoring data would provide. However, the relatively small number of employees at the schools and low response on the pulse surveys resulted in a lack of monitoring data, which limited the value of the real-time feedback. Based on monitoring data that was collected, implementation factors showed a similar pattern overtime and appeared to be highly correlated, complicating the specification of actions needed to prevent implementation failure.

Despite the limited monitoring data, the real-time feedback appeared to be of value for schools that already were successful in implementing the approach, supporting them in optimising the implementation even further. For them, a drop in implementation factors functioned as early warning signal and was a trigger for taking action to maintain successful implementation. In addition, interviews revealed that taking part in the pulse surveys increased employees' feelings of involvement in the approach. However, at schools were implementation of the approach was less successful, it appeared that implementation problems (lack of employee involvement and readiness for change) had already occurred

before the action planning phase which probably also resulted in a low response to the monitoring. Regarding RQ2, the results of this study suggest that real-time feedback during the realisation of the action plans may indeed facilitate the implementation, but the benefits depend on the level of response on the monthly measurements which is related to employee commitment to the approach. Especially when implementation fails, feedback could be useful to improve implementation. However, when implementation failure is related to a decrease in employee commitment this will impact the response on the monthly measurements and consequently the quality of the monthly feedback reports. Collecting data on implementation factors before the active phase of the approach, may provide the possibility to anticipate on implementation problems earlier. In addition, other monitoring methods that are less dependent on all employees to actively participate might be better options to solve this problem, e.g. by working with a panel of employees (30), interviewing a selection of employees and/or aligning the monitoring more closely with the primary processes within the organisation.

More research on suitable methods for monitoring implementation and detecting implementation hinderances covering all phases of the approach is needed. From a research perspective, good quality monitoring data on implementation processes could also provide a more detailed picture on changes in implementation factors overtime and interrelations between implementation factors from a time-sensitive perspective (13, 19). This type of data could be useful to determine which implementation factors are most important to focus on to avoid implementation failure and may also contribute further to our understanding of the implementation processes of these kind of approaches. In addition, to make more impact in organisational practice would require more research on the practical feasibility of real-time monitoring and feedback, as well as practical tools that could be easily used by organisations to monitor the implementation process themselves, without the supervision of researchers.

Strengths and weaknesses

There are several strengths and weaknesses of this study that should be taken into consideration. A strength of the study is, that to our knowledge, it is among the first studies to investigate the value of real-time feedback as part of the implementation strategy of a participatory organisational-level intervention, and to reflect on the use of real-time monitoring to study the implementation process during the active phase of the approach.

Another strength of the study is that the process evaluation was carried out according to the framework for process evaluations of organisational-level interventions (22). For this study an additional implementation factor ‘monitoring and feedback’ was added to the framework since this was an important aspect of the implementation strategy. Although the framework is extensive and it requires substantial effort to collect good quality data on all relevant aspects of the implementation, using the framework provided theoretical and practical guidance as well as more insight into how implementation factors (e.g. management

commitment, employee involvement, communication, readiness for change) facilitated or hindered the development and implementation of the approach. Adding the implementation factor 'monitoring and feedback' to the framework provided relevant information on the action planning and implementation phase of the approach, and can be a valuable contribution to the process evaluation framework.

A third strength is that the study used an extensive mixed methods approach (questionnaires, interviews, data logs, monthly pulse surveys) to evaluate the implementation of the approach. Quantitative measures were appropriate for comparisons of implementation factors between the schools, whereas qualitative measures provided more detailed information on the implementation process and the relation between implementation factors. Combining different forms of data collection provided a more detailed and complete picture of the implementation process than would have been the case if only quantitative of qualitative data were used.

A weakness of the study is, however, that (due to the Covid 19 pandemic) the response to the T2 questionnaire was low. As a result, for two of the four schools there was not enough quantitative data from the T2 measurement. This impacted the possibilities to compare the implementation process of the approach between the schools.

Another limitation is that the schools included in the study were not randomly selected, but they voluntarily applied to participate. Their willingness to address work stress and their commitment from the management to the approach at start may not be representative for all schools. The fact that even these schools did not all succeed to implement the approach successfully also raises some concerns about the broad applicability of these type of approaches to prevent of decrease work stress.

Recommendations for practice

Based on the results of this study, several reflections can be made on the implementation of organisational-level work stress prevention approaches. This study confirms once more the difficulty of successful implementation of these type of approaches. In line with other studies, implementation of the approach appears most successful in schools where the level of employee involvement, management commitment and communication were already sufficient at the start of the project. As suggested by Roodbari et al. (15) this may imply that a certain level of employee involvement, management commitment, readiness for change and communication is required at the start of these approaches to be successful. Measuring these factors not only during implementation, but also before the start of the project, as also suggested by Nielsen et al. (31) might be necessary to determine the 'organisational readiness' to successfully implement the approach, and take tailored action to increase these implementation factors if needed before starting the approach. During the approach, monitoring methods that do not depend on employee involvement, might be better suited

to measure implementation failure and take timely action. More research is needed on suitable methods and measures for this purpose.

Conclusions

This study presented the results of a process evaluation of a work stress prevention approach that was implemented in four primary schools in the Netherlands. Results show the implementation level varied between schools and was hindered by the intervention context, school size, and planning of the approach. Management commitment and employee involvement appeared important factors for successful implementation. Additionally, the study explored the value of real-time feedback as part of the implementation strategy of the approach. Results suggest that real-time feedback to implementors could be valuable to further improve implementation, but has not proven to prevent implementation failure in its current form. Data on implementation factors during all phases of the approach could potentially signal implementation problems earlier and could provide a more detailed picture of the implementation process evolving over time.

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Authors' contribution

MBR conducted the study and was responsible for data collection and drafting the article. RS, NW, IN, MZ and CB provided intellectual input. MBR, IN and MZ designed the pulse survey measures. All authors provided comments on the draft versions. All authors have read and approved the final version of the manuscript.

Data availability

Due to the privacy of the participants, the dataset generated and analysed during the study is not publicly available. On reasonable request data are available from the corresponding author.

Ethical considerations & disclosures

The study protocol is reviewed by the Medical Ethics Review Committee of VU University Medical Center (IRB00002991) and the requirement for approval was waived by the ethics committee, as the Medical Research Involving Human Subjects Act (WMO) does not apply to the current study. All participants were a priori informed about the aims and the design of the study and could participate voluntarily. Informed consent was obtained from all individual participants included in the study.

References

1. Tang CS, Au W, Schwarzer R, Schmitz G. Mental health outcomes of job stress among Chinese teachers: Role of stress resource factors and burnout. Journal of Organisational Behaviour: The International Journal of Industrial, Occupational and Organisational Psychology and Behaviour. 2001;22(8):887-901.
2. van den Heuvel, S G, van Thor J, Ferandez Beiro L, van Dam L, Driven HJ. Nationale Enquete Arbeidsomstandigheden 2021 in vogelvlucht. Leiden/Heerlen. 2022.
3. Perrachione BA, Rosser VJ, Petersen GJ. Why Do They Stay? Elementary Teachers' Perceptions of Job Satisfaction and Retention. Professional Educator. 2008;32(2):n2.
4. Weiss EM. Perceived workplace conditions and first-year teachers' morale, career choice commitment, and planned retention: A secondary analysis. Teaching and teacher education. 1999;15(8):861-79.
5. Harvey SB, Modini M, Joyce S, Milligan-Saville JS, Tan L, Mykletun A, et al. Can work make you mentally ill? A systematic meta-review of work-related risk factors for common mental health problems. Occup Environ Med. 2017 Mar;74(4):301-10.
6. EU-OSHA. Second European Survey of Enterprises on New and Emerging Risks (ESENER-2). In Overview Report: Managing Safety and Health at Work. 2016.
7. International Labour Office (ILO). Guidelines on occupational safety and health management systems (ILO-OSH 2001). Geneva, Switzerland: ILO; 2001.
8. UK Health and Safety Executive. Managing the causes of work-related stress: A step-by-step approach using the management standards (2nd ed.). Great Britain: HSE, 2007.
9. World Health Organisation. WHO guidelines on mental health at work. Geneva: World Health Organisation; 2022.
10. Nielsen K, Randall R, Holten A, González ER. Conducting organisational-level occupational health interventions: What works? Work & Stress. 2010;24(3):234-59.
11. Bakhuys Roozeboom MC, Schelvis RM, Houtman IL, Wiezer NM, Bongers PM. Decreasing employees' work stress by a participatory, organisational-level work stress prevention approach: a multiple-case study in primary education. BMC Public Health. 2020;20:1-16.
12. Nielsen K, Randall R, Albertsen K. Participants' appraisals of process issues and the effects of stress management interventions. Journal of Organisational Behaviour: The International Journal of Industrial, Occupational and Organisational Psychology and Behaviour. 2007;28(6):793-810.
13. Nielsen K, Noblet A. Chapter Introduction: Organisational interventions: Where we are, where we go from here? In: Organisational Interventions for Health and Well-being. Taylor & Francis; 2018.
14. Peters SE, Nielsen KM, Nagler EM, Revette AC, Madden J, Sorensen G. Ensuring organisation-intervention fit for a participatory organisational intervention to improve

food service workers' health and wellbeing: Workplace organisational health study. Journal of Occupational and Environmental Medicine. 2020;62(2):e33-45.
15. Roodbari H, Axtell C, Nielsen K, Sorensen G. Organisational interventions to improve employees' health and wellbeing: A realist synthesis. Appl Psychol. 2022;71(3):1058-81.
16. Nielsen K, Abildgaard JS. Organisational interventions: A research-based framework for the evaluation of both process and effects. Work & Stress. 2013;27(3):278-97.
17. von Thiele Schwarz U, Nielsen K, Edwards K, Hasson H, Ipsen C, Savage C, et al. How to design, implement and evaluate organisational interventions for maximum impact: The Sigtuna Principles. European Journal of Work and Organisational Psychology. 2021;30(3):415-27.
18. Augustsson H, von Thiele Schwarz U, Stenfors-Hayes T, Hasson H. Investigating variations in implementation fidelity of an organisational-level occupational health intervention. Int J Behav Med. 2015;22:345-55.
19. Nielsen K, De Angelis M, Innstrand ST, Mazzetti G. Quantitative process measures in interventions to improve employees' mental health: A systematic literature review and the IPEF framework. Work & Stress. 2022:1-26.
20. Tafvelin S, von Thiele Schwarz U, Nielsen K, Hasson H. Employees' and line managers' active involvement in participatory organisational interventions: Examining direct, reversed, and reciprocal effects on well-being. Stress Health. 2019;35(1):69-80.
21. Bakhuys Roozeboom MC, Niks IMW, Schelvis RMC, Wiezer NM, Boot CRL. Design of a Participatory Organisational-Level Work Stress Prevention Approach in Primary Education. Front Psychol. 2022 Mar 30;13:827278.
22. Nielsen K, Randall R. Opening the black box: Presenting a model for evaluating organisational-level interventions. European Journal of Work and Organisational Psychology. 2013;22(5):601-17.
23. De Lange AH, Taris TW, Kompier MA, Houtman IL, Bongers PM. The relationships between work characteristics and mental health: Examining normal, reversed and reciprocal relationships in a 4-wave study. Work & Stress. 2004;18(2):149-66.
24. Randall R, Nielsen K, Tvedt SD. The development of five scales to measure employees' appraisals of organisational-level stress management interventions. Work & Stress. 2009;23(1):1-23.
25. Bouckenooghe D, Devos G, Van den Broeck H. Organisational change questionnaire–climate of change, processes, and readiness: Development of a new instrument. J Psychol. 2009;143(6):559-99.
26. SPSS. IBM Corp.Released, Statistics for Windows, Version 25.0.Armonk, NY: IBM Corp. 2017.
27. Clarke V, Braun V, Hayfield N. Thematic analysis. Qualitative psychology: A practical guide to research methods. 2015;3:222-48.

28. Lehmann AI, Bauer GF, Brauchli R. Intervention effects for direct and indirect participants in an organisational health intervention: A mixed-methods study. Work & Stress. 2022:1-25.
29. Nielsen K. Leaders can make or break an intervention–but are they the villains of the piece. Leading to occupational health and safety: How leadership behaviours impact organisational safety and well-being. 2017:197-210.
30. Lien M, Saksvik PØ. Healthy change processes—A diary study of five organisational units. Establishing a healthy change feedback loop. Stress Health. 2016;32(4):258-69.
31. Nielsen K, Marzocchi I, Di Tecco C, Vignoli M, Ghelli M, Ronchetti M, et al. Validation of the Intervention Preparedness Tool: a short measure to assess important precursors for successful implementation of organisational interventions. Work & Stress. 2023:1-19.

Appendix

Supplementary table 1: Interview protocol

Implementation factor	Interview (principal & employee)
Design and realisation of action plans	
Appropriate measures	Do you believe the risk assessment identified the most important work stress risks? (principal & employee); To what extent did the participatory group sessions result in appropriate measures? (principal & employee); To what extent did the general action plan with the logic model of change contribute to the selection of appropriate measures? (principal); To what extent were measures as part of the action plan targeted at the most important work stress risks? (principal & employee)
Implementing intervention activities	To what extent were all measures as part of the action plan implemented? (principal & employee); What are the reasons for not implementing planned measures? (principal & employee); To what extent do you believe the measures have led to change regarding the work stress risks and work stress ? (principal & employee)
Implementation strategy	
Monitoring and feedback	To what extent did the monthly feedback report based on the pulse surveys provide insight regarding work stress risks, work stress and the implementation process? (principal); To what extent did these feedback reports result into actions to improve implementation? (principal)
Employee involvement	To what extent did you feel involved with the identification of work stress risks and the selection and implementation of measures? (employee)
Management commitment	To what extent did you feel involved with the identification of work stress risks and the selection and implementation of measures? (principal); To what extent did you feel able to fulfill your role in a satisfactory manner? (principal)
Information and communication	What kind of information was provided to employees about the (progression of the) project? (principal)
Context	
Omnibus context	Wat characterizes the school as compared to other schools? (principal); How would you describe the school culture? (principal)
Discrete context	Have major events occurred during the implementation of the approach? (principal & employee); How did these events influence the (outcomes of) the approach? (principal & employee)
Mental models	
Appraisal of the intervention and its activities (e.g. satisfaction)	To what extent are you satisfied with the approach? (principal & employee); To what extent did the approach meet with you expectations? (principal & employee); What did you value about the approach? And what not? (principal & employee)

Supplementary table 2: Detailed results of process evaluation per school

	School A	School B	School C	School D
Intervention design and implementation				
Fidelity *Were main activities of the approach (installing working group, participation in focus group meetings, behavioural analyses, developing of action plans, regular meeting with working groups, implementing measures) executed according to plan?*	yes	yes	partly no periodic meetings with the working group	no no working group was installed, the school had withdrawn from active participation during the implementation phase
Developing intervention activities *Did the measures as part of the action plan target the main work stress risks? Were the measures considered appropriate?*	yes **interviews:** Most important risks identified? Yes. Group sessions resulted in appropriate measures? Yes. General action plan facilitated selection of measures? Yes. Measures targeted at most important risks? Yes.	yes **interviews:** Most important risks identified? Yes, but risks were not very school specific and not all risks can be solved at school level. Group sessions resulted in appropriate measures? Yes. General action plan facilitated selection of measures? Yes. Measures targeted at most important risks? Yes, but not all risks were targeted due to capacity and time limitations.	partly **interviews:** Most important risks identified? Yes, but identified risks were quite general and not very school specific. Group sessions resulted in appropriate measures? Yes. General action plan facilitated selection of measures? Partly, selected measures were primarily based on school principals' vision. Measures targeted at most important risks? Yes, but questionable	no information

	School A	School B	School C	School D
			whether measures are appropriate to reduce risks, since not al risks can be solved at school level.	
Implementing intervention activities *To what extent were all measures as part of the action plan implemented?*	yes **Interviews:** all measures are implemented as planned.	partly **Interviews:** most measures are implemented as planned but not all due to a lack of time	partly **Interviews:** most measures are implemented as planned.	no **Interviews:** no measures are implemented as part of the project because the pace of the approach did not match the school planning
Implementation strategy				
Monitoring and feedback *Was information regarding the implementation of measures provided to working groups? Did this information result into actions to improve*	yes Response to pulse surveys was high. On average 21.6 employees participated in each pulse survey. Working group received feedback reports of all measurements and actions were taken based on the feedback reports.	partly Response to pulse surveys was high. On average 8.1 employees participated in each pulse survey. Working group did only receive a feedback report of the first measurement. No actions were taken based on the feedback reports.	partly Response to pulse surveys decreased over time. On average 12.7 employees participated in each pulse survey. Working group did only receive a feedback report of the July measurement. No actions were taken based on the feedback reports.	no Response to pulse surveys was low. On average 1.2 employees participated in each pulse survey. The school principal did not receive feedback report. No actions were taken based on the feedback reports.
Management commitment *Was there commitment and support from managers during the approach?*	yes **Interviews**: principal felt very committed to the project **research logs:** no change of management; **T2:** 100% reported high management commitment.	yes **Interviews**: principal felt committed to the project **research logs:** change of management at step 2 of the project.	partly **Interviews**: principal did not feel very committed to the project, because principal was not involved from start **research logs:** Two times change of management during action planning;	no **Interviews**: commitment of principal was high at start but decreased when planning of the approach did no longer match with school planning **research logs:** during the action planning the

	School A	School B	School C	School D
			T2: 54% reported high management commitment.	school principal decided to withdraw from actively participating in the project
Employee involvement *Did employees participate in decision making during the approach?*	partly **Interviews**: employees felt involved in the project **research logs**: high participation in focus groups, high response on all questionnaires and Pulse surveys; **T2:** 70% felt involved in the project; 30% felt able to think along with measures.	partly **Interviews**: employees felt involved in the project **research logs**: high participation in focus groups, high response on all questionnaires and pulse surveys.	partly **Interviews**: employees felt little involved in the project **research logs**: high participation in focus groups, low response on T2 questionnaire and Pulse surveys; **T2:** 38% felt involved in the project; 31% felt able to think along with measures.	no **Interviews**: employees felt not involved in the project **research logs**: high participation in focus groups, low response on T2 questionnaire and pulse surveys.
Information and communication *Was information provided to participants during the implementation of the approach?*	yes **Interviews:** employees were informed about the approach **research logs:** frequent information updates from school principal and working group; **T2:** 87% was informed about the objective, and 91% about the progress of the project.	yes **Interviews:** employees were informed about the approach **research logs**: regular information updates from school principal.	partly **Interviews:** employees were partially informed about the approach **research logs:** sporadic information updates from school principal; **T2:** 54% was informed about the objective, and 38% about the progress of the project.	no **Interviews:** employees were not informed about the approach **research logs:** no information updates from school principal;
Context				
Omnibus context *Did the intervention fit in with the culture and conditions of the school?*	yes	yes	yes	yes

	School A	School B	School C	School D
Discrete context *Did events take place that hindered the implementation of the approach?*	no **interviews:** corona pandemic increased work load; lack of personnel	no **interviews:** corona pandemic increased work load; many changes in personnel	no **interviews:** corona pandemic increased work load; change of management challenged management commitment and shifted the priority of the project.	no **interviews:** corona pandemic increased work load.
Mental models				
Readiness for change *Were participants ready for change during the approach?*	partly Believe that work stress is a problem that should be addressed: **T0**: 85%, **T1**:91%, **T2**: 78% Believe that employees will benefit from approach: **T0**: 65% , **T1:** 69%; **T2:** 57%	partly Believe that work stress is a problem that should be addressed: **T0**: 91%, **T1**: 90%, **T2**: no information Believe that employees will benefit from approach: **T0:** 50%; **T1:** 50%; **T2:** no information	partly Believe that work stress is a problem that should be addressed: **T0**: 83%, **T1**: 74%, **T2**: 69% Believe that employees will benefit from approach: **T0**: 48%; **T1:** 65%; **T2:** 38%	partly Believe that work stress is a problem that should be addressed: **T0**: 92%, **T1**: 94%, **T2**: no information Believe that employees will benefit from approach: T**0**: 8%; **T1**: 53%; **T2**: no information
Appraisal of the intervention and its activities (e.g. satisfaction) *Were participants satisfied with the approach?*	yes **T2:** employees rated satisfaction with the approach a 6.8 (scale 1-10).	no information	partly **T2:** employees rated satisfaction with the approach a 5.9 (scale 1-10).	No information

Chapter 6

Effects of a Participatory Work Stress Prevention Approach for Employees in Primary Education:

Results of a Quasi-Experimental Study

Maartje C. Bakhuys Roozeboom

Noortje M. Wiezer

Roosmarijn M. C. Schelvis

Irene M. Niks

Cécile R. L. Boot

Based on:

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Abstract

Objective: Work stress is a serious problem for employees in primary education. This study evaluates the effects of a work stress prevention approach on emotional exhaustion and work stress determinants (job crafting behaviour, quantitative and emotional demands, leadership, support, autonomy, team culture and feelings of competence), and the impact of implementation success (e.g. management commitment, employee involvement, communication during implementation) on these outcomes.

Methods: A quasi-experimental study was conducted with an intervention group (4 schools, N=102 employees) and a control group (26 schools, N=656 employees) using questionnaires at baseline (T0), one-year (T1) and two-year (T2) follow-up. Multilevel mixed model analyses were performed to test effects of condition and implementation success on changes in emotional exhaustion and work stress determinants between T0 and T2 in the intervention and control group.

Results: No effect were found for emotional exhaustion. Improvement of quality of leadership between T0 and T2 was significantly larger in the intervention compared to the control group. Additionally, implementation success was associated with a decrease in unnecessary demands and an increase in quality of leadership, team culture and job crafting behaviour.

Conclusions: This study shows no direct effect of the approach on emotional exhaustion, but it does show beneficial effects on quality of leadership. Additionally, results suggest that, when successfully implemented, the approach also has beneficial effects on other work stress determinants (ie, job crafting behaviour, unnecessary demands and team culture). Results indicate that – if implemented successfully – the organisational-level intervention has the potential to improve the psychosocial work context.

Key terms: effect evaluation; organisational-level occupational health intervention.

Introduction

Work stress is an urgent issue among workplaces around the globe that can lead to work-related emotional exhaustion. Especially in education, the number of employees reporting work-related emotional exhaustion is high (1), and this can have severe consequences on teachers' health, students and schools (2). Effective interventions are badly needed. Over the past decades research has provided evidence for the importance of interventions to help teachers cope with stressors (3, 4). However, a problem with these kind of interventions is that they do not focus on the underlying source of the problem (5). Organisational-level occupational health interventions however do focus on reducing the causes of work stress (6). During these interventions work stress determinants are identified and tailored actions are implemented to mitigate or remove these determinants. These interventions are characterized by employee participation during all steps of the approach, which is believed to empower employees to improve their working conditions (7, 8) and secures that planned actions fit in with the organisational culture (9, 10). Although these interventions are considered the gold standard (11–13) – and there is evidence for their effectiveness (14) – in practice, they often do not bring about the intended outcomes (15).

A possible explanation for this is the selection of inappropriate actions (ie, actions that do not consist of the effective ingredients to decrease work stress determinants) (16). Ensuring the appropriateness of actions, requires a theory of change (17). In contrast to the abundance of theories linking determinants to health outcomes (eg, work stress), theories linking planned actions to changes in determinants are scarce and seldomly used in organisational-level interventions (6, 18). Therefore, building a logic model of change could be of added value to the work stress prevention approach because it maps the program logic: What needs to change to reduce work stress? What determinants should the measures target? What actions are appropriate to affect the determinants? Answering these questions provides guidance for selecting appropriate actions (19, 20) that can be implemented successfully (21).

Another explanation for organisational-level occupational health interventions not bringing about the intended results is the unsuccessful implementation of the actions (22). Previous research on the application of a similar approach in primary education showed that the implementation of the action plans phase is particularly important, whereas especially during this phase it is difficult to keep employees informed and involved and managers committed (23). Providing feedback on factors that can hinder or facilitate the implementation such as management commitment, employee involvement, and communication (22) could provide the opportunity for implementors to act on hinderances the moment they occur and may reduce the risk of implementation failure (24, 25).

The focus of the current study is an organisational-level occupational health intervention (ie, work stress prevention approach) for primary education. To ensure the selection of appropriate measures and decrease the risk of implementation failure, in the current study this approach is expanded with (i) building a logic model of change to facilitate action planning and (ii) real-time feedback of the implementation process to implementers to prevent implementation failure.

Organisational-level interventions are challenging to evaluate and traditional randomized controlled trial designs often do not match with the dynamics of the organisational context that is hard to control (26). To provide more information on intervention effects in relation to implementation success, several researchers have proposed to use data from the evaluation of the implementation process in the effect evaluation (23, 26–28). They suggest to use data on implementation factors eg, management commitment, employee involvement, and communication as a proxy for the level of implementation, and investigate whether this impacted changes between baseline and follow-up on the outcome measures.

This paper aims to evaluate the effects of this work stress prevention approach that was implemented in primary education workplaces in The Netherlands. The following research questions (RQ) were formulated: *To what extent did the work stress prevention approach in intervention schools reduce emotional exhaustion over a two-year follow up period, compared to control schools (RQ1)? To what extent did the work stress prevention approach in intervention schools change work stress determinants over a two-year follow up period, compared to control schools (RQ2)?*

In addition, RQ were formulated to test whether the implementation process impacted effects of the work stress prevention approach on work stress and work stress determinants: *To what extent is there an association between the level of implementation and effects of the work stress prevention approach on emotional exhaustion between baseline and two-year follow up (RQ3)? To what extent is there an association between the level of implementation and effects of the work stress prevention approach on work stress determinants between baseline and two-year follow up (RQ4)?*

Methods

Study design and study population

In The Netherlands, primary schools generally fall under the governance of larger foundations that provide staff services such as HR practices, personnel recruitment and professional education. Schools each have their own location and can be seen as separate, independent units. This study was initiated by two school foundations and a large research institute in The

Netherlands. A total of 30 primary schools (each with 10–35 employees) fell under the scope of these two school foundations. In total, four schools (one small and one large school from each school foundation) could participate in the intervention group. Schools were recruited to participate as intervention school via an email sent out by the school foundations to all school principals. Schools that applied were in fact a large and a small school from each school foundation, and after their application the recruitment procedure was closed. Reasons for participation were, amongst others, signals of work stress reported by employees. All other 26 schools were appointed as control schools. During the intervention, the heads of the intervention schools were asked not to discuss the progress of the intervention with the heads of the control schools. Teaching and non-teaching employees of all schools were invited to participate in the study. Informed consent was obtained from all individual participants included in the study. The Medical Ethics Committee of the VU University Medical Centre (Amsterdam, The Netherlands) approved the study protocol.

Work stress prevention approach

The full program of the approach has been described previously (29). Figure 1 provides an overview of the steps. During step 1, at each school a working group was formed (consisted of the school principal and 2– 3 employees) that was responsible for action planning (step 3) and implementation (step 4). During step 2, work stress determinants were identified by a risk assessment, and a logic model of change was built by the researchers based on Intervention Mapping (19), by: (i) setting a program objective, (ii) identifying performance objectives (behavioural actions needed to accomplish the program objective), (iii) identifying determinants for the performance objectives and (iv) selecting behavioural change methods to target the determinants. During step 3, possible actions were inventoried by participatory group sessions with all personnel. Based on the results of the participatory group sessions and the logic model of change the research team developed a general action plan for all schools that included several appropriate possible measures. At each of the schools, the working groups selected and specified measures from the general action plan into a school specific action plan. Table 1 provides an overview of the results of the risk assessment translated into actions. During step 4, action plans were implemented by the working groups and monthly pulse surveys were carried out among all employees of the intervention schools, measuring the implementation process, progression on determinants and outcomes. Results at school level were fed back to working groups to optimise implementation and/or (further) tailor the action plan if needed. Step 5 consisted of the evaluation, which is the focus of the present study.

Employees of the intervention schools took part in the work stress prevention approach lasting 30 months, whereas employees of the control schools only participated in the baseline and follow-up measurements. Although these steps were similar for all intervention schools,

the schools differed regarding the planned actions. In this effect evaluation we intend to study the effects of the approach as a whole.

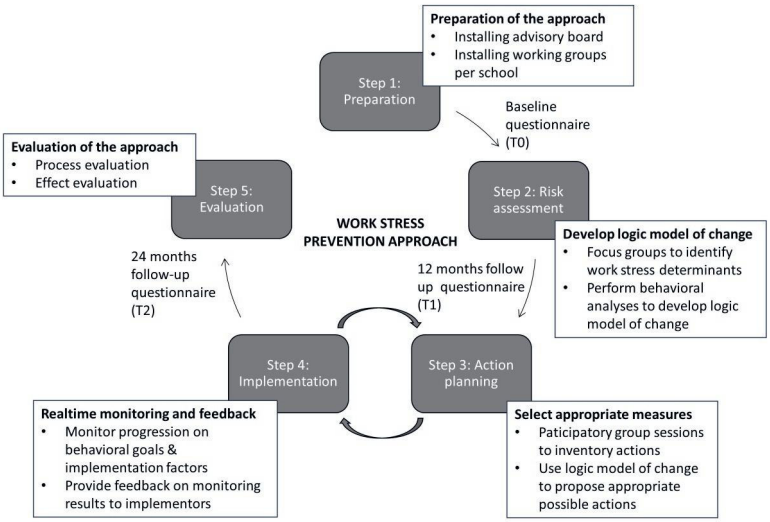

Figure 1: Work stress prevention approach

Table 1: Results of risk assessment translated into measures.

Program goal	Work stress determinants		Behavioral change methods	Measures
	Performance objectives	Determinants based on risk assessment		
Reduce work stress	Manage workload (job crafting behavior; prioritize and adjust tasks, communicate needs, signal overload, set goals)	Job demands (quantitative demands, emotional demands, unnecessary work tasks)	Job re-design	e.g. reduce overlap in administrative tasks; redivide tasks based on competencies
		Organisational resources (leadership, autonomy, safe team culture, social support)	Social support, modelling, teambuilding	e.g. new format performance reviews with principal; teambuilding activities (organising sport activities; giving compliment to colleagues); peer consultation
		Personal factors (feelings of competence)	Self-monitoring, active learning	e.g. individual coaching; training to communicate with parents; monitoring overload and behavioral goals

Sample size

Sample size was calculated according to the number of cases needed for the effect evaluation of the approach on emotional exhaustion, including two groups with respectively 4 (intervention) and 26 (control) clusters. Due to practical and budgetary constraints, 4 schools could be included in the intervention group. The estimated average cluster size was 15 participants (intervention schools: N=60, control schools N=390). Assuming a significance level (α) of 0.05, two-sided tests and power (1-β) of 0.80 and an intraclass correlation coefficient for schools of 0.01, an effect on emotional exhaustion of Cohen's d=0.43 could be detected. A review on burnout prevention programs found effect sizes on emotional exhaustion between d=0.29 and d=1.2 (30). This suggests that the anticipated sample size is sufficient to detect an effect on emotional exhaustion.

Measures

Emotional exhaustion was measured with 5 items of the Utrecht Burnout Scale (UBOS) (31) based on the Maslach Burnout Inventory-General Survey (MBI-GS) (32). The selected subset of items primarily measures the emotional exhaustion component of burnout complaints (e.g. *"I feel emotionally exhausted by my work").* Response scales range from 1 = never to 7 = every day (α=0.87).

Job crafting behaviour was measured by 6 items selected from the Job Crafting Scale (JCS) (33; e.g. "*I make sure that I make optimal use of my capacities").* Response scales range from 1 = totally disagree to 5 = totally agree (α=0.77).

Quantitative demands were measured by 3 items based on the Dutch version of the Job Content Questionnaire (JCQ) (34, 35; e.g. *"Do you have a lot of work to do?")* Response scales range from 1 = never to 4 = always (α=0.78).

Emotional demands were measured by 3 items based on the Copenhagen Psychosocial Questionnaire (36; "*Does your work put you in emotionally disturbing situations?").* Response scales range from 1 = never to 4 = always (α=0.74).

Unnecessary work tasks were measured by 4 items based on The Danish Psychosocial Work Environment Questionnaire (DPQ) (37; e.g. "*Do you spend time on work tasks that you have difficulty seeing the purpose of?").* Response scales range from 1 = to a very large extent to 5 = to a very small extent (α=0.81).

Autonomy was measured by 3 items based on the Dutch version of the JCQ (34, 35; *"Can you decide for yourself how you do your work?"*). Response scales range from 1 = yes regularly to 3 = no (α=0.69).

Co-worker support is measured by 3 items of the Dutch 'Weerbaarheidsmonitor' (38). The items are originally based on the Dutch 'Moreelsvragenlijst van Defensie' (39). Items are slightly adjusted to reflect the work context (e.g. "*I can rely on my colleagues in difficult times").* Response scales range from 1 = totally disagree to 5 = totally agree (α=0.92).

Leadership is measured by two scales. Quality of leadership is measured by 4 items based on the DPQ (37; e.g. "*Does your immediate supervisor give high priority to the wellbeing of employees in the workplace?*"). Response scales range from 1 = to a very large extent to 5 = to a very small extent (α=0.87). *Participatory leadership* is measured by 4 items of the Dutch 'Weerbaarheidsmonitor' (38; e.g. *"The one who supervises me lets me have a say in things that have to do with my work").* Response scales range from 1 = totally disagree to 5 = totally agree (α=0.83).

Safe team culture is measured by 3 items from the Dutch 'Weerbaarheidsmonitor' (38). The items are based on the Psychological Safety Scale (40; e.g. "*Employees in our team can be vulnerable*"). Response scales range from 1 = totally disagree to 5 = totally agree (α=0.85).

Feelings of competence is measured by 2 items based on the Basic Needs Satisfaction at Work Scale (41–43; e.g. "*I do not feel very competent when I am at work*"). Response scales range from 1 = not at all true to 7 = very true (α=0.81).

Implementation process (level of implementation) is measured with 7 items based on the IPM-Q (44) on information ("*I am aware of the objectives of the approach*"), communication ("*I was informed about the progress of the approach*"), team commitment ("*I have the feeling that the team is positive about the approach*"), management commitment ("*I have the feeling that the principal is positive about the approach*"), employee involvement ("*I was involved in the approach*"), participation in decision making ("*I could think along with the actions or changes that were implemented as part of the approach*"), implemented actions ("*I noticed actions or changes being implemented as part of the approach*"), that were constructed into a scale based on factor analyses and reliability analyses. Response scales range from 1 = totally disagree to 5 = totally agree (α=0.90).

Data on potential confounders or effect modifiers were collected at baseline, including age (in years), gender (male, female, other), contract size (number of working hours per week according to contract), function (teacher vs other), job tenure (in years), type of contract [permanent vs temporary (eg, fixed contract, on-call or substitute worker)].

Statistical analyses

To study effects of the work stress prevention approach multilevel mixed model analyses were performed to adjust for clustering of schools using SPSS version 25 (IBM Corp, Armonk, NY, USA). For all analyses, a value of P<0.05 was indicated as statistically significant. Covariates to include in the analyses were selected based on the "change-in-estimate" approach. In this

approach covariate selection decisions are made based upon whether inclusion of a covariate changes the estimate of the causal effect for the exposure with ≥10%. Additionally, based on forward selection covariates were added to the model starting with the covariates that changed the estimate of the causal effect for the exposure the most. Based on this approach the covariates age, contract size and function were included in the analyses.

To investigate RQ1 and RQ2, multivariate mixed model analyses were carried out for emotional exhaustion and work stress determinants with time (T0, T1, T2) and time × condition (intervention versus control) as independent variables. To investigate RQ3 and RQ4, multivariate mixed model analyses were carried out for emotional exhaustion and work stress determinants with time (T0, T1, T2) and time × implementation process as independent variables. In these analyses, the control group received the minimum score on the implementation process scale (score=1). The mixed model analysis method is robust against missing data in the dependent variable because, for maximum likelihood estimations, all observed data in the outcome are used to obtain the parameter estimates for the model.

Results

Participant flow

Since the approach was expected to have an effect at school level, data from new respondents at T1 and T2 were included in the analyses. Figure 2 outlines the participants flow.

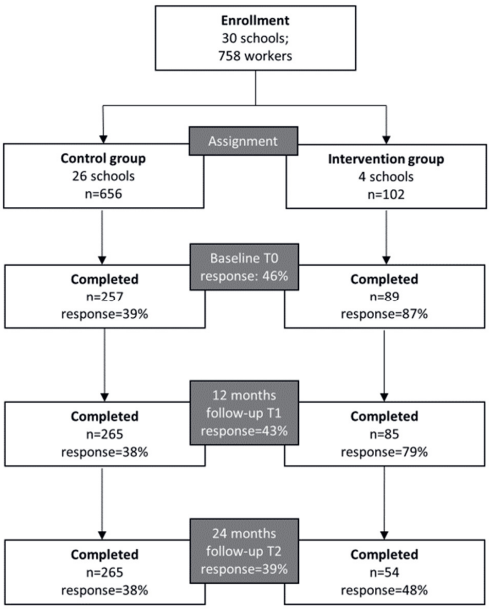

Figure 2: Participant flow of the study

Descriptive statistics

Table 2 shows the baseline characteristics of the study population. The control group comprised more employees with a long job tenure (>20 years) than the intervention group.

Table 2: Descriptive characteristics of control group and intervention group at T0. [SD=standard deviation.]

	Control group (26 schools; N=257)		Intervention group (4 schools; N=89)		Total (30 schools; N=246)	
	% [a]	Mean [b] (SD)	% [a]	Mean [b] (SD)	% [a]	Mean [b] (SD)
Gender (female)	86.8		93.3		88.4	
Age (in years)		42.5 (11.80)		39.7 (12.06)		41.7 (11.91)
Function (teacher)	72.0		76.4		73.1	
Type of contract (permanent)	89.5		86.5		88.7	
Contract size (in hours per week)		26.5 (9.38)		27.0 (9.79)		26.6 (9.47)
Job tenure (years)						
<1	8.6		13.5		9.8	

	Control group (26 schools; N=257)		Intervention group (4 schools; N=89)		Total (30 schools; N=246)	
	% [a]	Mean [b] (SD)	% [a]	Mean [b] (SD)	% [a]	Mean [b] (SD)
1–5	25.3		28.1		26.0	
5–10	12.5		19.1		14.2	
10–20	32.3		30.3		31.8	
>20	21.4 [c]		9.0 [c]		18.2	

a Percentages are column percentages, and are tested with the Pearson χ^2-test (horizontal comparisons); b Means are tested with the t-test; c P<0.05.

Means and standard deviations (SD) of the control group and intervention group at all measurements are presented in table 3. At baseline the intervention group scored higher on job crafting behaviour, and lower on feelings of competence compared to the control group.

Table 3: Means and standard deviations (SD) of work stress, work stress determinants and level of implementation of the control and intervention group[a] at T0, T1 and T2.

	Control group		Intervention group	
	Mean (SD)	N	Mean (SD)	N
Emotional exhaustion (range: 1–7)				
T0	2.58 (1.20)	257	2.61 (1.31)	89
T1	2.43 (1.22)	265	2.57 (1.16)	85
T2	2.55 (1.23)	265	2.49 (1.29)	54
Job crafting behavior (range: 1–5)				
T0	3.83 (0.51) [b]	257	3.97 (0.48) [b]	89
T1	3.77 (0.51) [b]	265	3.93 (0.51) [b]	85
T2	3.77 (0.50)	265	3.87 (0.49)	54
Quantitative demands (range: 1–4)				
T0	2.57 (0.61)	257	2.64 (0.54)	89
T1	2.51 (0.58)	265	2.61 (0.56)	85
T2	2.59 (0.59)	265	2.64 (0.59)	54
Emotional demands (range: 1–4)				
T0	2.14 (0.54)	257	2.08 (0.48)	89
T1	2.08 (0.53)	265	2.14 (0.54)	85
T2	2.17 (0.54)	265	2.19 (0.57)	54
Unnecessary worktasks (range: 1–5)				
T0	2.24 (0.75)	257	2.10 (0.77)	89
T1	2.04 (0.82)	265	2.03 (0.72)	85
T2	2.09 (0.79)	265	1.88 (0.85)	54
Autonomy (range: 1–3)				
T0	2.56 (0.42)	257	2.49 (0.39)	89

	Control group		Intervention group	
	Mean (SD)	N	Mean (SD)	N
T1	2.60 (0.41) [b]	265	2.47 (0.41) [b]	85
T2	2.52 (0.42)	265	2.54 (0.45)	54
Co–worker support (range: 1–5)				
T0	4.31 (0.66)	257	4.27 (0.70)	89
T1	4.30 (0.71)	265	4.31 (0.67)	85
T2	4.23 (0.69)	265	4.40 (0.69)	54
Safe teamculture (range: 1–5)				
T0	4.05 (0.64)	257	4.05 (0.64)	89
T1	4.07 (0.65)	265	4.04 (0.66)	85
T2	3.97 (0.71)	265	4.15 (0.70)	54
Participatory leadership (range: 1–5)				
T0	3.75 (0.78)	257	3.87 (0.64)	89
T1	3.84 (0.74)	265	3.80 (0.71)	85
T2	3.73 (0.80) [b]	265	4.01 (0.73) [b]	54
Quality of leadership (range: 1–5)				
T0	3.69 (0.75)	257	3.72 (0.65)	89
T1	3.78 (0.70)	265	3.88 (0.61)	85
T2	3.60 (0.76) [b]	265	4.02(0.56) [b]	54
Feelings of competence (range: 1–7)				
T0	4.08 (0.58) [b]	257	3.90 (0.71) [b]	89
T1	4.05 (0.68)	265	3.96 (0.64)	85
T2	4.09 (0.64)	265	4.06 (0.66)	54
Implementation process (range: 1–5)				
T2	1.00 (0.00)	265	3.49 (0.72)	52
Implementation process items (range: 1–5):				
Implemented actions (T2)	1.00 (0.00)	265	2.96(1.05)	52
Information (T2)	1.00 (0.00)	265	3.83(0.79)	52
Communication (T2)	1.00 (0.00)	265	3.58(0.10)	52
Team commitment (T2)	1.00 (0.00)	265	3.27(0.82)	52
Management commitment (T2)	1.00 (0.00)	265	3.96(0.84)	52
Employee involvement (T2)	1.00 (0.00)	265	3.42(1.02)	52
Participation in decision–making (T2)	1.00 (0.00)	265	3.12(1.02)	52

a Differences between means of control group and intervention group are tested with the t-test; b P<0.05

Effects related to condition

Results of the multivariate mixed model analyses are presented in table 4. No statistically significant intervention effect related to condition was found on emotional exhaustion (RQ1). This implies that there was no statistically significant difference between the intervention group and the control group on the level of emotional exhaustion at T2 as compared to T0. There was a statistically significant difference between the intervention group and the control group on leadership quality at T2 as compared to T0, in favor of the intervention group (β=-0.380) (RQ2). For the other work stress determinants, no intervention effects related to condition were found.

Effects related to implementation process

No statistically significant effects of the implementation process were found for emotional exhaustion (RQ3) and quantitative demands, emotional demands, autonomy and feelings of competence (RQ4). This implies that there was no statistically significant difference between employees in schools with high levels of implementation success compared to employees in schools with low levels of implementation success on these outcome measures at T2 as compared to T0.

Table 4: Results of multivariate mixed model analyses, controlled for age. contract size and function. [CI=confidence interval; RQ=research question.]

	Time × Group [a]			Time × Implementation [b]		
	Regression coefficient (B)	95% CI	P-value	Regression coefficient (B)	95% CI	P-value
	RQ1			**RQ3**		
Emotional exhaustion	0.006	-0.345–0.357	0.974	-0.112	-0.266–0.043	0.155
	RQ2			**RQ4**		
Job crafting behavior	-0.091	-0.248–0.065	0.248	0.073 [d]	0.007–0.139	0.032
Quantitative demands	-0.057	-0.250–0.135	0.553	-0.018	-0.095–0.060	0.652
Emotional demands	-0.013	-0.171–0.145	0.870	-0.001	-0.067–0.066	0.985
Unnecessary demands	0.238	-0.053–0.529	0.106	-0.125 [d]	-0.243– -0.007	0.038
Leadership quality	-0.380 [d]	-0.685 – -0.075	0.016	0.178 [e]	0.053–0.302	0.006
Participatory leadership	-0.255 [c]	-0.533–0.022	0.071	0.129 [d]	0.014–0.244	0.028
Co-worker support	-0.079	-0.342–0.184	0.549	0.100 [c]	-0.008–0.208	0.070
Autonomy	-0.006	-0.163–0.151	0.938	-0.038	-0.104–0.028	0.252
Safe team culture	-0.082	-0.334–0.170	0.518	0.113 [d]	0.009–0.217	0.033

	Time × Group [a]			Time × Implementation [b]		
	Regression coefficient (B)	95% CI	P-value	Regression coefficient (B)	95% CI	P-value
Feelings of competence	0.075	-0.124–0.274	0.454	0.048	-0.035–0.131	0.251

a Time (T2 vs baseline) × group (control vs intervention); b Time (T2 vs baseline) × implementation; c P<0.1.; d P<0.05.; e P<0.01.

However, statistically significant effects of the implementation process were found for unnecessary demands (β=-0.125), quality of leadership (β=0.178), participatory leadership (β=0.129), safe team culture (β=0.113) and for job crafting behaviour (β=0.073) in the expected favorable direction. Employees in organisations with high levels of implementation process showed a more favorable change between T0 and T2 on these work stress determinants than employees in organisations with low levels of implementation.

Discussion

The current study aimed to evaluate the effectiveness of a work stress prevention approach in primary education. When comparing intervention and control group, no effect of the approach on emotional exhaustion and most of the work stress determinants were found. However, results do show beneficial effects on quality of leadership. This is an important finding since it is known from literature that leadership is strongly related to work stress of subordinates (45). Furthermore, when taking into account the implementation process, results show that a high score on the implementation process (suggesting a more successful implementation process) was again associated with an increase in quality of leadership but also with a decrease in unnecessary demands and an increase in safe team culture and job crafting behaviour. These findings suggest that, when implemented successfully (that is, when employees are informed and involved, team and management is considered committed, and employees noticed actions or changes being implemented), the work stress prevention approach is potentially effective in decreasing work stress determinants.

There are several explanations for not finding statistically significant effects between the intervention and control group on emotional exhaustion and most of the work stress determinants. The COVID-19 pandemic (started after T1) affected the ability of schools to give priority to the action plans. Consequently, looking at the separate implementation process items, especially the score on the item regarding noticeable changes or actions being implemented as part of the approach was relatively low. The process evaluation demonstrated that the level of implementation of the approach varied greatly across the intervention schools and at some of the intervention schools, few actions were implemented (Bakhuys Roozeboom et al, 2023, submitted for publication). A low level of implementation

of the approach obviously limited the effects the intervention was possible to bring about. Additionally, the response on the T2 questionnaire was relatively low affecting the statistical power to detect changes, which may also explain why overall effects of the approach on emotional exhaustion and most of the work stress determinants between the intervention group and control group could not be found.

Considering these circumstances, it is particularly interesting that effects on quality of leadership were found. From the results it is not clear what impacted the increase in (perceived) quality of leadership. This could be caused by the implemented actions, but it is also possible that employees have appreciated their leader taking part in the approach, and this positively impacted their perspective on quality of leadership. Either way this is an interesting finding, because besides their potential direct impact on employees' wellbeing and stress, leaders also have an important role in organisational-level interventions (46). Since the work stress prevention approach is aimed to have a cyclical nature, the increase in quality of leadership may be a positive indicator of sustainable change.

Looking at the analyses that took into account the implementation process, as a proxy for the level of implementation (RQ3 and RQ4), results show that the level of implementation success does predict changes in the expected favorable direction on most of the work stress determinants. These findings suggest that, when implemented successfully (that is, when employees are informed and involved, team and management is considered committed, and employees noticed actions or changes being implemented), the work stress prevention approach is potentially effective in decreasing work stress determinants as identified in the logic model of change that may reduce emotional exhaustion in a longer term. Finding effects on secondary outcomes (work stress determinants), but not on primary outcomes (emotional exhaustion), appears to be a common phenomenon according to a recent review of reviews on organisational-interventions to improve the psychosocial work environment (14). A possible explanation for not finding a direct effect of the approach on emotional exhaustion could be related to the timing of the measurements. That is, to be able to detect effects on secondary as well as primary outcomes requires adequate timing of the measurements (47). However, optimal timing is often difficult to determine with these type of interventions, due to the fact that some effects of measures manifest themselves earlier than others. An additional follow-up measurement could be recommended to investigate longer-term effects of the approach, also on primary outcomes.

An important strength of the study is that in addition to per protocol analyses this study also researched the impact of implementation success on the effects of the approach. Although several researchers recommend these type of analyses, they are often lacking in effect evaluations (26). This study illustrates the importance of these type of analyses because they provide valuable additional information to draw conclusions on the effectiveness of interventions in relation to their implementation. Without these analyses, there is a risk of

wrongly labeling interventions as not effective, while in practice they potentially are effective when implemented successfully.

Another strength of the study is that a logic model of change was built during the approach to select appropriate actions that targeted work stress as well as work stress risks. Consequently, the effect evaluation not only focused on effects of the approach on emotional exhaustion but also on specific work stress risks as determined in the logic model of change. This provided more insights into the mechanism of how the intervention works.

There are also some limitations that need to be considered. Since effects were hypothesized to occur at school level, data from new respondents were included in the analyses. This limited negative effects of drop-out (due to the long follow-up period between baseline and T1 and T2) on the statistical power to detect changes. However, the low response on the T2 questionnaire, did negatively affect the statistical power, and may also have resulted in a selection bias. Furthermore, the lack of randomization may have caused unknown confounders to be unevenly distributed across groups. The fact that intervention schools were the first to voluntarily apply for participation and that they scored higher on job crafting behaviour at baseline, may indicate that these schools were more willing to address work stress and more open for change, which may have contributed to the study results. This is in line with what is already known from literature, namely that willingness to participate is an important prerequisite for organisational intervention to be successful.

Another limitation is the unevenly distributed number of schools in the intervention and control group. In the analyses to investigate the association between the level of implementation and progression of emotional exhaustion and work stress determinants between baseline and T2 (RQ3 and RQ4), the control group received the minimum score on implementation process scale (score=1). A disadvantage of this procedure is that the analyses are dominated by a large control group with a score of 1 (low variance). However, this procedure was chosen to maintain the same study population used to investigate RQ1 and RQ2. Moreover, this procedure makes optimal use of the power to detect changes.

Concluding remarks

Despite the limitations the study has provided interesting insights. Although the study shows no direct effect of the approach on emotional exhaustion, results indicate that the approach has beneficial effects on (perceived) quality of leadership. In addition, results suggest that, when successfully implemented, the approach also has beneficial effects on several of the other work stress determinants. These results not only underline once more the importance of successful implementation of these kind of approaches, but also illustrate the need of including the level of implementation when studying the (potential) effectiveness of these type of approaches.

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Data collected and used for this study are available on request from the corresponding author. The data are not publicly available due to their containing information that could compromise the privacy of research participants.

Declaration of interest

The authors declare no competing interests.

Authors' contribution

MBR conducted the study and was responsible for data collection and drafting the article. RS, NW, IN, and CB provided intellectual input and edited the article. All authors provided comments on the draft versions. All authors have read and approved the final version of the manuscript.

References

1. Herman KC, Prewett SL, Eddy CL, Savala A, Reinke WM. Profiles of middle school teacher stress and coping: Concurrent and prospective correlates. J School Psychol. 2020;78:54–68. https://doi.org/10.1016/j.jsp.2019.11.003.
2. Greenberg MT, Brown JL, Abenavoli RM. Teacher stress and health effects on teachers, students, and schools. Edna Bennett Pierce Prevention Research Center, Pennsylvania State University. 2016:1–12.
3. Hepburn S, Carroll A, McCuaig-Holcroft L. A complementary intervention to promote wellbeing and stress management for early career teachers. Int J Environ Res Public Health. 2021;18(12):6320. https://doi.org/10.3390/ijerph18126320.
4. Oliveira S, Roberto MS, Veiga-Simão AM, Marques-Pinto A. A meta-analysis of the impact of social and emotional learning interventions on teachers' burnout symptoms. Educ Psychol Rev. 2021;33(4):1779–808. https://doi.org/10.1007/s10648-021-09612-x.
5. Sinclair RR, Cheung JH, Cox A. Defining healthy schools: An occupational health psychology perspective on healthy school climates. Educator Stress: An Occupational Health Perspective. 2017:293–317. https://doi.org/10.1007/978-3-319-53053-6_13.
6. Nielsen K. How can we make organisational interventions work? Employees and line managers as actively crafting interventions. Hum Relat 2013;66(8):1029–50. https://doi.org/10.1177/0018726713477164.
7. Nielsen K, Randall R, Albertsen K. Participants' appraisals of process issues and the effects of stress management interventions. Int J Ind Occup Org Psych. 2007;28(6):793–810. https://doi.org/10.1002/job.450.
8. Nielsen K, Noblet A. Chapter Introduction: Organisational interventions: Where we are, where we go from here? In: Organisational Interventions for Health and Well-being. Taylor & Francis; 2018. https://doi.org/10.4324/9781315410494.
9. Peters SE, Nielsen KM, Nagler EM, Revette AC, Madden J, Sorensen G. Ensuring organisation-intervention fit for a participatory organisational intervention to improve food service workers' health and wellbeing: Workplace organisational health study. J Occ Environ Med. 2020;62(2):e33–45. https://doi.org/10.1097/JOM.0000000000001792.
10. Roodbari H, Axtell C, Nielsen K, Sorensen G. Organisational interventions to improve employees' health and wellbeing: A realist synthesis. Appl Psychol. 2022;71(3):1058–81. https://doi.org/10.1111/apps.12346.
11. International Labour Office (ILO). Guidelines on occupational safety and health management systems (ILO-OSH 2001). Geneva, Switzerland: ILO; 2001.
12. Health and Safety Executive: Managing the causes of work-related stress: A step-by-step approach using the management standards. 2007, Great Britain: HSE, 2.
13. WHO guidelines on mental health at work. Geneva: World Health Organisation; 2022.

14. Aust B, Møller JL, Nordentoft M, Frydendall KB, Bengtsen E, Jensen AB, et al. How effective are organisational-level interventions in improving the psychosocial work environment, health, and retention of workers? A systematic overview of systematic reviews. Scand J Work Environ Health. 2023;49(5):315–29. https://doi.org/10.5271/sjweh.4097.
15. Semmer NK. Job stress interventions and organisation of work. Handbook of occupational health psychology. 2003:325–53. https://doi.org/10.1037/10474-016.
16. Cox T, Taris TW, Nielsen K. Organisational interventions: Issues and challenges. Work Stress. 2010;24(3):217–8. https://doi.org/10.1080/02678373.2010.519496.
17. von Thiele Schwarz U, Richter A, Hasson H. Getting everyone on the same page: Cocreated program logic (COP). In: Organisational Interventions for Health and Well-being. Taylor & Francis; 2018. https://doi.org/10.4324/9781315410494-3.
18. Karanika-Murray M, Biron C. The nature of change in organisational health interventions: Some observations and propositions. Salutogenic organisations and change: The concepts behind organisational health intervention research. 2013:239–58. https://doi.org/10.1007/978-94-007-6470-5_13.
19. Bartholomew Eldredge LK, Markham CM, Ruiter RAC, Fernández ME, Kok G, Parcel GS. Planning health promotion programs: an intervention mapping approach. John Wiley & Sons; 2016.
20. van Doorn RR, Massar K, Kok G. Gedragsverandering binnen organisaties: Kan intervention mapping een bijdrage leveren aan het ontwikkelen van effectieve interventies? [Behaviour change within organisations: Can intervention mapping contribute to the development of effective interventions?] Gedrag en Organ. 2018. https://doi.org/10.5117/2018.031.002.003.
21. Bakhuys Roozeboom MC, Wiezer NM, Boot CR, Bongers PM, Schelvis RM. Use of intervention mapping for occupational risk prevention and health promotion: a systematic review of literature. Int. J Environ Res Public Health. 2021;18(4):1775. https://doi.org/10.3390/ijerph18041775.
22. Nielsen K, Randall R, Holten A, González ER. Conducting organisational-level occupational health interventions: What works? Work Stress. 2010;24(3):234–59. https://doi.org/10.1080/02678373.2010.515393.
23. Bakhuys Roozeboom MC, Schelvis R, Houtman IL, Wiezer NM, Bongers P. Decreasing employees' work stress by a participatory, organisational-level work stress prevention approach: a multiple-case study in primary education. BMC Public Health. 2020;20(1):676. https://doi.org/10.1186/s12889-020-08698-2.
24. Lien M, Saksvik PØ. Healthy change processes-A diary study of five organisational units. Establishing a healthy change feedback loop. Stress Health. 2016;32(4):258–69. https://doi.org/10.1002/smi.2698.
25. Tafvelin S, von Thiele Schwarz U, Nielsen K, Hasson H. Employees' and line managers' active involvement in participatory organisational interventions: Examining direct,

reversed, and reciprocal effects on well-being. Stress Health. 2019;35(1):69–80. https://doi.org/10.1002/smi.2841.
26. Schelvis RM, Hengel, Oude Hengel, Karen M, Burdorf A, Blatter BM, Strijk JE, van der Beek, Allard J. Evaluation of occupational health interventions using a randomized controlled trial: challenges and alternative research designs. Scand J Work Environ Health. 2015:491–503. https://doi.org/10.5271/sjweh.3505.
27. Randall R, Griffiths A, Cox T. Evaluating organisational stress-management interventions using adapted study designs. Eur J Work Org Psychol. 2005;14(1):23–41. https://doi.org/10.1080/13594320444000209.
28. Huijs JJ, Houtman IL, Taris TW, Blonk RW. Effect of a participative action intervention program on reducing mental retirement. BMC Public Health. 2019;19(1):194. https://doi.org/10.1186/s12889-019-6522-x.
29. Bakhuys Roozeboom MC, Niks IMW, Schelvis RMC, Wiezer NM, Boot CRL. Design of a Participatory Organisational-Level Work Stress Prevention Approach in Primary Education. Front Psychol. 2022 Mar 30;13:827278. https://doi.org/10.3389/fpsyg.2022.827278.
30. Awa WL, Plaumann M, Walter U. Burnout prevention: A review of intervention programs. Patient Educ Couns. 2010;78(2):184–90. https://doi.org/10.1016/j.pec.2009.04.008.
31. Schaufeli WB, van Dierendonck D. UBOS Utrechtse Burnout Schaal: Handleiding. Swets Test Publishers; 2000.
32. Maslach C, Jackson SE, Leiter MP, Schaufeli WB, Schwab RL. Maslach burnout inventory. Consulting Psychologists Press Palo Alto, CA; 1986.
33. Tims M, Bakker AB, Derks D. Development and validation of the job crafting scale. J Vocat Behav. 2012;80(1):173–86. https://doi.org/10.1016/j.jvb.2011.05.009.
34. Karasek R. Job content questionnaire and user's guide. Department of Industrial systems Engineering, University of Southern California, Los Angeles. 1985.
35. Karasek Jr RA. Job demands, job decision latitude, and mental strain: Implications for job redesign. Adm Sci Q. 1979:285–308. https://doi.org/10.2307/2392498.
36. Kristensen TS, Hannerz H, Høgh A, Borg V. The Copenhagen Psychosocial Questionnaire-a tool for the assessment and improvement of the psychosocial work environment. Scand J Work Environ Health. 2005:438–49. .https://doi.org/10.5271/sjweh.948.
37. Clausen T, Madsen IE, Christensen KB, Bjorner JB, Poulsen OM, Maltesen T, et al. The Danish Psychosocial Work Environment Questionnaire (DPQ): Development, content, reliability and validity. Scand J Work Environ Health. 2019 Jul 1;45(4):356–69. https://doi.org/10.5271/sjweh.3793.
38. Delahaij R, Binsch O, Kamphuis W. Weerbaarheidsmonitor voor de politie. Soesterberg: TNO; 2012. Report No.: TNO 2012 M10280.
39. van Boxmeer L, Verwijs C, Bruin Rd, Duel J, Euwema MC. A direct measure of morale in the Royal Netherlands Armed Forces Morale survey: Theoretical puzzle, emperical

testing and validation. Paper presented at the International Military Testing Association (IMTA) Annual Conference, Gold Coast, Australia; 2007.

40. Baer M, Frese M. Innovation is not enough: Climates for initiative and psychological safety, process innovations, and firm performance. Int J Ind Occup Org Psych . 2003;24(1):45–68. https://doi.org/10.1002/job.179.
41. Deci EL, Ryan RM, Gagné M, Leone DR, Usunov J, Kornazheva BP. Need satisfaction, motivation, and well-being in the work organisations of a former eastern bloc country: A cross-cultural study of self-determination. Person Soc Psychol Bull. 2001;27(8):930–42. https://doi.org/10.1177/0146167201278002.
42. Ilardi BC, Leone D, Kasser T, Ryan RM. Employee and supervisor ratings of motivation: Main effects and discrepancies associated with job satisfaction and adjustment in a factory setting 1. J Appl Soc Psychol. 1993;23(21):1789–805. https://doi.org/10.1111/j.1559-1816.1993.tb01066.x.
43. Kasser T, Davey J, Ryan RM. Motivation and employee-supervisor discrepancies in a psychiatric vocational rehabilitation setting. Rehabil Psychol. 1992;37(3):175. https://doi.org/10.1037/h0079104.
44. Randall R, Nielsen K, Tvedt SD. The development of five scales to measure employees' appraisals of organisational-level stress management interventions. Work Stress. 2009;23(1):1–23. https://doi.org/10.1080/02678370902815277.
45. Harms PD, Credé M, Tynan M, Leon M, Jeung W. Leadership and stress: A meta-analytic review. Leadership Q. 2017;28(1):178–94. https://doi.org/10.1016/j.leaqua.2016.10.006.
46. Christensen M, Innstrand ST, Saksvik PØ, Nielsen K. The line manager's role in implementing successful organisational interventions. Span J Psychol. 2019;22:E5. https://doi.org/10.1017/sjp.2019.4.
47. De Lange AH, Taris TW, Kompier MA, Houtman IL, Bongers PM. The relationships between work characteristics and mental health: Examining normal, reversed and reciprocal relationships in a 4-wave study. Work Stress. 2004;18(2):149–66. https://doi.org/10.1080/02678370412331270860.

Chapter 7

General Discussion

Maartje C. Bakhuys Roozeboom

General Discussion

Organisational-level interventions are considered the gold standard to prevent and decrease work stress. These interventions follow a stepwise approach in which work stress risks are identified and action plans containing tailored measures are implemented to mitigate or remove these risks. Although there is evidence for their effectiveness (1, 2), these interventions are at risk of program failure due to the selection of inadequate measures and/or due to implementation failure during the implementation of the action plans. Innovations in organisational-level interventions to optimise the selection of measures and the implementation of action plans, could potentially reduce the risk of program failure and make these interventions more effective. The main aim of this thesis was to increase our understanding of how organisational-level work stress interventions can be designed and implemented to effectively decrease work stress in primary schools, and to investigate innovations that can optimise these interventions. The objectives were:

- To explore the effects of an organisational-level work stress intervention (version 1) in primary schools to decrease work stress (**chapter 2**);
- To explore the relation between design, implementation and effects of occupational risk prevention and health promotion interventions (**chapter 3**);
- Use insights of chapter 2 and 3 to design (**chapter 4**) an organisational-level work stress intervention (version 2) to decrease work stress, with innovative aspects to prevent program failure due to inadequate measures or due to implementation failure of the action plans, and evaluate the implementation process (**chapter 5**) and effects (**chapter 6**) in primary schools.

In this chapter, the results of the separate studies in relation to these objectives are discussed. In addition, several reflections are made on preventing program failure due to inadequate measures or due to implementation failure of the action plans based on the findings from our studies. Additionally, conclusions are drawn regarding the value of organisational-level work stress interventions to decrease work stress in primary schools based on our study results. Furthermore, methodological strengths and limitations of our studies are considered. To conclude, recommendations are made for practice and directions for future research are discussed.

Part 1: Exploring effects of an organisational-level work stress intervention (version 1) in primary schools

As described in **chapter 2,** the effects of a participatory organisational-level work stress intervention (i.e. work stress prevention approach) on job demands, resources, work stress

and job satisfaction were investigated in five primary schools in the Netherlands. Although no effect on the primary outcome emotional exhaustion was found, the approach appeared to have positive effects on job demands and job satisfaction. The study showed that the implementation process was challenging and effects of the approach were dependent on the implementation success. This could imply that a more successful implementation may have resulted in more effects on work stress determinants and emotional exhaustion. Results of the study suggests that the approach has potential to improve the psychosocial work context. However, improvements to the approach are needed to make it more effective.

Part 2: Exploring the relation between design, implementation and effects of occupational risk prevention and health promotion interventions

To further improve the work stress prevention approach to decrease work stress in primary education, we aimed to gain more insights into the design, implementation and effects of interventions within the broader occupational health domain. To this purpose, as described in **chapter 3**, the relation between design, implementation and effects of occupational risk prevention and health promotion interventions was explored. We focused on interventions that used Intervention Mapping for the planning of the intervention. Intervention mapping (IM) is a method to systematically design interventions that is regularly applied within the public health domain. We aimed to investigate whether IM is effectively used within the occupational safety and health domain as well. To answer this question, the fidelity of the use of the intervention mapping protocol to design occupational risk prevention and health promotion interventions, and their implementation success and effects were explored.

Although the study was quite explorative in nature, several conclusions can be drawn that are relevant for planning occupational risk prevention and health promotion interventions including organisational-level interventions aimed at work stress prevention. Results suggest that organising a participative approach and planning implementation is difficult in practice. In addition, results imply that a theory-based approach as part of the intervention development, although this is considered as a complex and time-consuming procedure, may ultimately pay off, resulting in a tailored intervention that matches the target group.

Part 3: Design, process and effect of an organisational-level work stress intervention (version 2) to decrease work stress in primary schools

Design of the work stress prevention approach (version 2)

Based on the lessons learned from chapter 2 and 3, in **chapter 4** an adjusted work stress prevention approach (version 2) was developed to be implemented in primary schools to decrease work stress. This version of the approach contained innovative aspects to prevent program failure due to inadequate measures or due to implementation failure of the action plans. The approach consisted of the general five steps: *1) preparation*: installing an advisory

board and working groups, *2) risk assessment*: inventory of work stress risks, 3) *action planning*: conducting an action plan with appropriate measures to target work stress risks, 4) *implementation*: implementing the action plan, and 5) *evaluation*: conducting a process and effect evaluation.

To prevent program failure due to inadequate measures, an innovation was added to the risk assessment phase: a logic model of change was built to facilitate the selection of appropriate measures. This was expected to increase the potential effect of the action plans on work stress risks (proximal outcomes) and eventually on work stress (distal outcome). During the implementation of the action plans, working groups received feedback based on real-time monitoring data regarding the progress of the (behavioral) performance objectives and work stress risks that the measures aimed for. The working groups could use this feedback to adjust and optimise the action plans.

To prevent implementation failure during the implementation of the action plans, an innovation was added to the implementation phase: working groups received monthly feedback regarding several implementation factors, based on the real-time monitoring data. This feedback could be used by the working groups to monitor the implementation process and take timely actions to improve the implementation when needed.

The approach was implemented in 4 primary schools in the Netherlands. A process evaluation was carried out using quantitative and qualitative data to investigate the implementation process of the approach. The effects of the approach were studied in a quasi-experimental study with an intervention group and a control group using questionnaires at baseline (T0), one-year (T1) and two-year (T2) follow-up. According to the logic model of change, effects of the approach on proximal as well as distal outcomes were investigated.

Process and effect

Regarding the implementation process of the work stress prevention approach (version 2), results of the process evaluation (**chapter 5**) showed that the level of implementation of all steps of the approach varied substantially between schools and was hindered by the intervention context, school size, and planning of the approach. Management commitment and employee involvement appeared important factors for successful implementation. Real-time feedback during the implementation of action plans appeared valuable to further improve implementation, but not to prevent implementation failure.

Effects of the work stress prevention approach (version 2) were investigated on emotional exhaustion and work stress determinants as identified in the risk assessment (i.e. job crafting behavior, quantitative and emotional demands, quality of leadership, support, autonomy, team culture and feelings of competence) (**chapter 6**). Additionally the impact of implementation success (e.g. management commitment, employee involvement, communication during implementation) on emotional exhaustion and work stress

determinants was studied as well. The effect evaluation showed no effects of the approach on emotional exhaustion. However, the approach appeared to have positive effects on quality of leadership. In addition, the implementation process appeared to have a significant impact on the effects of the approach. Results showed that implementation success was associated with a decrease in several of the work stress risks.

Reflection on findings

In the following paragraphs reflections are made on the findings of this thesis. Since the work stress prevention approach (version 2) was specifically designed to prevent program failure due to inadequate measures or due to implementation failure of the action plans, several reflections are made on whether the studied approach succeeded in this respect, and what we can learn from the results of our study. In addition, conclusions are drawn regarding the value of the approach to decrease work stress in primary schools using a participatory organisational-level work stress interventions based on the results of the studies in this thesis.

Program failure due to inadequate measures

In this thesis, program failure due to inadequate measures referred to situations where the action plan did not achieve to accomplish the intended outcomes, as a result from flaws in the design of the action plan regardless of the implementation. This can occur when measures do not target the most important work stress risks, or when measures are not adequate to decrease these risks.

To decrease this risk of program failure due to inadequate measures, a logic model of change was built as part of the risk assessment of the approach (version 2) to facilitate the selection of measures. This required adequate specification of what needed to change. Decreasing work stress risks often requires different actors within the organisation to take specific behavioral actions (e.g. employees and managers prioritizing tasks, taking breaks, and providing constructive feedback). Specifying the needed behavioral changes was expected to facilitate selecting appropriate measures to accomplish these changes (3). For this reason, a logic model of change was developed by the researchers during the action planning phase, based on Intervention Mapping (IM) (4), by (i) setting a program objective (i.e. decrease work stress among primary school workers), (ii) identifying performance objectives (behavioral actions needed to accomplish the program objective, i.e. manage workload), (iii) identifying determinants for the performance objectives (i.e. job demands, organisational resources, personal factors) and (iv) selecting methods to target the determinants (i.e. job re-design). This resulted in a general action plan, in which the rationale behind the proposed measures was mapped out. Together with results from participatory group sessions with all personnel

in which possible measures were inventoried, working groups used this general action plan to select school specific actions (i.e. reduce overlap in administrative tasks). During implementation of the action plans, progress on the (behavioral) performance objectives and work stress risks that the action plans targeted was monitored and feedback was provided to working groups to adjust the action plan if deemed necessary.

Although some issues could not be addressed at school level (e.g. administrative burden, too many children per class), according to employees and school principals the logic model of change facilitated the selection of measures, and according to them the planned measures appeared appropriate to target most of the identified work stress risks. In addition, results of the effect evaluation showed that when actions were implemented as intended, effects on proximal outcomes were found. This indicates that, in fact, the selected and implemented measures did effectively change some of the identified work stress risks according to the logic model of change.

In our study the effectiveness or appropriateness of the separate measures was not evaluated. The study focused on evaluating the approach as a whole, since it was expected that all steps of the approach together would contribute to the decrease of work stress (5). However, to increase our understanding of the working aspects of the intervention, it would be interesting to evaluate the effects of the separate measures that are implemented as part of the action plan as well. This would provide more information on the adequateness of measures and broaden our knowledge on potentially effective measures that could be used in future organisational-level interventions to inform the selection of actions. However, this would also require an even more extensive data collection.

Based on the results of our study it is not possible to draw conclusions on whether program failure due to inadequate measures was prevented, but some reflections can be made regarding the strengths and weaknesses of our attempt to prevent this risk. According to participants, a strength of developing a logic model of change was the specification of behaviors related to decreasing work stress. These were amongst others to manage the workload, e.g. prioritize work tasks, adjust them to personal needs within the boundaries and priorities set at school level, ensure sufficient recovery, express issues, set boundaries, monitor signs of overload. Translating the intervention goals in terms of behavior was considered as valuable because it helped to make more concrete the changes participants hoped to observe among themselves and their colleagues.

During the implementation of action plans the (behavioral) performance objectives and work stress risks as identified in the logic model of change were monthly monitored by pulse surveys among employees, and feedback regarding their progress was provided to individual participants (at individual level) and to the working groups (at school level). The mechanism of this feedback loop to prevent program failure of the action plans was twofold. First, this feedback mechanism was expected to facilitate working groups to optimise the action plans,

because action plans could be adjusted based on this feedback, and new measures could be introduced when deemed necessary. Second, according to the Goal Setting Theory (6, 7) monitoring and receiving feedback on the progression of goals is also considered to be positively related to goal pursuit.

In our study, the provision of feedback reports was hindered by a lack of response on the monthly pulse surveys at some of the schools. Feedback on progress of the intended outcomes did result into adjusting the action plan at one of the schools. At schools where provision of feedback reports was not hindered by a low response, working groups reported that feedback on the progress of the (behavioral) performance objectives and work stress risks indeed functioned as a reminder and helped them to pursuit their goals.

However, feedback reports at individual level were not often looked at. A possible explanation for this is that the (behavioral) performance objectives were formulated by the researchers based on results from participatory sessions. This resulted in generic (behavioral) performance objectives that applied to all employees at the schools. However, it is plausible that the behavioral change needed to decrease work stress varied between employees, for instance, based on the extent to which they already exhibited the intended behavior, or the level of resistance they experienced regarding the behavior. Translating or tailoring the (behavioral) performance objectives at organisational level into matching personalized behavioral goals (e.g. what can I do to bring about the collective goal?), could potentially increase employees' personal commitment towards the approach. This might also have made the individual feedback reports more interesting for employees and could have increased the response rates. Additionally, goal setting can be a very powerful behavioral change mechanism in itself, especially when combined with monitoring and feedback on their personal progress (7). Looking deeper into incorporating (individual) goal setting into organisational-level approaches might be a promising direction to explore further.

Although we cannot draw firm conclusions as to whether our efforts to minimize program failure due to inadequate measures have been effective in that respect, aspects of it were valued by participants (e.g. setting behavioral goals, feedback on progress at school level). However, practical issues (e.g. lack of response in the pulse surveys) may have hindered some of its' potential benefits. More research, e.g. on practical alternatives for monitoring and feedback that do not rely on high response rates from participants could further explore the value of periodic feedback to ensure the adequateness of measures.

Our efforts to reduce the risk of program failure due to inadequate measures were focused on improving the action plans to potentially make them sort more effect on the work stress risks. This is obviously important to ensure that management and employees remain positive and committed to the approach. However, the effectiveness of *initial* measures may actually be less important than the fact that organisations are trying to make a change and are willing to learn from their efforts. In interviews during the process evaluation participants explicitly

mentioned the learning cycle ("trying out measures") as one of the most valuable aspects of the approach. The working mechanism of organisational level interventions does not only depend on the actual measures or actions that are implemented, but also on other more general type of organisational mechanisms that are put in motion by the approach.

In our study, the approach (version 2) for example appeared to have positively affected employees' perception of the quality of leadership. This could be a result of the implemented actions, but it is also possible that employees appreciated their leaders' involvement in the approach, positively influencing their perception of leadership quality. In addition, in their review Roodbari et al (8) identified several mechanisms of organisational interventions in relation to outcomes. These were amongst others implementation adherence, communication, employees' participation, senior management support, middle management support and external consultants/researchers support. This implies that improving the effectiveness of the approach might require more attention for these mechanisms as well.

Implementation failure of the action plans

An additional objective of this thesis was to explore the prevention of implementation failure of the action plans. This referred to the inability to implement the action plan including the planned measures as intended. This type of failure occurs when there are obstacles or hinderances in the process of implementing the planned measures, and can compromise the achievement of the intended outcomes of the intervention. To prevent this, as part of the work stress prevention approach (version 2), during the implementation of the actions plans the implementation process was monitored (together with the (behavioral) performance objectives as described in the previous paragraph) using monthly pulse surveys among employees. Results were translated by the researchers into feedback reports at school level and provided to the working groups as a steering tool. Working groups could use this real-time feedback to signal implementation issues and take action if needed.

Results of the study showed, however, that despite these efforts implementation failure of the action plans did occur at some of the schools. At other schools, where the implementation process was already going well, the feedback was considered valuable and resulted in actions to further positively stimulate implementation of the action plans. Although the results of the process evaluation regarding the value of real-time feedback were exploratory and additional research is needed to draw more firm conclusions, this may indicate that real-time feedback could be used to further optimise implementation of action plans, but not to *prevent* implementation problems during this phase.

A problem with the real-time feedback was that, as mentioned in the previous paragraph, the provision of feedback reports and the quality of the feedback relied on the response of employees on the monthly pulse surveys. However, at schools where the implementation of

the action plan was not successful, the response on the pulse surveys was also limited. This may indicate that implementation problems at some of the schools had already occurred *before* the implementation of the action plans. The real-time feedback during the implementation of action plans may have come too late to prevent implementation failure of the action plans.

In line with other studies (8), implementation of the approach appeared most successful in schools where the level of employee involvement, management commitment and communication were already sufficient *at the start* of the project or at least before the implementation of the action plans. Roodbari et al. (9) found similar results, showing that good pre-intervention job design and employees' health and wellbeing predicted better post-intervention job design and employees' health and wellbeing, and link this to the Conservation of Resources (COR) theory (10). According to this theory employees already need to have a certain amount of resources in order to increase them during the intervention. Results of these studies may imply that successful implementation of organisational-level interventions requires a certain level of 'organisational readiness' from the start onwards, referring to the organisation's capacity and willingness to implement the approach effectively.

However, organisational-level interventions are often applied in organisations that already suffer from work stress (11). But especially when work stress is an issue, it is likely that preconditions to successfully implement the approach (e.g. management commitment, employee involvement) are not met. On top of that, organisational-level interventions require efforts from all members of the organisation (5). This appears to be a paradox: when employees are already under significant pressure e.g. to meet job demands, introducing additional initiatives aimed at preventing work stress can potentially exacerbate this pressure. This could contribute to further stress and resistance to the approach (12). Finally, when work stress is already high, organisations and employees are in need of a rapid solution. However, organisational-level interventions are designed as cyclical organisational change processes that ultimately contribute to a healthy psychosocial work environment. Based on the COR theory (10),one might expect that the effectiveness of these interventions increases with every iteration. However, these organisational change processes can take several years to yield results.

Since high levels of work stress appear to be an important barrier to successfully implement organisational-level work stress interventions, these interventions may be better suited for primary prevention purposes, than for secondary prevention purposes, whereas in practice these interventions are currently used for both. In addition, better preparing organisations regarding the preconditions that need to be met before starting the intervention could potentially increase the level of implementation success. Furthermore, it is important that expectations regarding the efforts and gains of the approach are managed so that the intervention is not considered a quick fix, but requires an investment that will probably sort

effects on the longer term. Finally, although the efforts to prevent implementation failure as part of the work stress prevention approach (version 2) were specifically targeted at the implementation of the action plans phase, feedback on implementation factors during all phases of the approach could potentially signal implementation problems earlier and help implementors to take preventive measures if needed (13).

Based on our studies and others', there are several implementation factors of significant importance for successful implementation, that would require specific attention to decrease the risk of implementation failure of organisational-level work stress interventions, namely: management commitment, employee involvement, communication, readiness for change, context-intervention fit, and resources and infrastructure. Some of these factors can be addressed during the approach (e.g. context-intervention fit), but other factors serve as precondition for success and should be addressed even before starting the approach (e.g. management commitment).

Consistent with other studies (12, 14, 15), our studies again showed that management served an important role in making the approach a success. At schools where the head of the school was very committed to the approach, implementation of the approach remained a priority issue, most measures were realized and employees were most informed and satisfied with the approach. These findings once again stress the crucial role of managers as drivers of change (16), that can make or break the intervention from the start onwards (17). For this reason ensuring that management is committed to the approach from the beginning of the approach onwards is an important precondition for success. However, there are no one-size-fits all measures available to secure or increase management commitment, since it relies on individual managers' perceptions, e.g. regarding the urgency to tackle work stress, the perceived costs vs benefits of the approach, competing priorities, as well as their attitude towards the approach and their resistance to change. Depending on reasons for a possible lack of management commitment, measures to overcome this could entail raising awareness of risks and costs of work stress, providing a business case for work stress prevention, sharing good practice examples of successful interventions, etc. But even if management is committed at the start of the approach, there is a risk of losing it due to e.g. changes in management during the approach. Since turnover among management occurs frequently in primary education, additional strategies might be needed to secure the commitment of new managers to the approach. For organisations to invest in employee commitment before and during the approach could contribute to a bottom-up commitment, and may force new managers to prioritize the approach.

A second implementation factor that also in previous research has been deemed crucial in organisational-level interventions is employee involvement. Earlier research has shown that the extent to which employees reported to have been involved during planning and implementation of the intervention, actually explained the intervention outcomes (18).

Employees have expert knowledge of the workplace and involving them makes this knowledge accessible (8). In addition, it provides opportunities for employees to control their working conditions and "worker control" is an important determinant of employee wellbeing (8, 18). Furthermore, involving employees in identifying work stress risks and selecting adequate measures will increase employees' readiness for change and ensure commitment to the intervention (8). For this reason, in both approaches (version 1 and 2) employees were involved in the risk assessment and planning of measures by means of participatory sessions. Despite the fact that the majority of employees participated in these sessions, a large proportion did not feel involved in the selection of measures. This may imply that employees' suggestions were not sufficiently taken into account by working groups, or employees were not sufficiently informed about the way their proposed measures were included in the action plan. Considering the importance of direct involvement of participants in intervention decision making (18, 19), the form and frequency of involvement of employees in organisational-level work stress interventions could be reconsidered. Abildgaard et al (20) proposed a framework on forms of participation in work environment interventions that could provide directions to further improve employee involvement in organisational-level work stress interventions. In addition to selecting appropriate forms to enhance employee involvement, it is also important that employee involvement is supported by a psychosocially safe organisational culture. A constructive dialogue on work stress risks requires an organisational culture in which employees feel safe and supported to discuss (stress-related) problems. When the organisational culture does not support the dialogue on work stress, (additional) preparatory measures may be needed before starting the approach. Managers can do a range of things to enhance the (psycho)social safety culture, they can for example stress the importance of openly discussing work stress risks and provide a good example. Other examples include regular meetings where employees can share their experiences and concerns without fear of judgment, and social or team building activities that allow colleagues to get to know each other better.

A third important implementation factor in organisational-level interventions that is also mentioned in earlier research is communication (21-23). In our study on the work stress prevention approach version 1 we found that satisfaction with communication about the intervention positively impacted the intervention outcomes. Also in the work stress prevention approach version 2 communication appeared an important implementation factor. More detailed or more frequent communication for example on how and why proposed measures are (not) included in the action plan, could potentially have increased employees' feelings of involvement and consequently their commitment towards the approach.

Readiness for change is a fourth implementation factor that is considered important for the success of organisational-level interventions (24). Readiness for change refers to the extent to which participants have positive appraisals or attitudes towards the intervention and

believe the intervention will help to improve their working conditions. Participants with a positive attitude towards the intervention are expected to be more likely to engage and participate in intervention activities (25). In our studies we found several examples of relations between management commitment, communication and employee readiness for change. In schools where the management was very committed to the approach, this resulted in positive communication about the approach and impacted employees' attitude towards the approach and their feelings of involvement. In schools where the management was less committed, employees were also less positive about the approach. However, although management has a substantial impact on employees' attitudes towards the approach, there can be other factors impacting employees' readiness for change. When readiness for change drops, or when there is resistance to change at start of the approach, it is important to understand the cause. Resistance to change in organisational settings can stem from various psychological and behavioral factors, including reactance (perceiving a restricted sense of control), skepticism (doubts about the effectiveness of necessity of the approach), or inertia (reluctance to disrupt current patterns)(26). By monitoring and understanding the underlying causes of resistance to change during all phases of the approach organisations can take tailored actions to enhance readiness for changes when needed.

Context-intervention fit (27), referring to the appropriateness of the intervention in its setting (28), also appeared an important aspect for successful implementation. This entails that the intervention is tailored to the organisational context by aligning the intervention with the organisational goals and making sure it fits with organisational practices. The context-intervention fit is also impacted by events that take place during the intervention (e.g. restructuring, macro-economic changes). In our study, at one of the schools the timing of the steps of the approach (version 2) did not match with the school planning. A mis-fit in this respect resulted in drop-out during the action planning phase. This highlights the importance of tailoring the (timing of the) approach to the organisational context. However, the organisational context can change during the approach. In our study, the covid-19 pandemic drastically changed the priorities of the schools. The switch to home schooling, staff dropout, sick parents and children and continuously changing policy measures from the Dutch government had schools to constantly improvise to ensure the provision of education, pushing the active implementation of the approach in some schools to the background. Monitoring the context-intervention fit overtime and adjusting the approach if needed to optimise this fit is thus required.

Additionally, successful implementation of the approach also required that necessary resources and infrastructure are in place to support intervention efforts. This includes allocating budgetary resources, and providing employees with time to participate during the approach, but it also includes preparing the organisation of the approach, e.g. by installing working groups. Our studies showed that schools that had previous experience with good

functioning working groups were better able to implement the approach. This suggests that in some situations additional preparations (e.g. support with installing working groups, or involving an external facilitator) could increase the potential success of implementation.

Based on the results of the studies in this thesis, we believe that decreasing the risk of implementation failure of organisational-level work stress interventions requires addressing these implementation factors from the start of the approach onwards. This entails checking the organisational readiness at start of the approach, and take preparatory actions to increase this if needed. Additionally, it requires monitoring of these factors during the approach and making organisations able to act on implementation hinderances when they occur. More research is needed on suitable monitoring methods that are practical and feasible and can be easily used by organisations to monitor the implementation process themselves, also without the supervision of researchers.

Value of the approach

There are several reflections to be made regarding the value of the work stress prevention approach to decrease work stress in primary schools based on the results of the studies as presented in this thesis. In both effectiveness studies of the work stress prevention approach version 1 (chapter 2) and 2 (chapter 6), no effects were found on emotional exhaustion (work stress). This could imply that this type of approach is not effective to decrease work stress in primary schools. However, looking at the additional results in both studies, we believe the study results provide a more nuanced picture regarding the value of the approach.

In both studies, effects were found on work stress determinants. This suggests that the approach did initiate a positive change, and it is possible that effects on work stress could occur on the longer term. In particular, the approach (version 2) appeared to have had a positive impact on employees' perception of the quality of leadership. This is an interesting finding because in addition to their potential direct impact on employee well-being and stress, leaders play a crucial role in organisational-level interventions. Since the work stress prevention approach is designed to be cyclical, the improvement in leadership quality may indicate sustainable change.

Both studies also showed that the effectiveness of the approach was related to the level of implementation. These findings suggest that, when implemented successfully, the work stress prevention approach is potentially effective in decreasing work stress risks and may reduce emotional exhaustion in a longer term.

However, there are several limitations of the work stress prevention approach to be mentioned as well. Earlier research has shown that failing implementation of organisational-level interventions is a recurrent problem (1, 2). In our studies, schools also encountered difficulties during the implementation of the approach, despite efforts to prevent implementation failure. The fact that successful implementation of the approach is

challenging in practice, negatively impacts the value of the approach and stresses the urgency to address implementation failure once more.

In addition, our studies suggest that the approach is mainly effective under certain preconditions (amongst others management commitment, employee involvement, communication) that ideally are met at the start of the approach. This questions whether these type of interventions are a good fit for every organisation in any situation and raises concerns about the broad applicability of these type of approaches without adequate additional preparations. This is of relevance since organisational-level interventions are considered the recommended approach by WHO/ILO to prevent work stress and address psychosocial risks (29-31). However, when for example the organisational culture is hindering an open dialogue on stress, additional measures might be required to improve the psychosocial safety culture first, before starting the approach. Or when major organisational changes (e.g. restructuring with forced redundancies) are planned, the approach may better be postponed. More research on these preconditions, and perspectives for action could contribute to improving the applicability of the approach.

Despite these limitations, our studies have shown that the approach did sort effect on work stress risks, and at some of the schools a positive change was set in motion. In addition, qualitative data showed that employees did appreciate the approach. In particular, employees valued the dialogue and raised awareness on work stress and work stress risks, making stress prevention a shared responsibility within the schools.

Based on the above, we conclude that, if implemented successfully, the work stress prevention approach has potential to improve the psychosocial work context. However, since successful implementation is very challenging and implementation problems often occur before the actual implementation of action plans, further improvements of the approach should focus on preventing implementation failure throughout all phases of the approach.

Methodological considerations

In this thesis we explored the potential value of organisational-level interventions to decrease work stress in primary schools. Since the implementation process of these approaches is as essential as the content of the actual measures, understanding the working mechanisms of organisational-level interventions required an evaluation of the implementation process (Is the intervention implemented as planned? What factors facilitated or hindered the implementation?), as well as the intervention effects (Did the intervention sort effects on the identified work stress risks (proximal outcomes) and work stress (distal outcome)?). And since the effectiveness of these interventions is related to the implementation success, it also

required taking the implementation process into account when studying the intervention effects (Did the level of implementation impact the effectiveness of the intervention?) (32). To this mean, two work stress prevention approaches (version 1 and 2) were implemented in primary schools, and their implementation process and effects were evaluated, as well as the relation between implementation success and effects. There are several methodological strengths and limitations of these studies that deserve consideration.

An important strength of these studies is that they involved the evaluation of an organisational-level intervention implemented at different schools, each with their own organisational context. Although conducting intervention research is challenging considering amongst others the long duration of these type of interventions which increases the risk of organisational changes during their course, we evaluated two versions of a work stress prevention approach in different studies. This makes it possible to draw more general conclusions about this type of approach to decrease work stress in primary schools. Another strength of this thesis is that it involved exploratory innovative aspects (i.e. developing a logic model of change to facilitate the selection of measures, and real-time monitoring of the implementation process to improve the implementation of measures) to include in organisational-level interventions to make them more effective to tackle work stress in primary education.

In addition, our studies used an extensive mixed methods approach (questionnaires, interviews, data logs, monthly pulse surveys) to investigate the effects and implementation process of the approach. This made it possible to quantitatively estimate the effectiveness of the approach, but also to get a more detailed insight into the implementation process and the results of the intervention as experienced by employees.

When intended outcomes are distal and multifactorial, it is difficult to link effects or the lack of effects to the intervention (3). For this reason, to determine the effectiveness of the approach, in our studies not only the effects on the distal outcome (work stress) were investigated, but also on the proximal outcomes (work stress risks). This provided more information on the working mechanism of the intervention (i.e. did implemented measures result in changes in the targeted work stress risks?).

Finally, an important strength of our thesis is that it researched the impact of implementation success on the effects of the approach. Although several researchers recommend these type of analyses, they are often lacking in effect evaluations (33). The studies in this thesis illustrate the importance of these type of analyses because they provide valuable additional information to draw conclusions on the effectiveness of interventions in relation to their implementation. Without these analyses, there is a risk of wrongly labeling interventions as not effective, while in practice they potentially are effective when implemented successfully.

There are also some limitations of the studies to be considered. First, (primary) schools in the Netherlands are relatively small as compared to schools in other countries. Collecting sufficient (quantitative) data to provide a representative picture of the situation per school was challenging. Additionally, the turn-over rate of personnel in primary schools in the Netherlands is high, and changes in personnel also occurred in our studies. Turn-over among teachers and non-teaching staff at the schools possibly impacted their commitment to the approach. Ensuring high participation rates and minimizing attrition in organisational studies is generally difficult, and this appeared a challenge in our studies as well. Low participation in some of the schools could have negatively impacted the generalisability of the findings.

In addition, a complication encountered during the study on the work stress prevention approach (version 2) was the Covid-19 pandemic that had an substantial impact on the intervention and control schools. Although the outbreak of the Covid 19 virus contributed to the urgency to address work stress risks, the pandemic challenged the ability of schools to give priority to the action plans. Despite the fact that schools continued with the approach during the pandemic, the pandemic may have negatively affected the potential effectiveness of the approach. In addition, the fact that action plans were to a large extent implemented during the Covid-19 pandemic may have consequences for the generalisability of the findings.

Another difficulty that we encountered studying the effects of the approach (version 1 and 2) was the timing of the follow-up questionnaire. The cyclical nature of the work stress prevention approach complicates determining an optimal timing for follow-up, as the approach is ideally integrated into the organisation's ongoing policy cycle rather than having a definite endpoint. At the time of the follow-up questionnaire, schools were still enacting measures from their action plans, but the extent of implementation varied among schools. Additionally, the effects of different measures likely manifest at different rates. For instance, reducing unnecessary work tasks might have an immediate impact on job demands, whereas enhancing social support and autonomy may require more time to show effects. More frequent measurements to monitor effects over time could help overcome this problem and contribute to a better understanding of the change process.

Another limitation is that the schools included in the study were not randomly selected, but they voluntarily applied to participate. The fact that intervention schools were the first to voluntarily apply for participation, may indicate that these schools were more willing to address work stress and more open for change, which may have contributed to the study results. Willingness to address work stress and commitment from the management to the approach at the start may not be representative for all schools.

Recommendations

Based on the results of the studies of this thesis, directions for future research are provided.

Directions for research

Real-time monitoring implementation: Our study made a start to explore the value of real-time monitoring of the implementation process for the purpose of enhancing the implementation of action plans. However, scholars have also stressed the importance of monitoring the implementation process from a research perspective, as part of the process evaluation (34, 35). Good quality monitoring data on implementation factors during the approach could provide a more detailed picture on changes in implementation factors overtime and interrelations between implementation factors from a time-sensitive perspective (34, 35). This type of data could be useful to determine which implementation factors are most important at what time to focus on to avoid implementation failure and may also contribute further to our understanding of the implementation processes of these kind of approaches. However, this requires more research on suitable methods for monitoring implementation and detecting implementation hinderances covering all phases of the approach.

Psychometric quality of implementation measures: Although more and more research is being conducted into the implementation of interventions, there is a major variety of evaluation frameworks, methods and measurements that is used (34). This makes the comparability of different studies difficult. Additionally, in their recent review, Nielsen et al (34) conclude that in most process evaluations the used process measures are often poorly validated. More valid and reliable measures for process evaluations of organisational-level interventions could enhance the rigor of process evaluations and facilitate meaningful interpretation and comparisons of intervention outcomes across studies (34). However, in practice, measures often have to be tailored to the specific intervention context to capture all relevant aspects. To balance this tension, researchers could use a combination of both types of measures: general measures for core components that are relevant across contexts, and tailored measures to capture context-specific details. More research on psychometric quality and the use of implementation measures (generic vs tailored) for process evaluations, is needed to improve the quality of process evaluations of organisational interventions.

Increasing organisational readiness: Results of our studies suggest that organisational-level interventions are mainly effective when certain preconditions (e.g. management commitment, employee involvement, communication) are met at the start of the intervention. To improve the potential effectiveness of the approach, it is important that organisations are aware of these preconditions, and can determine whether the preconditions are met in their situation. This requires practical tooling for organisations to

assess their 'organisational readiness'. An example of a tool that measures several preconditions for successful implementation of organisational interventions (i.e. readiness for change, intervention-context fit, and communication) is the Intervention Preparedness Tool (25). Although this tool was primarily developed for research purposes, a similar more practical tool could be useful for organisations to determine their organisational readiness. More research on organisational readiness measures, related to additional possible preconditions for successful implementation (e.g. management commitment, availability of resources), and the practical use of these instruments to benefit organisations could contribute to further developing and broadening organisational readiness measures for research and practice. Additionally, when the organisation is not considered 'ready' for the approach, interventions should be taken to invest in preparing organisations for the approach (e.g. by increasing management commitment and employee participation) (8, 36). However, there is still a lack of knowledge and guidance on how researchers and practitioners can increase these factors (8, 35, 37). More research is needed on evidence based strategies to improve implementation factors before the approach (i.e. 'get ready-interventions') to enhance organisational readiness, as well as during the approach to optimise the implementation process (37).

Long term impact of cyclical approach: Although organisational-level interventions claim to be cyclical in nature, most studies only report the first iteration of the 'plan-do-check-act cycle (37). Consequently, little is known on how the first revolution of the cycle informs the subsequent revolutions. Although investigating organisational-level interventions over multiple cycles is very time consuming and therefore expensive, this type of research is needed to draw conclusions on the value of (the cyclical nature of) these approaches on the long term, as well as the maintenance of the initial effects.

Implications for practice

Based on the results of this thesis, there are also several recommendations to be made for practice.

Facilitate organisational change: One of the most important features of the approach is the cyclical learning process in which measures are implemented, monitored, evaluated and adjusted if necessary. This implies that perhaps less emphasis should be put on the specific measures in the action plans, but more emphasis should be put on stimulating organisations to take measures in a participatory manner, and learn during the process. This requires genuine commitment from managers to this learning process, managers serving as a role model and actively promoting and engaging in the change process. Additionally, this requires an organisational culture where employees feel safe to share ideas, take risks and admit mistakes without fear of retribution. Furthermore, it requires a culture that values learning and development and encourages experimentation and sharing of knowledge. Practical tools for monitoring and feedback could facilitate this long-term change process.

Include a system perspective: According to hierarchy of control, work stress risks should be targeted at their source (38). A strength of organisational-level interventions is that they focus on structures, policies, and processes within the organisation that cause work stress, and that these interventions increase the organisational efficacy to target these work stress risks. However, these structures, policies and processes that cause stress can also be influenced by external factors such as market conditions, laws and policies, and societal expectations, which are beyond the control of the organisation. The fact that work stress is highly prevalent in the entire education sector may indicate that the source of the problem is indeed (partly) rooted at macro level. Although, as also shown in our studies, organisational-level interventions can contribute to improving the psychosocial work context, decreasing work stress in primary education might also require changes at macro level (changing the system). In addition, also factors at micro level can impact work stress. There are individual differences in experiencing work stress that are influenced by personal factors, for example coping style, or past experiences. A system-based multi-level approach combining intervention strategies at macro level (e.g. aimed at policies, administrative burden, teacher shortages), organisational level (e.g. aimed at job demands and resources), and micro-level (e.g. aimed at resilience) ensures a comprehensive approach that addresses both systemic root causes, organisational stressors and individual needs.

References

1. Montano D, Hoven H, Siegrist J. Effects of organisational-level interventions at work on employees' health: a systematic review. BMC Public Health. 2014;14(1):1-9.
2. Aust B, Møller JL, Nordentoft M, Frydendall KB, Bengtsen E, Jensen AB, et al. How effective are organisational-level interventions in improving the psychosocial work environment, health, and retention of workers? A systematic overview of systematic reviews. Scand J Work Environ Health. 2023.
3. von Thiele Schwarz U, Richter A, Hasson H. Getting everyone on the same page: Cocreated program logic (COP). In: Organisational Interventions for Health and Well-being. Taylor & Francis; 2018.
4. Bartholomew Eldredge LK, Markham CM, Ruiter RAC, Fernández ME, Kok G, Parcel GS. Planning health promotion programs: an intervention mapping approach. John Wiley & Sons; 2016.
5. Nielsen K, Randall R, Holten A, González ER. Conducting organisational-level occupational health interventions: What works? Work & Stress. 2010;24(3):234-59.
6. Latham GP, Locke EA. Increasing productivity and decreasing time limits: A field replication of Parkinson's law. J Appl Psychol. 1975;60(4):524.
7. Locke EA, Latham GP. The development of goal setting theory: A half century retrospective. Motivation Science. 2019;5(2):93.
8. Roodbari H, Axtell C, Nielsen K, Sorensen G. Organisational interventions to improve employees' health and wellbeing: A realist synthesis. Appl Psychol. 2022;71(3):1058-81.
9. Roodbari H, Nielsen K, Axtell C, Peters SE, Sorensen G. Developing initial middle range theories in realist evaluation: a Case of an organisational intervention. International Journal of Environmental Research and Public Health. 2021;18(16):8360.
10. Hobfoll SE. Conservation of resources: a new attempt at conceptualizing stress. Am Psychol. 1989;44(3):513.
11. Schelvis R, Wiezer NM, Van der Beek, Allard J, Twisk JW, Bohlmeijer ET, Oude Hengel KM. The effect of an organisational level participatory intervention in secondary vocational education on work-related health outcomes: results of a controlled trial. BMC Public Health. 2017;17(1):1-14.
12. Kompier MA, Cooper CL, Geurts SA. A multiple case study approach to work stress prevention in Europe. European Journal of Work and Organisational Psychology. 2000;9(3):371-400.
13. Tafvelin S, von Thiele Schwarz U, Nielsen K, Hasson H. Employees' and line managers' active involvement in participatory organisational interventions: Examining direct, reversed, and reciprocal effects on well-being. Stress Health. 2019;35(1):69-80.
14. Noblet AJ, LaMontagne AD. The challenges of developing, implementing, and evaluating interventions. The Oxford handbook of organizational well-being. 2009:466.

15. Lundmark R, Hasson H, von Thiele Schwarz U, Hasson D, Tafvelin S. Leading for change: line managers' influence on the outcomes of an occupational health intervention. Work & Stress. 2017;31(3):276-96.
16. Christensen M, Innstrand ST, Saksvik PØ, Nielsen K. The line manager's role in implementing successful organisational interventions. The Spanish journal of psychology. 2019;22:E5.
17. Nielsen K. Leaders can make or break an intervention–but are they the villains of the piece. Leading to occupational health and safety: How leadership behaviours impact organisational safety and well-being. 2017:197-210.
18. Nielsen K, Randall R. The importance of employee participation and perceptions of changes in procedures in a teamworking intervention. Work & Stress. 2012;26(2):91-111.
19. Lehmann AI, Bauer GF, Brauchli R. Intervention effects for direct and indirect participants in an organisational health intervention: A mixed-methods study. Work & Stress. 2022:1-25.
20. Abildgaard JS, Hasson H, von Thiele Schwarz U, Løvseth LT, Ala-Laurinaho A, Nielsen K. Forms of participation: The development and application of a conceptual model of participation in work environment interventions. Economic and Industrial Democracy. 2020;41(3):746-69.
21. Westgaard RH, Winkel J. Occupational musculoskeletal and mental health: Significance of rationalization and opportunities to create sustainable production systems–A systematic review. Appl Ergon. 2011;42(2):261-96.
22. Dollard MF, Bakker AB. Psychosocial safety climate as a precursor to conducive work environments, psychological health problems, and employee engagement. J Occup Organ Psychol. 2010;83(3):579-99.
23. Jimmieson NL, Terry DJ, Callan VJ. A longitudinal study of employee adaptation to organisational change: the role of change-related information and change-related self-efficacy. J Occup Health Psychol. 2004;9(1):11.
24. Augustsson H, von Thiele Schwarz U, Stenfors-Hayes T, Hasson H. Investigating variations in implementation fidelity of an organisational-level occupational health intervention. Int J Behav Med. 2015;22:345-55.
25. Nielsen K, Marzocchi I, Di Tecco C, Vignoli M, Ghelli M, Ronchetti M, et al. Validation of the Intervention Preparedness Tool: a short measure to assess important pre-conditions for successful implementation of organisational interventions. Proceedings of the 15th European Academy of Occupational Health Psychology conference:'Supporting knowledge comparison to promote good practice in Occupational Health Psychology'; 2022.
26. Knowles ES, Riner DD. Omega approaches to persuasion: Overcoming resistance. In: The science of social influence. Psychology Press; 2011. p. 83-114.

27. Randall R, Nielsen KM. Does the intervention fit?: An explanatory model of intervention success and failure in complex organisational environments. In: Improving organisational interventions for stress and well-being. Routledge; 2012. p. 120-34.
28. Nielsen K, Randall R. Assessing and addressing the fit of planned interventions to the organisational context. Derailed organisational interventions for stress and well-being: Confessions of failure and solutions for success. 2015:107-13.
29. World Health Organisation. WHO guidelines on mental health at work. Geneva: World Health Organisation; 2022
30. International Labour Office (ILO). Guidelines on occupational safety and health management systems (ILO-OSH 2001). Geneva, Switzerland: ILO; 2001.
31. UK Health and Safety Executive. Managing the causes of work-related stress: A step-by-step approach using the management standards (2nd ed.). 2007.
32. Cox T, Taris TW, Nielsen K. Organisational interventions: Issues and challenges. Work & stress. 2010;24(3):217-8.
33. Schelvis RM, Wiezer NM, Blatter BM, van Genabeek JA, Hengel KMO, Bohlmeijer ET, et al. Evaluating the implementation process of a participatory organisational level occupational health intervention in schools. BMC Public Health. 2016;16(1):1212.
34. Nielsen K, De Angelis M, Innstrand ST, Mazzetti G. Quantitative process measures in interventions to improve employees' mental health: A systematic literature review and the IPEF framework. Work & Stress. 2022:1-26.
35. Nielsen K, Noblet A. Chapter Introduction: Organisational interventions: Where we are, where we go from here? In: Organisational Interventions for Health and Well-Being. Taylor & Francis; 2018.
36. Nielsen K, Miraglia M. What works for whom in which circumstances? On the need to move beyond the 'what works?'question in organisational intervention research. Human relations. 2017;70(1):40-62.
37. Noblet A, Nielsen K. Chapter Epilogue: Critical reflections and the Way Forward. In: Organisational Interventions for Health and Well-being. Taylor & Francis; 2018.
38. Lamontagne AD, Keegel T, Louie AM, Ostry A, Landsbergis PA. A systematic review of the job-stress intervention evaluation literature, 1990–2005. International journal of occupational and environmental health. 2007;13(3):268-80.

Summary

Summary

Work stress is a significant problem among employees in primary education worldwide. Teachers often face amongst others high workloads, large sized classes, and administrative pressure. Additionally, they may encounter challenges related to student behaviour, parental expectations, and limited resources. All of these factors can contribute to stress and diminished job satisfaction. Research from different contexts has consistently documented high levels of work stress and burnout among teachers, often surpassing those reported by workers in other sectors. The consequences of work stress extent beyond individual well-being, impacting schools and students, leading to decreased performance, commitment, and increased sickness absence. Moreover, high levels of work stress contribute to turnover, exacerbating existing shortages in the teachers' profession, which threaten the quality of education systems globally.

Effective interventions to prevent or reduce work stress among employees in primary schools are urgently needed. However, existing interventions are often targeted at the individual level rather than addressing the root causes of stress. Organisational-level interventions which focus on eliminating work stress at its' source are recommended by e.g. the World Health Organisation and the International Labour Organisation. These interventions involve collaborative efforts of all members of the organisation to identify and implement tailored measures to mitigate work stress risks within an organisation. However, while organisational-level interventions are the recommended approach to prevent and decrease work stress, these interventions are not always successful. This could be caused, amongst others, by program failure due to the selection of inadequate measures to decrease or eliminate work stress risks, or due to unsuccessful implementation of the planned measures.

The main aim of this thesis is to increase our understanding of how organisational-level interventions can be designed and implemented to effectively decrease work stress in primary schools, whilst applying innovations that can optimise these interventions to prevent program failure (**chapter 1**). The objectives of this thesis were:

1. To explore the effects of an organisational-level intervention (version 1) in primary schools to decrease work stress.
2. To explore the relation between design, implementation and effects of occupational risk prevention and health promotion interventions.
3. To design an organisational-level intervention (version 2) in primary schools to decrease work stress, preventing program failure due to inadequate measures or due to implementation failure of the action plans, and to evaluate the implementation process and effects.

The aim of **chapter 2** was to explore the effect of a participatory organisational-level work stress intervention (work stress prevention approach version 1) in primary schools on work

stress (emotional exhaustion) and job satisfaction, and on (quantitative) job demands and resources (i.e. autonomy, supervisor and coworker support). In addition, we investigated whether and how implementation factors (participation, communication and dialogue on stress) were related to these effects. The approach consisted of five steps: 1) installing working group at each school, 2) assessment of work stress risks, 3) conducting an action plan with measures to target work stress risks, 4) implementing the action plan, and 5) conducting a process and effect evaluation. Using a multiple case study research design the effect of the approach was investigated at 5 primary schools in the Netherlands, with quantitative measurements at baseline and 12-months follow-up. In addition, qualitative data were collected to explore the implementation process in more detail.

Results showed a statistically significant decrease in job demands and increase in job satisfaction between baseline and follow-up. In addition, employees that were more satisfied with the communication about the intervention showed more improvements in autonomy and job satisfaction. However, employees reporting an increased dialogue on work stress between employees and management showed a smaller decrease in job demands.

There are several conclusions possible based on the results of the study. Although no effects on the primary outcome emotional exhaustion were found, the approach appeared to have positive effects on job demands and job satisfaction. The implementation of action plans was a challenging phase of the approach. Especially during this phase it was difficult to keep employees informed and involved, and the implementation of action plans was hindered by lack of time and/or lack of priority. The study showed that effects of the approach were dependent on the implementation success. This could imply that a more successful implementation may have resulted in more effects on work stress determinants and emotional exhaustion. Results of the study specifically underline the importance of communication about the intervention as part of the implementation process, impacting the effectiveness of the intervention on autonomy and job satisfaction.

Qualitative interview data revealed that participants valued the approach, in particular the dialogue and raised awareness on work stress and work stress risks, making stress prevention a shared responsibility within the schools. To make more firm conclusions on the value of the approach to decrease work stress in primary education, more knowledge is needed on improving the approach to prevent implementation failure and make it more effective.

The aim of **chapter 3** was to gain more insights in designing interventions that are successfully implemented and effective within the occupational health domain. These insights could potentially be used to further improve the work stress prevention approach to decrease work stress in primary schools. In particular, the chapter focused on exploring the relation between design, implementation and effects of occupational risk prevention and health promotion interventions and whether Intervention Mapping could be a useful tool in this. Intervention mapping (IM) is a method to systematically design interventions that is characterized by:

participation, theory-based approach, ecological approach and implementation planning (Bartholomew Eldredge, Markham et al. 2016). IM is applied regularly within the public health domain, and the aim of chapter 3 was to investigate whether IM is effectively used within the occupational safety and health domain as well. Specifically, this study explored the fidelity of the use of the intervention mapping protocol, and the implementation success and effects of 12 occupational risk prevention and health promotion interventions (as described in 28 articles). Results showed that all included studies had difficulties following the IM-protocol in one way or another. Studies had difficulties in: 1) organising participation of all stakeholders (target group was often not involved in intervention design; lack of support of stakeholders was considered barrier for implementation success); 2) following all steps of the theory-based approach, and 3) in planning the implementation of the intervention. No relation was found between fidelity of the IM-protocol and the intervention effects. Although no relation was found between the overall fidelity of the IM-protocol and the implementation process, there appeared to be a relation between the fidelity of the activities related to the theory-based approach (as one of the core elements of IM), and the implementation process, suggesting a high fidelity regarding the theory-based approach to be related to a more successful implementation.

Although the study was primarily exploratory, several conclusions are relevant for designing occupational risk prevention and health promotion interventions, including organisational-level work stress interventions. The findings indicate that organising a participative approach and planning its implementation can be challenging in practice. Additionally, the results imply that incorporating a theory-based approach in the development of interventions, despite being complex and time-consuming, may ultimately be worthwhile, leading to a more tailored intervention that aligns with the needs of the target group.

Taking into account the results from chapter 2 and 3, in **chapter 4** a (new) work stress prevention approach (version 2) was developed to decrease work stress in primary schools. The approach contained innovative aspects to prevent program failure due to inadequate measures or due to implementation failure of the action plans. The work stress prevention approach consisted of the general five steps (see Figure 1). During step 1 (preparation) at each school a working group was formed that was responsible for action planning (step 3) and implementation (step 4). The working group consisted of the school principal and 2 to 3 employees.

During step 2 (risk assessment), causes of work stress at the schools were identified by means of focus group meetings (two focus group meetings with 3 to 5 employees per school). In addition, to facilitate the selection of adequate measures a logic model of change was developed by the research team based on Intervention Mapping (19), by: (i) setting a program objective, (ii) identifying performance objectives ((behavioural) actions needed to accomplish

the program objective), (iii) identifying determinants for the performance objectives and (iv) selecting methods to target the determinants.

During step 3 (action planning) possible measures were inventoried by means of participatory focus group meetings at each school with all employees. Based on the results of the focus group meetings and the logic model of change the research team developed a general action plan for all schools. This general action plan included several appropriate possible measures and the rationale behind these measures. At each of the schools, the working groups selected and specified measures from the general action plan into a school specific action plan.

During step 4 (implementation), the measures from the action plan were implemented by the working groups. During implementation of the action plans, progress on the (behavioural) performance objectives and work stress risks that the action plans targeted was monitored by means of monthly pulse surveys. To prevent implementation failure of the action plans, the monthly pulse surveys also monitored the implementation process. Working groups received feedback reports based on these data, to provide the opportunity to adjust action plans to ensure the effectiveness of measures, an/or to optimise implementation when implementation barriers occurred.

During step 5 (evaluation), the implementation process and effects of the work stress prevention approach were evaluated.

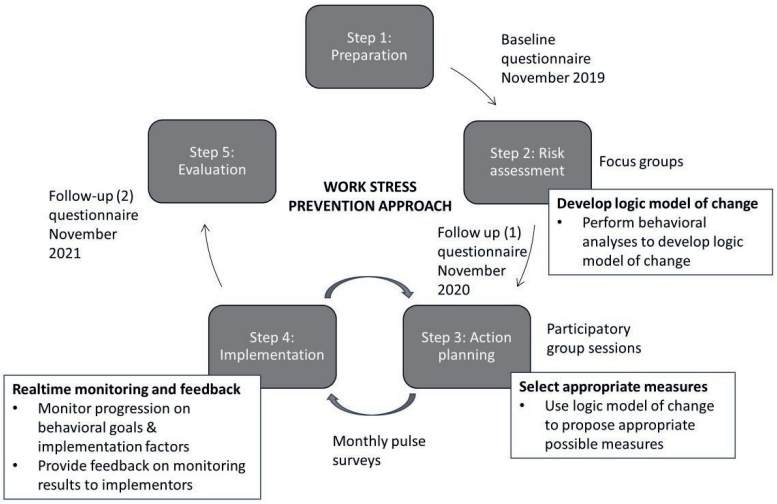

Figure 1: Work stress prevention approach (version 2.0)

Chapter 5 described the process evaluation of a work stress prevention approach (version 2) that was implemented in 4 primary schools in the Netherlands. As part of the implementation strategy of the approach, the innovation of real-time feedback was tested. The real-time feedback concerned (perceived) management commitment, employee involvement, communication and readiness for change and was provided to working groups within schools to facilitate them in managing the implementation phase of the approach. The study aimed to answer two research questions. The first research question was: (RQ1) *How successful is the implementation of the work stress prevention approach in primary education?* To determine implementation success, Nielsen & Randall's framework for process evaluations of organisational-level interventions was applied. Implementation success was determined regarding design and realisation of action plans, implementation strategy, intervention context and participants' mental models. On each of these aspects requirements were formulated that had to be met for the approach to be considered successfully implemented. The second research question was: (RQ2) *What is the value of real-time feedback as part of the implementation strategy of the work stress prevention approach?* The answer to this question was based on the collection of real-time monitoring data, change in implementation factors over time, the value of feedback according to implementors, and actions taken by implementors based on real-time feedback.

Regarding RQ1, the results of the process evaluation revealed differences between the schools in the level of implementation of the approach. At one school the implementation was successful, at two schools the implementation was partly successful and at one school the implementation was not successful. Factors that hindered implementation of the approach were the intervention context, school size, and planning of the approach. Management commitment and employee involvement appeared important factors for successful implementation.

Regarding RQ2, the real-time feedback appeared to be of value for schools that already were successful in implementing the approach, supporting them in optimising the implementation even further. However, at schools where implementation of the approach was less successful, low response on the monitoring data limited the value of the real-time feedback. It appeared that at these schools implementation problems (lack of employee involvement and readiness for change) had already occurred before the action planning phase which probably resulted in a low response to the monitoring. More research on suitable methods for monitoring implementation and detecting implementation hinderances covering all phases of the approach is needed.

Chapter 6 investigated the effects of the work stress prevention approach on emotional exhaustion and work stress determinants as identified in the risk assessment (i.e. job crafting behaviour, quantitative and emotional demands, leadership, support, autonomy, team culture and feelings of competence). Additionally the impact of implementation success (i.e.

management commitment, employee involvement, communication during implementation) on emotional exhaustion and work stress determinants was studied as well.

The following research questions were formulated: *To what extent did the work stress prevention approach in intervention schools reduce emotional exhaustion over a two-year follow up period, compared to control schools (RQ1)? To what extent did the work stress prevention approach in intervention schools change work stress determinants over a two-year follow up period, compared to control schools (RQ2)?* In addition, research questions were formulated to test whether the implementation process impacted effects of the work stress prevention approach on work stress and work stress determinants: *To what extent is there an association between the level of implementation and effects of the work stress prevention approach on emotional exhaustion between baseline and two-year follow up (RQ3)? To what extent is there an association between the level of implementation and effects of the work stress prevention approach on work stress determinants between baseline and two-year follow up (RQ4)?*

To answer these research questions, a quasi-experimental study was conducted with an intervention group (4 schools, N=102 employees) and a control group (26 schools, N=656 employees) using questionnaires at baseline (T0), one-year (T1) and two-year (T2) follow-up. Multilevel mixed model analyses were performed to test effects of condition and implementation success on changes in emotional exhaustion and work stress determinants between T0 and T2 in the intervention and control group.

Results showed no effect of the intervention on emotional exhaustion (RQ1) and most of the work stress determinants (RQ2), but results did indicate an effect on quality of leadership. The improvement of quality of leadership between T0 and T2 was significantly larger in the intervention compared to the control group. Additionally, when considering the level of implementation of the approach, results showed that implementation success was associated with a decrease in unnecessary demands and an increase in quality of leadership, participatory leadership, team culture and job crafting behaviour (RQ4). Results indicate that – if implemented successfully – the organisational-level intervention has the potential to improve the psychosocial work context.

Although the study showed no direct effect of the approach on emotional exhaustion, results indicate that the approach has beneficial effects on (perceived) quality of leadership. In addition, results suggested that, when successfully implemented, the approach also has beneficial effects on several of the other work stress determinants. These results not only underline once more the importance of successful implementation of these kind of approaches, but also illustrate the need of including the level of implementation when studying the (potential) effectiveness of these type of approaches.

In **chapter 7** findings of the studies were reflected upon, methodological strengths and limitations of our studies were considered, recommendations were made for practice and directions for future research were discussed.

Reflections on findings

To decrease the risk of program failure due to inadequate measures an innovation was added to the general steps of the work stress prevention approach (version 2): a logic model of change was built as part of the risk assessment to facilitate the selection of appropriate measures. According to employees and school principals the logic model of change facilitated the selection of measures, and planned measures appeared appropriate to target most of the identified work stress risks. In addition, results of the effect evaluation showed that when actions were implemented as intended, positive effects on proximal outcomes were found. This indicated that the selected and implemented measures did effectively change some of the identified work stress risks according to the logic model of change. Although we could not draw firm conclusions as to whether our efforts to prevent program failure due to inadequate measures were effective in that respect, aspects of it were valued by participants (e.g. setting behavioural goals, feedback on progress at school level). However, practical issues (e.g. lack of response in the pulse surveys) may have hindered some of its' potential benefits. More research e.g. on practical alternatives for monitoring and feedback that do not rely on high response rates from participants could further explore the value of periodic feedback to ensure the adequateness of measures. Furthermore, the working mechanism of organisational-level interventions does not only depend on the actual measures or actions that are implemented, but also on other (more general) type of organisational mechanisms (e.g. employees' participation, management support) that are put in motion by the approach. Improving the effectiveness of the approach might require more attention for these mechanisms as well.

An additional objective of this thesis was to explore the prevention of implementation failure of the action plans. To this purpose, another innovation was added to the work stress prevention approach (version 2): during the implementation of the actions plans the implementation process was monitored using monthly pulse surveys among employees. Results were translated by the researchers into feedback reports at school level and provided to the working groups as a steering tool. Working groups could use this real-time feedback to signal implementation issues and take action if needed. However, Despite these efforts, implementation failure of the action plans did occur at some of the schools. At other schools, where the implementation process was already going well, the feedback was considered valuable and resulted in actions to further positively stimulate implementation of the action plans. This may indicate that real-time feedback could be used to further optimise implementation of action plans, but not to prevent implementation problems during this phase. The real-time feedback during the implementation of action plans may have come too

late to prevent implementation failure. Successful implementation of organisational-level interventions may require a certain level of 'organisational readiness' from the start onwards, referring to the organisation's capacity and willingness to implement the approach effectively. Based on the results of the studies in this thesis, we believe that decreasing the risk of implementation failure of organisational-level work stress interventions requires addressing implementation factors from the start of the approach onwards. This entails checking the organisational readiness at start of the approach, and take preparatory actions to increase this if needed. Additionally, it requires for organisations to monitor these factors and to act on implementation hinderances when the occur.

In both effectiveness studies of the work stress prevention approach version 1 (chapter 2) and 2 (chapter 6), no effects were found on emotional exhaustion (work stress). This could imply that this type of approach is not effective to decrease work stress in primary education. However, in both studies, results were found on work stress determinants. This suggests that the approach did initiate a positive change, and it is possible that effects on work stress could be sorted on the longer term. Both studies also showed that the effectiveness of the approach was related to the level of implementation. These findings suggest that, when implemented successfully, the work stress prevention approach is potentially effective in decreasing work stress risks and may reduce emotional exhaustion in a longer term. However, since successful implementation is very challenging, further improvements of the approach should focus on preventing implementation failure throughout all phases of the approach.

Methodological strengths and limitations

Several methodological strengths and limitations of the studies were described. Strengths were amongst others the evaluation of two versions of a work stress prevention approach implemented in different schools in different studies, making it possible to draw more general conclusions about this type of approach to decrease work stress in primary schools. Another strength was that the studies used an extensive mixed methods approach (questionnaires, interviews, data logs, monthly pulse surveys) to investigate the implementation process and effects of the approaches. Finally, an important strength was that the impact of implementation success on the effects of the approach was investigated. There are also some limitations to be mentioned. Collecting sufficient data to provide a representative picture of the situation per school was challenging. In addition, due to the cyclical nature of the approach, the timing of the follow-up questionnaire was difficult. Furthermore, the schools included in the study were not randomly selected, but they voluntarily applied to participate. This may have indicated that these schools were more willing to address work stress and more open for change, which may have contributed to the study results.

Recommendations

Based on the results of this thesis, additional research was suggested on the following topics:

- Real-time monitoring of the implementation
- Improve psychometric quality of implementation measures
- Increase organisational readiness
- Investigate the long term impact of cyclical approach

The following recommendations were made for practice.

- Facilitate organisational change
- Include a system perspective

Samenvatting

Samenvatting

Werkstress is wereldwijd een groot probleem onder werknemers in het basisonderwijs. Leraren hebben vaak te maken met een hoge werkbelasting, grote klassen en veel administratieve druk. Bovendien worden ze vaak geconfronteerd met uitdagingen door lastig gedrag van leerlingen, hoge verwachtingen van ouders en beperkte beschikbare middelen op scholen. Al deze factoren kunnen bijdragen aan stress en leiden tot minder werktevredenheid. Talloze onderzoeken wijzen uit dat de mate van werkstress en burn-out onder leraren hoog is, vaak hoger dan bij werknemers in andere sectoren. De gevolgen van werkstress reiken verder dan het individuele welzijn maar raken ook scholen (minder betrokkenheid van leraren en meer ziekteverzuim) en leerlingen (verminderde prestaties). Bovendien draagt een hoge mate van werkstress bij aan het personeelsverloop, waardoor de bestaande tekorten in het onderwijs verder toenemen. Dit vormt een bedreiging voor de kwaliteit van onderwijssystemen. Effectieve interventies om werkstress bij medewerkers in het (basis)onderwijs te voorkomen of te verminderen zijn daarom dringend nodig.

Hoewel bestaande interventies vaak gericht zijn op het individu, is het essentieel om ook de oorzaken van werkstress aan te pakken. Onder andere de Wereldgezondheidsorganisatie (WHO) en de Internationale Arbeidsorganisatie (ILO) bevelen dan ook aan om organisatorische interventies in te zetten die zich richten op het aanpakken van werkstress bij de bron. Deze interventies bestaan uit gezamenlijke inspanningen van alle leden van de organisatie om maatregelen te treffen die zich richten op het verminderen van organisatiespecifieke werkstressrisico's. Echter, ondanks dat organisatorische interventies de aanbevolen aanpak zijn, zijn ze helaas niet altijd succesvol. Het falen van dit soort interventies kan bijvoorbeeld komen doordat niet de juiste maatregelen worden gekozen, of doordat deze maatregelen niet succesvol worden geïmplementeerd.

Het hoofddoel van dit proefschrift is om beter te begrijpen hoe organisatorische interventies ontwikkeld en geïmplementeerd kunnen worden om werkstress op scholen in het primair onderwijs effectief te verminderen. Hierbij zijn innovaties toegepast om deze interventies te optimaliseren en het falen ervan te voorkomen (**hoofdstuk 1**). De doelstellingen van het onderzoek beschreven in dit proefschrift waren:

1. Het verkennen van de effecten van een participatieve organisatorische werkstressinterventie (versie 1) om werkstress te verminderen bij scholen in het primair onderwijs.

2. Het onderzoeken van de relatie tussen ontwerp, implementatie en effecten van interventies gericht op het voorkomen van werkgerelateerde risico's en gezondheidsbevordering.

3. (I) Het zodanig ontwerpen van een participatieve organisatorische werkstressinterventie (versie 2) dat het falen van de interventie (door het kiezen van ineffectieve maatregelen of het niet succesvol implementeren van de maatregelen) wordt voorkomen, en vervolgens (II) het evalueren van het implementatieproces en (III) de effecten van deze interventie.

Doelstelling 1: Het verkennen van de effecten van een participatieve organisatorische werkstressinterventie (versie 1) om werkstress te verminderen bij scholen in het primair onderwijs.

Het doel van **hoofdstuk 2** was om het effect van een participatieve organisatorische werkstressaanpak (versie 1 van de werkstressaanpak) op basisscholen te onderzoeken. Gekeken werd naar de impact van de aanpak op werkstress (emotionele uitputting) en werktevredenheid, evenals op (kwantitatieve) taakeisen en hulpbronnen (zoals autonomie, steun van de leidinggevende en collega's). Daarnaast onderzochten we of en hoe implementatiefactoren (participatie, communicatie en de dialoog over stress) gerelateerd waren aan deze uitkomsten. De aanpak bestond uit vijf stappen: 1) het instellen van een werkgroep op elke school, 2) het inventariseren van werkstressrisico's, 3) het opstellen van een actieplan met maatregelen om werkstressrisico's aan te pakken, 4) het implementeren van het actieplan, en 5) het uitvoeren van een proces- en effectevaluatie. Met een meervoudig *casestudy*-onderzoeksdesign werd het effect van de aanpak onderzocht op vijf basisscholen in Nederland. Met behulp van vragenlijsten bij aanvang (voormeting) en na 12 maanden (nameting) werden kwantitatieve data verzameld. Daarnaast werden met behulp van interviews kwalitatieve gegevens verzameld om het implementatieproces in meer detail te onderzoeken.

De resultaten toonden een statistisch significante afname van taakeisen en een toename van werktevredenheid tussen de voormeting en de nameting op de vijf scholen. Daarnaast lieten medewerkers die tevredener waren over de communicatie tijdens de implementatie van de interventie meer verbeteringen zien in hun autonomie en werktevredenheid. Medewerkers die een toegenomen dialoog over werkstress tussen medewerkers en management rapporteerden, lieten echter een kleinere afname van taakeisen zien ten opzichte van medewerkers die geen toegenomen dialoog rapporteerden. Een mogelijke verklaring is dat het bespreken van werkstress en de oorzaken ervan mogelijk op de korte termijn resulteert in (extra) acties om de situatie te verbeteren.

Op basis van de resultaten van de studie kunnen verschillende conclusies worden getrokken. Hoewel er geen effecten op de primaire uitkomst (emotionele uitputting) werden gevonden, leek de aanpak positieve effecten te hebben op taakeisen en werktevredenheid. De implementatie van actieplannen vormde een uitdagende fase van de aanpak. Vooral in deze fase was het moeilijk om medewerkers geïnformeerd en betrokken te houden, en de

uitvoering van actieplannen werd belemmerd door een gebrek aan tijd en/of prioriteit. Uit het onderzoek bleek dat de effecten van de aanpak afhankelijk waren van het succes van de implementatie. Dit kan betekenen dat een succesvollere implementatie mogelijk tot meer en/of grotere effecten op de werkstressrisico's en emotionele uitputting zou hebben kunnen leiden. De resultaten van het onderzoek onderstrepen specifiek het belang van heldere communicatie over de interventie als belangrijk onderdeel van het implementatieproces, wat van invloed is op de effectiviteit van de interventie.

Kwalitatieve interviewgegevens onthulden dat deelnemers de aanpak waardeerden. Medewerkers gaven aan dat de aanpak leidde tot meer bewustwording rondom werkstress en werkstressrisico's. En door de dialoog hierover ervaarden ze de aanpak van werkstress meer als een gezamenlijke verantwoordelijkheid binnen de scholen. Om stevigere conclusies te trekken over de waarde van de aanpak om werkstress in scholen in het primair onderwijs te verminderen, is meer kennis nodig over manieren om de aanpak te verbeteren en met name implementatieproblemen te voorkomen.

Doelstelling 2. Het onderzoeken van de relatie tussen ontwerp, implementatie en effecten van interventies gericht op het voorkomen van werkgerelateerde risico's en gezondheidsbevordering.

Het doel van **hoofdstuk 3** was om meer inzicht te krijgen in het ontwerpen van interventies die succesvol geïmplementeerd en effectief zijn binnen het bredere werkgerelateerde gezondheidsdomein. Deze inzichten kunnen namelijk mogelijk worden gebruikt om de participatieve organisatorische werkstressaanpak verder te verbeteren om de werkstress op basisscholen te verminderen. Het hoofdstuk richtte zich op het verkennen van de relatie tussen het ontwerp, de implementatie en de effecten van interventies gericht op het voorkomen van werkgerelateerde gezondheidsrisico's en/of gezondheidsbevordering. Het onderzoek richtte zich hierbij specifiek op interventies die ontworpen waren met behulp van *Intervention Mapping* (IM). IM is een methode om systematisch interventies te ontwerpen. De methode benadrukt het belang van een participatieve aanpak (ontwikkel de interventie met stakeholders), een theorie-gebaseerde aanpak (kies op theorie en bewijs gebaseerde maatregelen), een ecologische aanpak (kijk naar knelpunten op verschillende niveaus) en implementatieplanning (plan de implementatie van de interventie).Het IM-protocol bevat dan ook verschillende stappen waarin deze onderdelen zijn uitgewerkt. IM wordt regelmatig toegepast binnen het bredere gezondheidsdomein en het doel van hoofdstuk 3 was om te onderzoeken of IM ook effectief wordt gebruikt binnen het werkgerelateerde gezondheidsdomein op het werk. In het bijzonder onderzocht deze studie de relatie tussen de mate van nauwkeurigheid in het volgen van de stappen van het IM-protocol, en het implementatiesucces en effect van 12 interventies gericht op het voorkomen van werkgerelateerde gezondheidsrisico's en/of gezondheidsbevordering (zoals beschreven in 28 artikelen).

Het onderzoek liet zien dat alle geïncludeerde studies in meer of mindere mate moeite hadden met het volgen van het IM-protocol. De studies ondervonden moeilijkheden bij: 1) het organiseren van de participatie van alle stakeholders (zo was de doelgroep van de interventie vaak niet betrokken bij het ontwerp van de interventie en werd een gebrek aan stakeholdersupport vaak gezien als een obstakel voor het succes van de implementatie); 2) het volgen van alle stappen van de theorie-gebaseerde aanpak; en 3) het plannen van de implementatie van de interventie. Er werd geen relatie gevonden tussen het nauwgezet volgen van het IM-protocol en de effecten van de interventie. Hoewel er geen relatie werd gevonden tussen het nauwgezet volgen van het IM-protocol als geheel en het implementatiesucces, leek er wel een relatie te zijn tussen het nauwgezet volgen van één van de substappen uit het protocol die verband hield met de theorie-gebaseerde aanpak en het implementatiesucces. De resultaten van het onderzoek suggereren dat het nauwgezet volgens van de stappen van IM ten aanzien van de theorie-gebaseerde aanpak mogelijk samenhangen met een succesvollere implementatie van de interventie.

Hoewel het onderzoek voornamelijk verkennend van aard was, leverde de studie verschillende inzichten op die relevant zijn voor het ontwerpen van interventies op het domein van werkgerelateerde gezondheid, waaronder organisatorische werkstressinterventies. De bevindingen wijzen erop dat het organiseren van een participatieve aanpak en het plannen van de implementatie in de praktijk uitdagend kunnen zijn. Bovendien impliceren de resultaten dat het uitwerken van een theorie-gebaseerde aanpak bij de ontwikkeling van interventies, hoewel complex en tijdrovend, uiteindelijk de moeite waard kan zijn en kan leiden tot meer op maat gemaakte interventies die aansluiten bij de behoeften van de doelgroep.

Doelstelling 3- I: Het zodanig ontwerpen van een participatieve organisatorische werkstressinterventie (versie 2) dat het falen van de interventie (door het kiezen van ineffectieve maatregelen of het niet succesvol implementeren van de maatregelen) wordt voorkomen

Op basis van de resultaten uit hoofdstuk 2 en 3 werd in **hoofdstuk 4** een participatieve organisatorische werkstressaanpak (versie 2) ontwikkeld om werkstress bij werknemers op basisscholen te verminderen. De aanpak bevatte innovatieve aspecten om het falen van de interventie (door inadequate maatregelen of door problemen bij de implementatie van maatregelen) te voorkomen. De aanpak bestond uit de vijf algemene stappen (zie Figuur 1).

Tijdens stap 1 (voorbereiding) werd op elke school een werkgroep gevormd die verantwoordelijk was voor de actieplanning (stap 3) en implementatie (stap 4). De werkgroep bestond uit de schooldirecteur en 2 tot 3 medewerkers.

Tijdens stap 2 (risicoinventarisatie) werden de oorzaken van werkstress op de scholen geïdentificeerd aan de hand van focusgroepbijeenkomsten (twee focusgroepbijeenkomsten met 3 tot 5 medewerkers per school). Om te voorkomen dat het programma zou falen door ongeschikte maatregelen, werd een innovatie toegevoegd aan stap 2: een logisch veranderingsmodel. Dit logische veranderingsmodel was bedoeld voor werkgroepen om de selectie van geschikte maatregelen te vergemakkelijken, met als uiteindelijke doel om de potentiële impact van de actieplannen op (de) werkstress(determinanten) te vergroten. Het logische veranderingsmodel werd ontwikkeld door het onderzoeksteam op basis van *Intervention Mapping* door: (i) het vaststellen van de interventiedoelen, (ii) het identificeren van gedrags- en omgevingsfactoren (ofwel: (gedrags)doelen die nodig zijn om het interventiedoel te bereiken), (iii) het identificeren van determinanten voor de gedrags- en omgevingsfactoren en (iv) het selecteren van methoden om de determinanten te veranderen.

Tijdens stap 3 (actieplanning) werden mogelijke maatregelen geïnventariseerd aan de hand van participatieve focusgroepbijeenkomsten op elke school met alle medewerkers. Op basis van de resultaten van de focusgroepbijeenkomsten en het logische veranderingsmodel ontwikkelde het onderzoeksteam een algemeen actieplan voor alle scholen. Dit algemene actieplan bevatte verschillende geschikte mogelijke maatregelen en de onderbouwing achter deze maatregelen. Op basis van het algemene actieplan konden de werkgroepen op de scholen maatregelen selecteren en verder uitwerken tot een schoolspecifiek actieplan.

In stap 4 (implementatie) werden de maatregelen uit de schoolspecifieke actieplannen geïmplementeerd door de werkgroepen. Om het falen van de interventie te voorkomen, werd in deze stap opnieuw een innovatie toegevoegd: real-time feedback tijdens het implementatieproces. Tijdens de implementatie van de actieplannen werd met maandelijkse *pulse*metingen de voortgang gemonitord op de werkstressdeterminanten waar de actieplannen op gericht waren. De werkgroepen konden deze feedback gebruiken om de actieplannen verder aan te passen en zo de effectiviteit van de maatregelen te optimaliseren. Om het falen van de implementatie van de actieplannen te voorkomen, werd met de maandelijkse *pulse*metingen ook het implementatieproces gemonitord. Werkgroepen kregen op basis hiervan maandelijks feedback over verschillende implementatiefactoren. Deze feedback kon door de werkgroepen worden gebruikt om het implementatieproces te volgen en tijdig acties te ondernemen om de implementatie te verbeteren indien nodig.

Tijdens stap 5 (evaluatie) werden het implementatieproces en de effecten van de aanpak geëvalueerd.

Figuur 1: Organisatorische werkstressaanpak (versie 2)

Doelstelling 3- II: Het evalueren van het implementatieproces van de participatieve organisatorische werkstressinterventie (versie 2)

Hoofdstuk 5 beschrijft de procesevaluatie van de participatieve organisatorische werkstressaanpak (versie 2) die werd geïmplementeerd op 4 basisscholen in Nederland. Daarnaast werd de waarde van *real-time feedback (*op basis van de maandelijkse *puls*emetingen), dat een innovatief onderdeel vormde van de implementatiestrategie van de aanpak, onderzocht. Werkgroepen van de scholen ontvingen *real-time feedback* ten aanzien van de door werknemers waargenomen betrokkenheid van het management, mate van betrokkenheid van medewerkers bij de aanpak, mate van communicatie, en bereidheid van medewerkers tot verandering. Op basis van deze informatie konden werkgroepen de implementatie van de actieplannen verbeteren indien nodig.

De studie had als doel twee onderzoeksvragen te beantwoorden. De eerste onderzoeksvraag was: *Hoe succesvol was de implementatie van de aanpak bij de scholen in het primair onderwijs?* Om het succes van de implementatie te bepalen, werd het raamwerk van Nielsen & Randall voor procesevaluaties van organisatorische interventies toegepast. Het succes van de implementatie werd bepaald met betrekking tot het ontwerp en de realisatie van actieplannen, de implementatiestrategie, de interventiecontext en de mentale modellen van de deelnemers. Voor elk van deze aspecten werden eisen geformuleerd waaraan moest worden voldaan om de aanpak als succesvol geïmplementeerd te beschouwen. De tweede onderzoeksvraag was: *Wat is de waarde van real-time feedback als onderdeel van de*

implementatiestrategie van de aanpak? Het antwoord op deze vraag was gebaseerd op de verzamelde *pulse*metinggegevens, veranderingen in implementatiefactoren in de loop van de tijd, de waarde van feedback volgens de werkgroepen, en acties die door werkgroepen werden ondernomen op basis van de *real-time feedback*.

Met betrekking tot de eerste onderzoeksvraag toonden de resultaten van de procesevaluatie grote verschillen aan tussen de vier scholen in de mate van implementatie van de aanpak. Op één school was de implementatie succesvol, op twee scholen was de implementatie gedeeltelijk succesvol en op één school was de implementatie niet succesvol. Factoren die de implementatie van de aanpak belemmerden, waren de interventiecontext, de grootte van de school en de timing van de stappen van de aanpak. Betrokkenheid van het management en deelname van medewerkers leken belangrijke factoren voor succesvolle implementatie.

Met betrekking tot de tweede onderzoeksvraag bleek de *real-time feedback* vooral van waarde te zijn voor scholen die al succesvol waren in het implementeren van de aanpak, omdat het hen ondersteunde in het verder optimaliseren van de implementatie. Echter, op scholen waar de implementatie van de aanpak minder succesvol was, beperkte een lage respons op de *pulse*metingen de waarde van de *real-time feedback*. Het bleek dat op deze scholen implementatieproblemen (zoals een gebrek aan medewerkersbetrokkenheid en bereidheid tot verandering) al speelden vóór de implementatie van de actieplanen, wat waarschijnlijk ook een reden vormde voor de lage respons op de *pulse*metingen. De resultaten suggereren dat er meer onderzoek nodig is naar geschikte methoden voor het monitoren van implementatieproces en het identificeren van implementatieproblemen, die alle fasen van de aanpak bestrijken.

Doelstelling 3- III: Het evalueren van het effect van de participatieve organisatorische werkstressinterventie (versie 2)

Hoofdstuk 6 onderzocht de effecten van de participatieve organisatorische werkstressaanpak op emotionele uitputting en werkstressdeterminanten zoals geïdentificeerd in de risico-inventarisatiefase (namelijk kwantitatieve en emotionele eisen, (gebrek aan) *job crafting*-gedrag, leiderschap, sociale steun, autonomie, teamcultuur en competentiegevoelens). Daarnaast werd ook de impact van het succes van de implementatie (gebaseerd op de volgende elementen: informatie en communicatie, commitment van het team, commitment van management, medewerkersbetrokkenheid, participatie in besluitvorming en geïmplementeerde acties) op emotionele uitputting en werkstressdeterminanten bestudeerd.

De volgende onderzoeksvragen werden geformuleerd: *In hoeverre verminderde de aanpak de emotionele uitputting bij interventiescholen over een periode van twee jaar, vergeleken met controlescholen (OV1)? In hoeverre veranderde de aanpak de werkstressdeterminanten bij interventiescholen over een periode van twee jaar, vergeleken met controlescholen (OV2)?*

Daarnaast werden onderzoeksvragen geformuleerd om te onderzoeken of het implementatieproces invloed had op de effecten van de aanpak op emotionele uitputting en werkstressdeterminanten*: In hoeverre is er een verband tussen de mate van implementatie en de effecten van de aanpak op emotionele uitputting tussen de nulmeting en de follow-up na 2 jaar (OV3)? In hoeverre is er een verband tussen de mate van implementatie en de effecten van de aanpak op werkstressdeterminanten tussen de nulmeting en follow-up na 2 jaar (OV4)?*

Om deze onderzoeksvragen te beantwoorden, werd een quasi-experimentele studie uitgevoerd met een interventiegroep (4 scholen, N=102 medewerkers) en een controlegroep (26 scholen, N=656 medewerkers) met behulp van vragenlijsten bij aanvang (T0), na één jaar (T1) en na twee jaar (T2). *Multilevel mixed model*-analyses werden uitgevoerd om de effecten van conditie (interventie- of controlegroep) en mate van implementatie te testen op veranderingen in emotionele uitputting en werkstressdeterminanten tussen T0 en T2 bij de interventie- en controlegroep.

De resultaten toonden geen effect van de interventie op emotionele uitputting (OV1) en de meeste werkstressdeterminanten (OV2), maar de resultaten toonden wel een effect van de interventie op de gerapporteerde kwaliteit van leiderschap. De verbetering van de kwaliteit van leiderschap tussen T0 en T2 was significant groter in de interventiegroep in vergelijking met de controlegroep. Wanneer het implementatieniveau van de aanpak werd meegenomen, toonden de resultaten bovendien aan dat het succes van de implementatie geassocieerd was met een afname van onnodige taakeisen en een toename van de kwaliteit van leiderschap, participatief leiderschap, teamcultuur en *job crafting*-gedrag (OV4). Resultaten wijzen erop dat – indien succesvol geïmplementeerd – de interventie op organisatieniveau het potentieel heeft om de psychosociale werkomgeving te verbeteren.

Deze resultaten onderstrepen niet alleen opnieuw het belang van een succesvolle implementatie van dit soort aanpakken, maar illustreren ook de noodzaak om het implementatieniveau mee te nemen bij het bestuderen van de (potentiële) effectiviteit van dit soort aanpakken.

In **hoofdstuk 7** wordt gereflecteerd op de bevindingen van de onderzoeken. Daarnaast worden de methodologische sterke punten en beperkingen van de studies besproken, aanbevelingen gedaan voor de praktijk en richtingen gegeven voor toekomstig onderzoek.

Reflecties op de bevindingen

Om het risico op falen van de interventie door inadequate maatregelen te verkleinen, werd een innovatief element toegevoegd aan de algemene stappen van de organisatorische werkstressaanpak (versie 2): er werd een logisch veranderingsmodel ontwikkeld als onderdeel van de risicoinventarisatiefase om de selectie van geschikte maatregelen door de

werkgroepen te vergemakkelijken. Volgens medewerkers en schoolleiders vergemakkelijkte het logisch veranderingsmodel inderdaad de selectie van maatregelen, en bleken de geplande maatregelen volgens hen geschikt om de meeste van de geïdentificeerde werkstressrisico's aan te pakken. Bovendien toonden de resultaten van de effectevaluatie aan dat wanneer de maatregelen zoals bedoeld werden doorgevoerd, er positieve effecten op werkstressdeterminanten werden gevonden, zoals beschreven in het logisch veranderingsmodel. Hoewel we geen definitieve conclusies konden trekken over de vraag of de toegevoegde innovatie daadwerkelijk effectief is geweest om het falen van de interventie door inadequate maatregelen te voorkomen, werden bepaalde aspecten ervan door deelnemers gewaardeerd (bijv. het stellen van gedragsdoelen, en de feedback ten aanzien van de voortgang op de werkstressdeterminanten op schoolniveau). Echter, de beperkte respons op de *pulse*metingen beperkte voor sommige scholen de waarde van de feedbackinformatie. Monitoringalternatieven die niet afhankelijk zijn van een hoge respons van medewerkers, zijn nodig om verder te onderzoeken of *realtime feedback* over de voortgang op de werkstressdeterminanten de inzet van effectieve maatregelen kan optimaliseren. Echter, het werkingsmechanisme van interventies op organisatieniveau hangt niet alleen af van de feitelijke maatregelen die worden doorgevoerd, maar ook van andere meer algemene organisatorische mechanismen (bijv. participatie van werknemers, ondersteuning van het management) die door de aanpak in gang worden gezet. Het verbeteren van de aanpak vereist mogelijk ook meer aandacht voor deze mechanismen.

Een tweede doel van dit proefschrift was het verkennen van manieren om het falen van de interventie door problemen tijdens implementatie van de maatregelen te voorkomen. Hiervoor werd nog een innovatie toegevoegd aan de werkstressaanpak (versie 2): tijdens de implementatie van de actieplannen werd het implementatieproces gemonitord met maandelijkse *pulse*metingen onder medewerkers. De resultaten hiervan op schoolniveau werden in de vorm van een feedbackrapport aan de werkgroepen verstrekt als stuurmiddel. Werkgroepen konden deze feedback gebruiken om implementatieproblemen te signaleren en indien nodig actie te ondernemen. Echter, ondanks deze inspanningen om het implementatieproces te optimaliseren, verliep de implementatie op sommige scholen niet succesvol, en de feedback leek vooral van waarde op scholen waar de implementatie al voorspoedig verliep. Deze bevindingen wijzen er mogelijk op dat *realtime feedback* kan worden gebruikt om de implementatie van actieplannen verder te optimaliseren, maar niet om implementatieproblemen in deze fase van de aanpak te voorkomen. De *realtime feedback* tijdens de implementatie van de actieplannen kwam voor sommige scholen mogelijk te laat om implementatieproblemen te voorkomen. Succesvolle implementatie van interventies op organisatieniveau vereist mogelijk een bepaald niveau van *'organisational readiness'* (bijvoorbeeld in termen van *management commitment*, prioriteit voor de aanpak, betrokkenheid van medewerkers, etc) vanaf de start van de aanpak. Om het risico op implementatiefalen bij organisatorische werkstressinterventies te verkleinen, zouden

organisaties voor aanvang moet bepalen of ze klaar zijn voor de aanpak en, indien dat niet het geval is, aanvullende acties moeten treffen. Daarnaast is het belangrijk dat organisaties deze implementatiefactoren blijven volgen zodat zij actie kunnen ondernemen als zich na verloop van tijd alsnog belemmeringen voordoen.

In beide studies naar de effectiviteit van de werkstressaanpak (versie 1 in hoofdstuk 2 en versie 2 in hoofdstuk 6) werd geen effect gevonden op emotionele uitputting (werkstress). Dit zou kunnen betekenen dat dit type aanpak niet effectief is om werkstress op basisscholen te verminderen. Echter, in beide studies werden wel degelijk effecten gevonden op werkstressdeterminanten. Dit suggereert dat de aanpak een positieve verandering teweeg heeft gebracht, en sluit niet uit dat effecten op werkstress mogelijk op langere termijn zichtbaar worden. Beide studies toonden ook aan dat de effectiviteit van de aanpak gerelateerd was aan de mate van implementatie. Deze bevindingen suggereren dat indien de aanpak succesvol wordt geïmplementeerd, de aanpak in potentie effectief is in het verminderen van werkstressrisico's en zo mogelijk op langere termijn ook emotionele uitputting kan verminderen. Aangezien succesvolle implementatie echter zeer uitdagend is, zouden verdere verbeteringen van de aanpak zich met name moeten richten op het voorkomen van implementatiefalen gedurende alle fasen van de aanpak.

Methodologische sterktes en beperkingen

De studies in dit proefschrift kenden vanuit methodologisch perspectief verschillende sterke punten en beperkingen. Een sterk punt was onder andere dat het proefschrift de evaluatie van twee versies van een participatieve organisatorische werkstressaanpak omvatte, die geïmplementeerd zijn in 9 verschillende scholen in 2 verschillende studies. Hierdoor was het mogelijk om meer algemene conclusies te trekken over dit type aanpak om werkstress in basisscholen te verminderen. Een ander sterk punt was dat de studies gebruik maakten van een uitgebreide *mixed methods*-benadering (vragenlijsten, interviews, datalogs, maandelijkse pulsemetingen) om het implementatieproces en de effecten van de aanpakken te onderzoeken. Ten slotte was een belangrijke sterk punt dat niet alleen de effecten van de aanpak, maar ook de impact van implementatiesucces op de effecten van de aanpak werd onderzocht. Er zijn ook enkele beperkingen van de studies te noemen. Het verzamelen van voldoende gegevens om een representatief beeld van de situatie per school te geven was uitdagend. Bovendien was de timing van de *follow-up*vragenlijst lastig te bepalen vanwege het cyclische karakter van de aanpak. Verder werden de scholen die in de studie waren opgenomen niet willekeurig geselecteerd, maar meldden zij zich vrijwillig aan om deel te nemen. Dit kan erop wijzen dat deze scholen meer bereid waren om werkstress aan te pakken en meer openstonden voor verandering, wat mogelijk van invloed is geweest op de gevonden studieresultaten.

Aanbevelingen

Op basis van de resultaten van dit proefschrift lijkt aanvullend onderzoek op de volgende onderwerpen zinvol:

- **Onderzoek manieren om het implementatieproces te monitoren:** Dit proefschrift heeft een begin gemaakt met het onderzoeken van de waarde van *realtime* monitoring van het implementatieproces om de effectiviteit van de actieplannen te optimaliseren. Goede monitoringgegevens van het implementatieproces zijn echter ook zeer nuttig voor de procesevaluatie omdat ze een gedetailleerd beeld geven van hoe de implementatie verloopt over de tijd en welke factoren de implementatie beïnvloeden. Deze informatie kan worden gebruikt om implementatiefalen te voorkomen. Meer onderzoek is nodig naar geschikte methoden om het hele proces goed te volgen en problemen vroegtijdig te signaleren.

- **Verbeter de psychometrische kwaliteit van implementatieprocesmaten:** Er wordt steeds meer onderzoek gedaan naar de implementatie van interventies, maar er zijn veel verschillende evaluatieraamwerken en meetmethodes in gebruik. Dit maakt het moeilijk om studies te vergelijken. Daarnaast zijn de gebruikte meetinstrumenten vaak onvoldoende gevalideerd. Betere en meer betrouwbare meetinstrumenten kunnen helpen om de kwaliteit van procesevaluaties te verbeteren en resultaten van verschillende interventies beter met elkaar te vergelijken.

- **Onderzoek manieren om de 'organisational readiness' te vergroten:** Onze studies laten zien dat interventies vooral effectief zijn wanneer bepaalde voorwaarden (zoals betrokkenheid van het management, deelname van medewerkers en goede communicatie) vanaf het begin aanwezig zijn. Het is belangrijk dat organisaties zich bewust zijn van deze voorwaarden en kunnen inschatten of ze daaraan voldoen. Een hulpmiddel hierbij kan een praktische tool zijn die organisaties kunnen gebruiken om hun mate van 'gereedheid' te beoordelen. Als een organisatie nog niet klaar is voor de interventie, zijn extra acties nodig alvorens een organisatie met de interventie kan starten. Denk bijvoorbeeld aan het vergroten van de betrokkenheid van het management of de medewerkersparticipatie. Er is echter nog weinig kennis over hoe deze factoren verbeterd kunnen worden. Meer onderzoek naar strategieën om organisaties beter voor te bereiden op participatieve organisatorische interventies is daarom nodig.

- **Onderzoek de lange termijn impact van de cyclische aanpak:** Hoewel organisatiegerichte interventies vaak beweren cyclisch van aard te zijn, rapporteren de meeste studies alleen de eerste fase van de *'plan-do-check-act'*-cyclus. Hierdoor weten we weinig over hoe de eerste cyclus de volgende rondes beïnvloedt. Onderzoek naar meerdere cycli is echter tijdrovend en duur, maar noodzakelijk om

conclusies te kunnen trekken over de waarde van deze aanpak op de lange termijn en over de duurzaamheid van de korte termijn effecten.

De volgende aanbevelingen werden gedaan voor de praktijk:

- **Faciliteer organisatieverandering:** Een belangrijk onderdeel van de aanpak is het cyclische leerproces, waarbij maatregelen worden uitgevoerd, gevolgd, geëvalueerd en indien nodig aangepast. Dit betekent dat de nadruk minder moet liggen op de specifieke maatregelen in de actieplannen en meer op het stimuleren van organisaties om samen maatregelen te nemen en te leren tijdens het proces. Dit vraagt om echte betrokkenheid van managers, die als voorbeeld moeten dienen en actief moeten meedoen aan het veranderingsproces. Daarnaast is er een organisatiecultuur nodig waarin medewerkers zich veilig voelen om ideeën te delen, risico's te nemen en fouten toe te geven zonder angst voor repercussies. Ook moet de organisatie leren en ontwikkelen waarderen en experimenteren en kennis delen aanmoedigen. Praktische hulpmiddelen voor monitoring en feedback kunnen dit langdurige veranderproces ondersteunen. Onderstaande kaders geven handvatten voor de werkgever (kader 1), leidinggevenden (kader 2) en medewerkers (kader 3) om van de aanpak een succes te maken.

  Richt je op het hele systeem: Volgens de hiërarchie van beheersmaatregelen (ofwel: arbeidshygiënische strategie) moeten werkstressrisico's bij de bron worden aangepakt. Een voordeel van organisatiegerichte interventies is dat ze zich richten op structuren, beleid en processen binnen de organisatie die werkstress veroorzaken. Deze interventies helpen de organisatie om deze werkstressrisico's beter aan te pakken. Toch kunnen externe factoren, zoals marktomstandigheden, wetgeving en maatschappelijke verwachtingen, ook invloed hebben op deze structuren en processen. Het feit dat werkstress wijdverspreid is in de hele onderwijssector, kan erop wijzen dat de oorzaak van het probleem deels op een hoger niveau ligt. Hoewel organisatiegerichte interventies de psychosociale werkomgeving kunnen verbeteren, kan het verminderen van werkstress in het basisonderwijs ook veranderingen op macro-niveau vereisen, zoals aanpassingen in het systeem. Daarnaast kunnen factoren op micro-niveau ook een rol spelen bij werkstress, zoals persoonlijke verschillen in hoe mensen werkstress ervaren, beïnvloed door bijvoorbeeld hun *coping*stijl of eerdere ervaringen. Een brede aanpak die zich richt op meerdere niveaus—macro (beleid, administratieve lasten, lerarentekorten), organisatie (werkbelasting en middelen) en micro (veerkracht)—heeft de potentie om gelijktijdig de diepere oorzaken, de organisatorische stressfactoren als de individuele behoeften te veranderen.

Kader 1: Wat kun je als werkgever doen?

Werkgevers zijn verantwoordelijk voor het initiëren en ondersteunen van werkstressinterventies, het creëren van een ondersteunende en gezonde werkomgeving, en het waarborgen dat zowel leidinggevenden als werknemers de juiste middelen en begeleiding hebben om succesvol werkstress te verminderen. De belangrijkste taken van de werkgever zijn:

Strategische verantwoordelijkheid: Werkgevers moeten een duidelijk beleid ontwikkelen en ondersteunen dat gericht is op het voorkomen en verminderen van werkstress. Dit houdt in dat ze strategische doelen stellen, middelen toewijzen en prioriteit geven aan werkstresspreventie binnen de organisatie.

Faciliteren van middelen en ondersteuning: Werkgevers moeten ervoor zorgen dat er voldoende middelen (zoals tijd, budget en personeel) beschikbaar zijn om werkstressinterventies te implementeren. Ze moeten ook zorgen voor deskundige ondersteuning, zoals HR-professionals of (externe) adviseurs, om deze processen te begeleiden.

Creëren van een gezonde werkcultuur: Werkgevers spelen een sleutelrol in het bevorderen van een cultuur waarin aandacht voor het welzijn van werknemers centraal staat. Dit betekent dat ze moeten zorgen voor een werkklimaat waarin open communicatie over werkstress mogelijk is, en waarin werknemers zich veilig voelen om problemen te bespreken.

Management betrekken en ondersteunen: Werkgevers moeten ervoor zorgen dat het managementteam betrokken is bij de aanpak van werkstress en wordt getraind in het herkennen en aanpakken van werkstress. Het is belangrijk dat leidinggevenden ook worden ondersteund in hun rol om een gezonde werkcultuur te bevorderen.

Zorgen voor naleving van wet- en regelgeving: Werkgevers hebben de verantwoordelijkheid om ervoor te zorgen dat de organisatie voldoet aan wetgeving met betrekking tot arbeidsomstandigheden en werkstresspreventie. Dit omvat het uitvoeren van risico-inventarisaties en-evaluaties (RI&E) en het nemen van passende maatregelen om werkstress te verminderen.

Monitoren en evalueren van interventies: Werkgevers moeten de voortgang van werkstressinterventies nauwlettend volgen en evalueren. Dit betekent dat ze regelmatig moeten controleren of de beoogde doelen worden bereikt en waar nodig bijsturen. Het evalueren van de effectiviteit van de interventies is essentieel om duurzame veranderingen te realiseren.

Communicatie en betrokkenheid: Werkgevers moeten zorgen voor een transparante communicatie over de werkstressinterventies en ervoor zorgen dat werknemers betrokken worden bij het proces. Dit betekent dat ze openheid moeten bieden over de voortgang, doelen en resultaten van de interventies.

Kader 2: Wat kun je als leidinggevende doen?

De rol van de leidinggevende bij de organisatorische werkstressaanpak is essentieel om een positieve verandering te realiseren. Leidinggevenden hebben de verantwoordelijkheid om het proces te faciliteren, medewerkers te ondersteunen en een gezonde werkcultuur te bevorderen. Leidinggevenden kunnen op de volgende manieren bijdragen aan het succes van de organisatorische werkstressaanpak:

Ondersteunen en motiveren: Leidinggevenden moeten zich actief inzetten om het proces van werkstressaanpak te ondersteunen. Dit betekent dat zij betrokken zijn bij de planning, uitvoering en evaluatie van de interventie en medewerkers aanmoedigen om mee te doen.

Rolmodel zijn: Leidinggevenden moeten het goede voorbeeld geven door bijvoorbeeld zelf stress en stressrisico's bespreekbaar te maken, laten zien de aanpak van werkstress belangrijk te vinden en actief betrokken te zijn bij de aanpak. Dit stimuleert medewerkers om ook prioriteit te geven aan hun eigen welzijn.

Dialoog bevorderen: Leidinggevenden spelen een cruciale rol in het bevorderen van open communicatie over werkstress. Door een veilige omgeving te creëren waarin medewerkers stressfactoren kunnen bespreken zonder angst voor repercussies, kunnen problemen sneller worden gesignaleerd en aangepakt.

Problemen signaleren: Leidinggevenden moeten alert zijn op signalen van werkstress bij hun medewerkers. Dit betekent dat ze regelmatig in gesprek gaan met hun team om de werkdruk, welzijn en eventuele stressfactoren te signaleren en te monitoren.

Participatieve besluitvorming: Het is belangrijk dat leidinggevenden medewerkers laten meedenken over welke maatregelen moeten worden genomen. Vaak worden deze beslissingen genomen door de werkgroep die bestaat uit een afvaardiging van medewerkers. In dat geval is het ook belangrijk dat medewerkers buiten de werkgroep de mogelijkheid hebben om inbreng te leveren en meegenomen worden in de besluitvorming.

Cultuur van leren en ontwikkeling stimuleren: Leidinggevenden moeten een cultuur bevorderen waarin leren en ontwikkelen centraal staan en medewerkers zich gesteund voelen in het nemen van risico's, het uitproberen van nieuwe manieren van werken en het delen van ervaringen.

Kader 3: Wat kun je als medewerker doen?

Werknemers zijn niet alleen de doelgroep van de werkstressaanpak, maar ook medeverantwoordelijk voor het succes ervan door hun actieve participatie en samenwerking. De rol van de werknemer bij de aanpak is dan ook cruciaal voor het succes van de interventie. Hun actieve betrokkenheid zorgt ervoor dat de maatregelen beter aansluiten bij de dagelijkse praktijk en behoeften van de werknemers. Medewerkers kunnen op de volgende manieren bijdragen aan het succes van de organisatorische werkstressaanpak:

Actieve deelname aan het proces: Het is belangrijk dat werknemers actief deelnemen aan het identificeren van werkstressrisico's en het ontwikkelen van actieplannen. Hun input is belangrijk om een nauwkeurig beeld te krijgen van de stressfactoren op de werkvloer en de haalbaarheid van werkstressmaatregelen.

Samenwerken in werkgroepen: Werknemers kunnen deelnemen aan werkgroepen die gericht zijn op het bedenken en implementeren van maatregelen om werkstress aan te pakken. Ze werken samen met het management om de plannen vorm te geven en uit te voeren.

Feedback geven: Werknemers kunnen regelmatig feedback geven over hoe zij de getroffen maatregelen ervaren. Dit helpt bij het evalueren van de voortgang en het aanpassen van maatregelen indien nodig.

Veilige cultuur bevorderen: Werknemers dragen bij aan een cultuur van openheid en vertrouwen, waarin ze zich veilig voelen om ideeën te delen, risico's te nemen en fouten te erkennen zonder bang te zijn voor negatieve gevolgen.

Deelnemen aan dialoog: Werknemers kunnen zelf bijdragen aan stresspreventie door werkstress bespreekbaar te maken, tijdig signalen te geven wanneer ze te veel werkdruk ervaren en hun eigen welzijn actief te bewaken.

Gedragsverandering: De aanpak van werkstress vraagt vaak ook een gedragsverandering van werknemers. Door aanpassingen te maken in hun manier van werken en hun omgang met stress kunnen werknemers bijdragen aan het verminderen van stress in de organisatie.

About the author

About the Author

Maartje Bakhuys Roozeboom was born in Amsterdam on March 5, 1981 and grew up in Haarlem. After completing her secondary education (Gymnasium) at the Kennemer Lyceum in 1999, she enrolled in a study Psychology at the VU University of Amsterdam. In 2004 she obtained her master's degree in Social Psychology (with distinction). After her study she worked at the Occupational Diseases Bureau FNV. There she became interested in the theme of occupational health. After completing an additional master's degree in General Social Sciences (cum laude) at Utrecht University in 2006, Maartje worked at the University of Amsterdam as a teacher of academic skills. In 2007 Maartje started her job as a research scientist at TNO. In that position, Maartje has conducted numerous studies to improve the psychosocial working environment, both from an organizational change and behavioral change perspective. Maartje completed several additional training courses during her work at TNO e.g. in the field of behavioral change, implementation of interventions and participatory research. Maartje started her PhD trajectory as an external PhD candidate at Amsterdam UMC (VU University) on the theme of innovations in organizational-level interventions, applied in primary schools. The project was embedded at the APH research institute. From November 2024 onwards, Maartje combines her job as research scientist at TNO with a post-doc position at Amsterdam UMC (VU University) on Virtual Reality Exposure to enhance return to work after stress-related sick leave in cabin crew.

Maartje lives in Haarlem with her partner Jelle and their two children Tijl (14) and Noortje (12).

List of publications

List of publications

International scientific articles

Bakhuys Roozeboom, M.C., Niks, I.M.W., Zwieten, M.H.J. van, Wiezer, N.M., Boot, C.R.L., Schelvis, R.M.C. (2024). Process Evaluation of a Work Stress Prevention Approach in Primary Education: Exploring the Added Value of Real-Time Feedback During Implementation. Journal of Occupational and Environmental Medicine 66(9):p e397-e406

Bakhuys Roozeboom, M.C., Wiezer, N. M., Schelvis, R. M., Niks, I. M., & Boot, C. R. (2024). Effects of a participatory work stress prevention approach for employees in primary education: results of a quasi-experimental study. *Scandinavian Journal of Work, Environment & Health, 4141.*

Bakhuys Roozeboom, M. C., Niks, I. M., Schelvis, R., Wiezer, N. M., & Boot, C. R. (2022). Design of a participatory organizational-level work stress prevention approach in primary education. *Frontiers in Psychology, 13,* 827278.

Bakhuys Roozeboom, M. C., Wiezer, N. M., Boot, C. R., Bongers, P. M., & Schelvis, R. M. (2021). Use of intervention mapping for occupational risk prevention and health promotion: a systematic review of literature. *International Journal of Environmental Research and Public Health, 18(4),* 1775.

Bakhuys Roozeboom, M. C., Schelvis, R. M., Houtman, I. L., Wiezer, N. M., & Bongers, P. M. (2020). Decreasing employees' work stress by a participatory, organizational level work stress prevention approach: a multiple-case study in primary education. *BMC Public Health, 20*, 1-16.

De Korte, E., Wiezer, N., Bakhuys Roozeboom, M., Vink, P., & Kraaij, W. (2018). Behavior change techniques in mHealth apps for the mental and physical health of employees: systematic assessment. *JMIR mHealth and uHealth, 6(10)*, e167.

Bakhuys Roozeboom, M., Visschedijk, G., & Oprins, E. (2017). The effectiveness of three serious games measuring generic learning features. *British journal of educational technology, 48(1),* 83-100.

Dankbaar, M. E., Bakhuys Roozeboom, M., Oprins, E. A., Rutten, F., van Merrienboer, J. J., van Saase, J. L., & Schuit, S. C. (2017). Preparing residents effectively in emergency skills training with a serious game. *Simulation in Healthcare, 12(1),* 9.

Klauw, M. van der, Oude Hengel, K., Bakhuys Roozeboom, M. C., Koppes, L. & Venema, A. (2016). Occupational accidents in the Netherlands: incidence, mental harm, and their

relationship with psychosocial factors at work. *International Journal of Injury Control and Safety Promotion, 23(1),* pp. 79-84.

Oprins, E., Visschedijk, G., Bakhuys Roozeboom, M. C., Dankbaar, M., Trooster, W., & Schuit, S. C. (2015). The game-based learning evaluation model (GEM): measuring the effectiveness of serious games using a standardised method. *International journal of technology enhanced learning, 7(4),* 326-345.

Book chapters

Frank Guldenmund, Birgitte Blatter, Frank Leoné, Frank van Luijk, Herman de Bruine, Jan Treffers, Job Groeneweg, Maartje Bakhuys Roozeboom, Marius Rietdijk, Tamara Wolsak, Victor Roggeveen. Gedrag & Veiligheid: Visies en interventies. Vakmedianet: 2018.

Bakhuys Roozeboom, M. Houtman, I & van den Bossche (2007). Monitoring Psychosocial Risks at Work. In: Leka, S & Cox, T. The European Framework for Psychosocial Risk Management: PRIMA-EF. Nottingham, IWHO, 2008

Dutch scientific articles

Houtman, I.L.D., Kraan, K.O., Bakhuys Roozeboom, M., Bossche, van den S. (2017). Trends in arbeidsomstandigheden van werknemers in Nederland en Europa. *Tijdschrift voor Arbeidsvraagstukken, 33(4),* pp. 404-428.

Bakhuys Roozeboom. M.C. Schelvis, R.M.C. & Wiezer, N.M. (2016). De Werkdruk Wegwijzer. *Tijdschrift voor Human Factors, 41(1),* pp. 25-28.

Bakhuys Roozeboom, M. & Wiezer, N. (2013). Engagementgame: een computerspel voor bevlogen personeel. *Tijdschrift voor Ergonomie, 38(3),* pp. 25-27.

Bakhuys Roozeboom, M. C., Ybema, J. F., & Buijs, P. (2011). Aandacht van huisarts en bedrijfsarts voor arbeid: Effecten op de tevredenheid van werknemers met de geboden zorg en op ziekteverzuim. *Tijdschrift voor gezondheidswetenschappen, 89,* 27-34.

E. Hooftman, W., Fekke Ybema, J., C. Bakhuys Roozeboom, M., & LJ Koppes, L. (2011). Determinanten van geregistreerd ziekteverzuim; verschillen tussen een retrospectieve en prospectieve onderzoeksopzet. *Tijdschrift voor Arbeidsvraagstukken, 27(*2).

LM van Hooff, M., C. Bakhuys Roozeboom, M., MM de Vroome, E., & GW Smulders, P. (2010). De invloed van afwijkende werktijden op de werk-thuis situatie. *Gedrag & Organisatie, 23*(3).

Fekke Ybema, J., & Bakhuys Roozeboom, M. (2009). Hoe gezondheidsbeleid de toewijding van werknemers beïnvloedt. *Gedrag & Organisatie, 22*(4), pp. 354-370.

Popular articles

Bakhuys Roozeboom, M. & Bouwens, L. (2023). Aan de slag met gedrag in de arbopraktijk. Vakblad Arbo. https://www.arbo-online.nl/29280/aan-de-slag-met-gedrag-in-de-arbopraktijk

Wiezer, N. & Bakhuys Roozeboom, M. (2022). Oorzaak en aanpak van werkdruk. Quintesse, 11(4), pp. 15-21.

Bakhuys Roozeboom M.C. & van den Bossche, S. (2016). Agressie op de werkvloer. *Psychosociaal Digitaal (1),* pp. 6-10.

Oprins, E.A.P.B., Bakhuys Roozeboom, M. & Visschedijk, G.C. (2013). Effectiviteit van serious gaming in het onderwijs. *Onderwijsinnovatie,* pp. 32-34.

Schelvis, R. Bakhuys Roozeboom, M. & Wiezer, N. (2012). Meer bevlogenheid, minder stress: beter bedrijfsresultaat. *Management Executive (4),* pp. 34-37.

Other international publications

Niks, I. & Bakhuys Roozeboom, M. Psychosocial risks in the health and social care sector. EU-OSHA: 2023. Psychosocial risk management social care en .pdf (europa.eu)

Van den Heuvel, S., Bakhuys Roozeboom, M., Eekhout, I. & Venema, A. (2019). Management of psychosocial risks in European workplaces: evidence from the second European survey of enterprises on new and emerging risks (ESENER-2). EU-OSHA: 2019.

Irastorza, X. Houtman, I.L.D. Eekhout, I. Venema, A. Bakhuys Roozeboom, M. C. & Buuren, S. van (2017). Health and safety risks at the workplace: a joint analysis of three major surveys. EU-OSHA: 2017.

Milczarek, M., Irastorza, X., Leka, S., Jain, A., Iavicoli, S., Mirabile, M., Buresti, G., Gagliardi, D., Houtman, I., Bakhuys Roozeboom, M.C., Vartia, M. & Pahkin, K. (2012). Drivers and barriers for psychosocial risk management: an analysis of the findings of the European Survey of Enterprises on New and Emerging Risks (ESENER). EU-OSHA: 2012.

González, R., Cockburn, W., Irastorza, X., Houtman, I. & Bakhuys Roozeboom, M.C. (2010). European Survey of Enterprises on New and Emerging Risks Managing safety and health at work. EU-OSHA: 2010.

Leka, S., Cox, T., Jain, A., Hassard, J., Ertel, M., Stilijanow, U., Cvitkovic, J., Lenhardt, U., Lavicoli, S., Deitinger, P., Petyx, C., Natali, E., Houtman, I.L.D., Zwetsloot, G.I.J.M., Bakhuys Roozeboom, M.C., Bossche, S.M.J. van den, Widerszal-Bazyl, M., Zolmierczyk-Zreda, D., Vartia, M., Pahkin, K., Lindstrom, K.& Sutela, S. (2008). Guidance on the European Framework for Psychosocial Risk Management: a resource for employers and worker representatives. WHO: 2008.

Other Dutch publications

Huijs, J., Bakhuys Roozeboom, M., van Empelen, O., van Keulen, H., van der Beek, D., Steijn, W., Douwes, M., Bouwens, L., Goede, H., leFeber, M. & Korte, E. (2022). Keuzewijzer gedragsinterventies veilig en gezond werken. Leiden, TNO, 2022.

Bakhuys Roozeboom, M., Huijs, J., van der Beek, D., van Keulen, H., Goede, H., van der Meer, L., de Korte, E & van Empelen, P. (2020). Gedrag is de sleutel bij het verlagen van gezondheids- en veiligheidsrisico's op het werk. Whitepaper, Leiden, TNO, 2020.

Wiezer, N.M., Schelvis, R., Zwieten, M. van, Kraan, K.O., Klauw, M. van der, Houtman, I., Kwantes, J.H. & Bakhuys Roozeboom, M.C. (2012). Werkdruk. Hoofddorp, TNO rapport, 2012.

International presentations

Bakhuys Roozeboom, M.C. Niks, I.M.W. Schelvis, R.M.C., Wiezer, N.M. Boot, C.R.L. (2023). Effects Of A Participatory Work Stress Prevention Approach For Employees In Primary Education: Results Of A Quasi-Experimental Study. In: Joint Congress of ICOH-WOPS & APA-PFAW 2023. Imagine! Decent work beyond covid-19. Tokyo, Japan, September 19-22, 2023

Bakhuys Roozeboom, M. C., Niks, I. M., Schelvis, R., Wiezer, N. M., & Boot, C. R. (2022). Design of a participatory organizational-level work stress prevention approach in primary education. In: 15th EAOHP Conference 2022. Supporting knowledge comparison to promote good practice in occupational health psychology. Book of conference proceedings. Bordeaux, France, July 6-8, 2022.

Bakhuys Roozeboom, M., Niks, I., van Zwieten, M., Wiezer, N. & Boot, C. (2022). Process evaluation of a work stress prevention approach in primary education using real-time monitoring. In: 6th International Conference Wellbeing at Work 2022. Wellbeing in hectic times. Book of Abstracts. Online conference, June 13-15, 2022

Bakhuys Roozeboom, M., Schelvis, R. & Wiezer, N. (2020). Decreasing employees' work stress by a participatory, organizational level intervention in primary education: A multiple-case study. In: 14th EAOHP Conference 2020. Promoting healthy and sustainable work. Book of conference proceedings. Nicosia, Cyprus, September 2-4, 2020.

van den Heuvel, S. G., Bakhuys Roozeboom, M., Eekhout, I., & Houtman, I. L. D. (2018). Management of psychosocial risks in european workplaces; drivers and barriers in a national and cultural context: abstract and presentation. Proceedings of the 13th European Academy of Occupational Health Psychology ((EAOHP), Adapting to rapid changes in today's workplace 5-7 September 2018 in Lisbon, Portugal.

Eekhout, I., Houtman, I. L. D., Bakhuys Roozeboom, M., & Venema, A. (2017). The joint analysis of the European Survey of Enterprises (ESERNER-2) and Labour Force Survey (LFS). In 5th European User Conference for EU-Microdata, 2-3 March Mannheim.

Dankbaar, M., Bakhuys Roozeboom, M., Oprins, E., Rutten, F., van Saase, J., van Merrienboer, J., & Schuit, S. (2014). Gaming as a training tool to train cognitive skills in Emergency Care: how effective is it?. In Games for Health 2014: Proceedings of the 4th conference on gaming and playful interaction in healthcare (pp. 13-14). Springer Fachmedien Wiesbaden.

Wiezer, N., Bakhuys Roozeboom, M., & Oprins, E. (2013). Serious gaming used as management intervention to prevent work-related stress and raise work–engagement among workers. In Digital Human Modeling and Applications in Health, Safety, Ergonomics, and Risk Management. Human Body Modeling and Ergonomics: 4th International Conference, DHM 2013, Held as Part of HCI International 2013, Las Vegas, NV, USA, July 21-26, 2013, Proceedings, Part II 4 (pp. 149-158). Springer Berlin Heidelberg.

Bakhuys Roozeboom, M.C., Wiezer, N.M. & Joling, C. (2013). Engagementgame. Serious gaming used as a management intervention to prevent work-related stress and raise work engagement among workers. APA NIOSH conference 2013, Los Angeles.

Klauw, M. van der, K. Oude Hengel, M. Bakhuys Roozeboom, L. Koppes & A. Venema. Occupational accidents in the Netherlands: prevalence, mental harm, and the relation with psychosocial factors of work. Working on Safety 2012, Sopot, Poland, Sept 11-14

Jong, T. de, Wiezer, N.M., Bakhuys Roozeboom, M.C. (2011). The effects of prolonged restructuring on well-being of 'survivors'. Dutch Results. 9th International Conference on Occupational Stress and Health. Work, Stress and Health 2011: Work and Well-Being in an Economic Context, May 19-22, Orlando, Florida.

Venema, A. & Bakhuys Roozeboom, M.C. (2010). Road accidents. WOS 2010- Working on Safety Conference, 7–10 September 2010, Roros, Norway.

Leka, S., Jain, A., Houtman, I.L.D., Bakhuys Roozeboom, M., Ertel, M., Pech, P. & Riedmann, A. (2010). European Survey of Enterprises on new and emering risks: key findings on psychosocial risk management at the workplace. Conference paper. In: Proceedings of the 9th European Academy of Occupational Health Psychology. EAOHP 2010: Nottingham.

Bakhuys Roozeboom, M.C. & Venema, A. (2009). The relation between workings conditions, measures to improve working conditions and safety climate. APA-NIOSH congres, Work, Stress and Health 5-8-11-2009, Puerto Rico

Houtman, I.L.D., Bossche, S.N.J. van den, Zwetsloot, G., Bakhuys Roozeboom, M.C., Widerszal-Bazyl, M., Zolnierczyk-Zreda, D., Leka, S.& Jain, A. (2008). Developing indicators for

psychosocial risk management. Proceedings of the 8th European Academy of Occupational Health Psychology (EAOHP), Valencia 12-14 November 2008.

Houtman, I.L.D. Bakhuys Roozeboom, M. Widerszal-Bazyl, M. & Zolnierczyk-Zreda, D. (2008). Work package on monitoring and indicators. International Conference Psychosocial Risk Management at Work: the European Framework, 5 November 2008, Rome.