Workplace health promotion participation in German companies – revisiting a theoretical approach using empirical enrichment

Inaugural Dissertation

zur

Erlangung des Doktorgrades
philosophiae doctor (PhD) in Health Sciences
der Medizinischen Fakultät
der Universität zu Köln

vorgelegt von

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Hundt Druck GmbH, Köln

2024

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Datum der Mündlichen Prüfung: 15.12.2023

Danksagung

Es ist mir noch nicht vollends klar geworden, aber nun liegt sie tatsächlich fertig vor mir: Meine Doktorarbeit. Strenggenommen wäre jetzt eine Wertschätzung aller bisherigen Personen, Gegebenheiten und Systeme aus meiner Biografie angebracht, die dazu geführt haben, dass dieses Ereignis eintrifft. Aber wie so oft in der Wissenschaft angeraten, erfolgt nun der Versuch sich kurzzufassen. Ich möchte an dieser Stelle meinen besonderen Dank gegenüber allen nachstehenden Personen zum Ausdruck bringen, die mich im Prozess der Anfertigung dieser Dissertation begleitet und unterstützt haben.

Mein Dank gilt zunächst meinem Betreuer und Doktorvater Prof. Dr. Holger Pfaff, der wesentlich an der Konzeption und den Ideen dieser Arbeit mitgewirkt hat und mir bei der Umsetzung fachlich stets eine große Hilfe war. Unsere konstruktiven Gespräche gaben mir sowohl Struktur als auch Inspiration für die Umsetzung dieser Arbeit. Außerdem gilt mein Dank meinen Tutoren Prof. Dr. Thomas Erren und Prof. Dr. Joachim Rösler, die mir viele wertvolle Hinweise für die Erstellung der Dissertation gegeben und mich in meiner Vorgehensweise kontinuierlich und positiv bestärkt haben.

Ich bedanke mich außerdem bei den (auch ehemaligen) Kolleg:innen, die mich über die Jahre am Institut fachlich und menschlich bei der Erstellung der Dissertation begleiteten. Meinen Ko-Autor:innen gilt ein Dank für die Mitarbeit und Unterstützung bei der Erstellung, Überarbeitung und Veröffentlichung der Publikationen. Insbesondere den Kolleg:innen aus dem Erdgeschoss an dieser Stelle ein Dank dafür, dass die Arbeit mit kleinen Impulsen wie Eis im Sommer, Kuchen zu Geburtstagen, humorvollen Gesprächen und gemütlichen Pausen am Nachmittag angenehm gestaltet wird. Natürlich auch – etagenunabhängig – allen Kolleg:innen ein Dank für das ein oder andere erfrischende und ermutigende Gespräch, ob zwischendurch an der Tür oder zu feierlichen Begebenheiten. Den hilfreichen Austausch in unseren diversen Jour Fixe-Formaten möchte ich an dieser Stelle nicht unerwähnt lassen. Den Studierenden und wissenschaftlichen Hilfskräften, die mich in dieser Zeit unterstützt haben, gilt ebenfalls ein ausdrücklicher Dank. Florian und Laura gilt zudem meine ausgesprochene Wertschätzung für die hilfreichen Anmerkungen beim Gegenlesen dieser Arbeit.

Des Weiteren möchte ich mich ebenfalls bei den Institutionen in- und außerhalb der Universität zu Köln bedanken, die diese Dissertation in jedweder Hinsicht finanziell, materiell und organisatorisch gefördert haben.

Mein außerordentlicher Dank gilt jedoch meinen Freund:innen und meiner Familie, die mir in dieser Zeit moralisch und verständnisvoll beigestanden haben. Malou und Denise – ich schätze unseren Kontakt seit Studienzeiten und auch wenn es mit der Dissertation mal schwieriger war, hat es mir stets geholfen, mit Euch darüber zu sprechen.

Andreas, Hape und Sabine – auch Ihr habt mich in dieser Zeit begleitet und die gemeinsamen Abende mit Spielen und lustigen Gesprächen sind mir in guter Erinnerung geblieben.

Tief verbunden richte ich meinen aufrichtigen und besonderen Dank an Marco – Worte können nur bedingt meinen Dank dafür zum Ausdruck bringen, dass Du in dieser Zeit stets an meiner Seite warst und mich verständnisvoll durch alle Höhen und Tiefen begleitet hast.

Zuletzt gilt ein besonderer Dank meiner Familie – einfach dafür, dass sie meine Familie sind und ohne die ich nicht die Person wäre, die ich heute bin. Leo, ein Dank, dass Du ein toller großer Bruder für Deine (früher noch kleine) Schwester warst. Meiner weiteren Familie ein Dank für ihre Zusprüche, ihre Neugier und ihre Ermutigungen. Vor allem aber gilt mein besonderer und letzter Dank meinen Eltern, die mir diesen Lebensweg ermöglichten und deren Unterstützung ihresgleichen sucht.

Zusammenfassung

Hintergrund: In internationalen Deklarationen wird betont, dass der Arbeitsplatz ein bedeutsames Setting ist, um die Gesundheit und das Wohlbefinden der Bevölkerung zu stärken. Allerdings sind die Teilnahmequoten an Maßnahmen der betrieblichen Gesundheitsförderung (BGF) in der Regel gering. Zwar gibt es empirische Evidenz für Faktoren der BGF-Teilnahme, jedoch ist die Diskrepanz zwischen BGF-Angebot und -Teilnahme in Deutschland, insbesondere die Rolle organisationaler Merkmale, noch nicht vollständig geklärt. Dies erfordert einen theoriebasierten Forschungsansatz sowie weitere empirische Untersuchungen der Wahrnehmungen betrieblicher Akteur:innen zur BGF, um die Bedingungen und Gründe für die Teilnahme an BGF-Maßnahmen in Unternehmen besser zu verstehen.

Zielsetzung: Vor dem Hintergrund des Forschungsstandes zielt diese kumulative Dissertation darauf ab, wahrgenommene Faktoren für die Teilnahme von Beschäftigten an BGF-Maßnahmen in deutschen Unternehmen zu untersuchen und in einen übergreifenden theoretischen Ansatz zu integrieren. Dazu wird Andersens Modell der Versorgungsinanspruchnahme verwendet und durch Schwarzers Health Action Process Approach (HAPA) ergänzt, um die empirischen Ergebnisse zusammenfassend zu betrachten und übergreifend zu diskutieren.

Methoden: Wissenschaftliche Erkenntnisse werden durch drei empirische Studien generiert. (1) Erstens werden qualitative Interviews mit acht Betriebsärzt:innen inhaltsanalytisch ausgewertet, um ihre Perspektiven auf Faktoren der BGF-Teilnahme von Beschäftigten zu explorieren. Die betriebsärztlichen Interviews entstammen der Prozessevaluation einer Muskel-Skelett-Maßnahme in 22 Betrieben. (2) Zweitens werden quantitative und qualitative Querschnittsdaten eines Online-Mixed-Methods-Fragebogens mit Führungskräften (n=179) eines großen IT-Unternehmens analysiert, die die BGF-Teilnahme und Gründe der Nicht-Teilnahme der Führungskräfte an solchen Maßnahmen adressieren. (3) Drittens werden Implikationen aus einem quasi-experimentellen Prä-Post-Vergleich eines Achtsamkeitstrainings mit Führungskräften (n=56) desselben Unternehmens herangezogen, um die Förderung der Teilnahme an BGF-Maßnahmen übergreifend zu diskutieren.

Ergebnisse: Aus den empirischen Ergebnissen resultieren sowohl organisationale Faktoren als auch individuelle Faktoren der BGF-Teilnahme, die durch Andersens Modell theoretisch gerahmt werden. Organisationale Faktoren wie zielgruppenorientierte und -angepasste Implementation der Maßnahmen, finanzielle Kompensation und etablierte betriebliche Kooperationsnetzwerke werden als förderlich für die BGF-Teilnahme identifiziert. Organisationale Faktoren wie unstete Arbeitsorte und -zeiten sowie hohe Arbeitsbelastung erweisen sich hingegen als hinderlich. Auf individueller Ebene erscheinen Faktoren wie das Wissen über die Verfügbarkeit von BGF-Maßnahmen, soziale Unterstützung und positive Nutzenerwartung als förderlich für die Teilnahme. Dagegen erscheinen Zeitkonflikte, kein wahrgenommener Bedarf oder

schwerwiegende gesundheitliche Einschränkungen als hinderliche Faktoren auf individueller Ebene. In der anschließenden Kombination von Andersens Modell mit dem HAPA ergeben sich empirische Outcomes sowie arbeitsplatzbedingte Barrieren und Ressourcen für die Aufrechterhaltung erlernter gesundheitsförderlicher Verhaltensweisen nach der Teilnahme an BGF-Maßnahmen. Im Hinblick auf die Förderung einer (erneuten) Teilnahme von Beschäftigten an BGF-Maßnahmen und im Hinblick auf die Aufrechterhaltung wünschenswerter organisationaler Outcomes werden theoretische Implikationen diskutiert, die aus der Kombination beider Modelle resultieren.

Schlussfolgerung: Die Ergebnisse bekräftigen gewisse organisationale und individuelle Faktoren der BGF-Teilnahme, die aus dem Forschungsstand hervorgehen, und tragen zudem differenziertere Faktoren aus der Perspektive von Betriebsärzt:innen und IT-Führungskräften bei. Neben den empirischen Befunden ergeben sich aus der übergreifenden Perspektive von Andersens Modells in Kombination mit dem HAPA zusätzliche theoretische Implikationen für die Förderung der Teilnahme an BGF-Maßnahmen. Die Dissertation stellt damit einen empirisch angereicherten theoretischen Ansatz bereit, der von Forschung und Praxis zur weiteren Untersuchung und Förderung der BGF-Teilnahme in Unternehmen genutzt werden kann.

Summary

Background: International declarations emphasize that the workplace is a crucial setting to strengthen the health and well-being of the working population. However, participation rates in workplace health promotion (WHP) measures typically remain low. While empirical evidence exists for factors of WHP participation, the disparity between WHP offers and participation in Germany, specifically the role of organizational characteristics, is not fully understood yet. This calls for a theory-driven approach and investigation of workplace actors' perceptions to better understand conditions of and reasons for WHP participation in companies.

Objectives: In light of the research state, this cumulative dissertation aims at investigating perceived underlying factors of WHP participation in German companies and integrating them into an overarching theoretical approach. More specifically, Andersen's Behavioral Model of Health Services Use is employed and supplemented by Schwarzer's Health Action Process Approach (HAPA) to integrate and discuss empirical findings.

Methods: Knowledge is generated using three empirical studies. (1) First, qualitative cross-sectional interviews with eight occupational physicians are content-analyzed to explore their perspectives on factors of employee participation in WHP. Interviews with occupational physicians resulted from the process evaluation of a musculoskeletal measure in 22 companies. (2) Second, quantitative and qualitative cross-sectional data of an online mixed-method survey with managers (n=179) of a large Information and Communications Technologies (ICT)-company are analyzed that address managers' WHP participation and their own reasons for not participating in WHP. (3) Third, implications resulting from findings of a quasi-experimental pre-post-comparison of a workplace mindfulness training with ICT-managers of the same company (n=56) are integrated to discuss how WHP participation can be promoted in general (3).

Results: Framed by Andersen's model, organizational and individual factors of WHP participation emerge from the empirical findings. Organizational factors such as tailored, target-oriented implementation of WHP measures, financial compensation, and an established collaborating WHP network appear as conducive for participation, while variable working locations/times and high workload appear as impeding for participation. On the individual level, conducive factors of WHP participation include perceived WHP availability, social support, and favorable benefit expectation, while impeding factors include individual time conflicts, no perceived need for WHP or severe health conditions. In the subsequent combination of Andersen's model with the HAPA, empirical outcomes, workplace barriers and resources for the maintenance of learned health-promoting behavior following WHP participation emerge. Theoretical implications stemming from the models' combination are discussed in light of facilitating (re-)use of WHP and maintaining beneficial organizational outcomes.

Conclusion: The findings affirm certain organizational and individual factors of WHP participation identified in the research state, while more differentiated factors are contributed from the perspectives of occupational physicians and ICT-managers. Aside from the empirical findings, the overarching perspective of Andersen's model combined with the HAPA generates further theoretical implications for the promotion of WHP participation. Thus, the dissertation contributes an empirically enriched theoretical approach that can be used by researchers and practitioners for further investigation and practical promotion of WHP participation in companies.

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List of abbreviations

AMSTAR	*A MeaSurement Tool to Assess systematic Reviews*
Andersen's model	*Andersen's behavioral model of health services use*
ANOVA	*Analysis of variance*
BGF	*Betriebliche Gesundheitsförderung/Workplace health promotion*
BGMi	*Project BGM-innovative*
BIBB/BAuA	*Bundesinstitut für Berufsbildung/Bundesanstalt für Arbeitsschutz und Arbeitsmedizin; Federal Institute for Vocational Education and Training/Federal Institute for Occupational Safety and Health*
DGUV	*Deutsche Gesetzliche Unfallversicherung/German Social Accident Insurance*
ENWHP	*European Network for Workplace Health Promotion*
ESWS	*European sustainable workforce survey*
GEDA 2014/2015-EHIS	*Studie 'Gesundheit in Deutschland aktuell' ('German Health Update') - European health interview survey*
GKV-Spitzenverband	*Spitzenverband Bund der Krankenkassen/ German National Association of Statutory Health Insurance Funds*
HAPA	*Health action process approach*
HPMs	*Health promotion measures*
HPQ	*World Health Organization Health and Work Performance Questionnaire*
IAB	*Institut für Arbeitsmarkt- und Berufsforschung der Bundesagentur für Arbeit/Institute for Employment Research of the Federal Employment Agency*
ICT	*Information and communication technologies*
MAAS	*Mindfulness Attention Awareness Scale*
MD Bund	*Medizinischer Dienst Bund/Federal Medical Service*
MSDs	*Musculoskeletal disorders*
OECD	*Organization for Economic Co-operation and Development*
OPs	*Occupational physicians*
OR	*Odds ratio*
p1	*Paper 1*
p2	*Paper 2*
p3	*Paper 3*
RE-AIM model	*A model to assess the public health impact of an intervention based on its Reach, Effectiveness, Adoption, Implementation and Maintenance*
WARM-UP	*Workplace HeAlth PRoMotion Utilization Process Model*
WHO	*World Health Organization*
WHO-5	*World Health Organization Well-Being Index*
WHP	*Workplace health promotion*
WMT	*Workplace mindfulness training*

1 Introduction

Several international declarations emphasize the importance of workplace health promotion (WHP) in today's working world. The World Health Organization (WHO) and the European Network for Workplace Health Promotion (ENWHP) point out that the workplace is a crucial life setting to facilitate the health and well-being of a broad employee population (European Network for Workplace Health Promotion [ENWHP], 1997; World Health Organization [WHO], 1997, 2005). In light of societal changes such as the demographic change, shortage of skilled workers, and increase in the working lifetime, strengthening workplace health promotion is substantial to create a sustainable healthcare system in Germany (Hollederer, 2021). Indeed, WHP measures are capable of addressing a variety of conditions that are important for the working population within the scope of work and its impacts on health. These measures can aim at both structural conditions and individual behaviors that promote employees' health, both on a physical and mental level (Barthelmes et al., 2019; Hartung et al., 2021). Although sustained participation in WHP is essential for measures' effectiveness, participation rates in WHP measures are typically low and disappointing (Robroek et al., 2021; Robroek et al., 2009). Reasons for (non)-participation are manifold: Individual time conflicts or lack of knowledge may impede participation, while insufficient access or high workload may impede participation due to workplace conditions. Albeit empirical evidence for such factors of WHP participation exists, the disparity between WHP offers and WHP participation is still unclear in Germany (Hollederer, 2021). Concurrently, perceptions of and participation in WHP measures from employees' perspectives have been neglected in research (Hermann et al., 2021; Nöhammer et al., 2009). We face the situation that few approaches in research about low WHP participation were theory-driven, albeit researchers called for such theory-driven approaches to guide intervention improvements (Linnan et al., 2001). Thus, this dissertation aims at investigating perceived underlying factors of WHP participation in companies and integrating them into an overarching theoretical approach. This is achieved using findings from three empirical studies in German companies and adapting the theoretical models based on these findings. Empirical research gaps that are addressed include perceived factors of participation and non-participation in WHP as well as the role of certain individual and organizational characteristics for WHP participation. While providing evidence from own empirical studies, this dissertation also contributes a re-thought theoretical approach to WHP.

More specifically, Andersen's Behavioral Model of Health Services Use is employed and supplemented by Schwarzer's Health Action Process Approach (HAPA) to integrate and discuss findings (Andersen et al., 2014; Schwarzer, 2008). As WHP research calls for triangulation of methods, both qualitative (paper 1, 2 and 3) and quantitative methods (paper 2 and 3) from empirical social sciences are applied for data collection and analysis (Faller,

2018). The investigated subjects in the studies consist of occupational physicians (paper 1) and managers (paper 2 and 3), allowing a top-down perspective on WHP participation. Furthermore, findings of paper 1 and 2 address the research aim directly, while findings of paper 3 are used to discuss further theoretical implications for WHP participation. Researchers argue the impact of the organization for WHP participation should be included much more in research (Bull et al., 2003; Clancy et al., 2018; van der Put & van der Lippe, 2020). Therefore, the dissertation puts more emphasis on perceived organizational characteristics but also considers individual characteristics relevant for WHP participation.

The dissertation is structured as follows: First, the theoretical background is introduced (chapter 2). Political, practical and research-related aspects of WHP are presented and WHP is theoretically integrated within the structure of the German health care system. Andersen's Behavioral Model of Health Services Use is then presented in detail as the main theoretical model. The theoretical background is concluded with a brief presentation of the HAPA model and the reasoning for using the HAPA as a supplement in the dissertation. Second, the empirical research state is introduced (chapter 3): Availability of and participation within WHP measures in Germany are presented using descriptive statistics of previous representative studies. This is followed by empirical factors of WHP participation identified in previous international and national studies. These factors are integrated within elements of Andersen's model and empirical research gaps for the present dissertation are derived based on the research state. Third, the research question and objectives (chapter 4), applied data bases and empirical methods (chapter 5) of this dissertation are described. Three underlying research papers of the author provide own empirical findings for this dissertation (Schubin et al., 2021; Schubin et al., 2020; Schubin et al., 2023); chapter 6 and Appendix 3). Key findings of these own papers are then discussed by integrating them into an adapted version of Andersen's model and, as a supplement, into a combination of the HAPA model with Andersen's model (chapter 7). Last, strengths and limitations of the dissertation are discussed and implications for research and practice are derived. The dissertation ends with a conclusion (chapter 8).

2 Theoretical background and reasoning

2.1 Workplace health promotion, occupational health management, prevention and occupational health and safety in Germany

Political, legal, practical and research-related aspects within the field of 'health at work' are addressed with various terms in Germany. In this chapter, four fundamental terms are described to narrow down the theoretical background: (a) 'Workplace health promotion' (WHP), (b) 'occupational health management', (c) 'prevention' and (d) 'occupational health and safety'. Occupational health management is distinguished from WHP first. WHP is described in more detail due to its importance for the overall topic. Subsequently, the terms prevention and occupational health and safety are complemented. The areas of prevention and health promotion are then represented within the German health care system. Finally, information on the effectiveness of WHP measures is complemented in the last paragraph.

Workplace health promotion (WHP) (a) and occupational health management (b) and are often used as interchangeable terms (Faller, 2018). On the one hand, health and performance are implemented as integral company goals through managerial strategies in occupational health management (b). The pursuit of operational key indicators, the systematic approach, and the postulated congruity of efficiency and health benefits are typical for occupational health management (Hartung et al., 2021). On the other hand, WHP (a) aims at health promoting organizational development by establishing participation-oriented structures and processes using 'health' as the guiding principle. The more complex the measures, the more the two constructs of occupational health management (b) and workplace health promotion (a) merge into each another (Hollederer, 2021).

In WHP (a), the process of health promoting organizational development claims a broad consensus and discourse across all company levels (top-down and bottom-up). Accordingly, WHP should enable employees to actively shape their working environment and enable such active participation on a structural level (Hartung et al., 2021). This understanding of WHP is based on the Ottawa Charter claiming that health promotion applies to all life settings: Instead of being a source of sickness, society's way of organizing work, working conditions, and leisure should be a source of health (WHO, 1986). In particular, the Luxembourg Declaration on Workplace Health Promotion defines WHP by all joint measures of employers, employees, and society aimed at improving health and wellbeing at the workplace (ENWHP, 1997). The declaration suggests improving work organization and working conditions, promoting active participation of employees, and strengthening personal skills to implement WHP. In practice however, approaches to WHP are diverse (Hollederer, 2021): WHP measures may aim at the working and structural conditions in the company, at the individual health behavior or at both of these levels (Barthelmes et al., 2019). Implementation of fitness facilities, healthy food in

the cafeteria and health checks at work are among the most commonly reported and prevalent types of WHP (van der Put et al., 2020; Verra et al., 2019).

The concept of WHP (a) is now briefly distinguished from the concepts of prevention (c) and occupational health and safety (d). The term 'prevention' typically aims at assessing, monitoring, reducing and preventing workplace hazards and mostly targets occupational groups at (high) risk (Verra et al., 2019). Legally, prevention (c) is realized by means of 'occupational health and safety' measures (d) in Germany ('Safety and Health at Work Act'). Both in Europe and specifically in Germany, regulations for occupational health and safety (d) legally bind employers to ensure a safe working environment and protection from risks at the workplace (Gagliardi et al., 2012; Hartung et al., 2021). Contrary to legally binding preventive measures, WHP participation (a) is voluntary for both employers and employees. However, it is questionable whether the distinction between 'mandatory' and 'voluntary' is valid as preventive measures alone are not sufficient to actively promote health at the workplace (Hartung et al., 2021). Rather, WHP (a) can be understood as a comprehensive concept to fulfill legal duties under occupational health and safety law (d) on a broad scale (Hartung et al., 2021). Preventive interventions (c) typically aim at avoiding disease, while health-promoting interventions (a) aim at strengthening health resources and improving living conditions. Still, health promotion and prevention are often used as joined terms since both concepts ultimately aim at health benefits (Hurrelmann et al., 2018). The practical importance of prevention (c) and health promotion (a) for the healthcare system is illustrated in **Figure 1**. The figure represents an ideal target state of the individual segments of the German healthcare system. Prevention and health promotion are depicted as an integral and essential part. While primary care and therapy are still in the center, they are closely linked with rehabilitation, nursing, prevention and health promotion in this ideal target state (Hurrelmann et al., 2018).

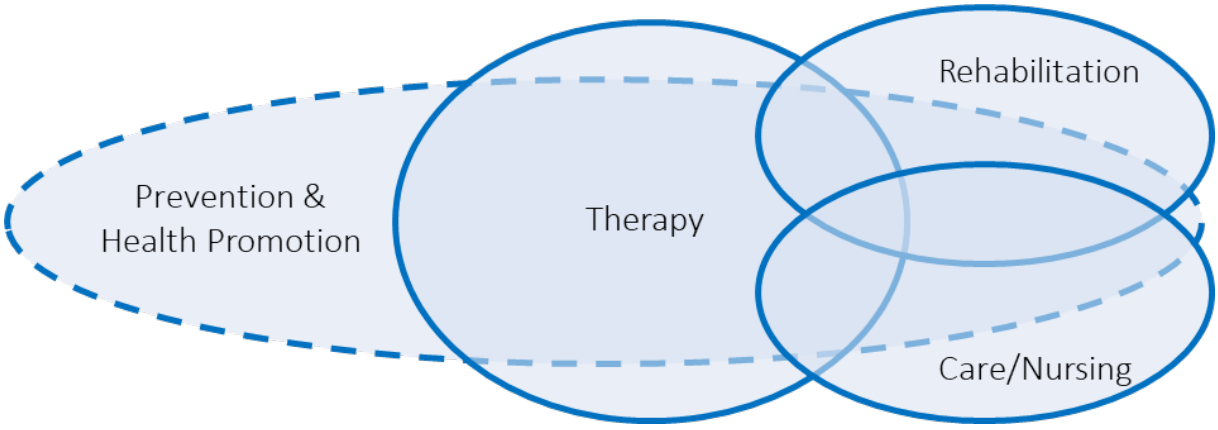


Figure 1. Representation of an ideal target state of the German health care system

(Hurrelmann et al., 2018, p. 31) © 2018 Hogrefe Verlag, Bern © 2004/2007/2010/2014 by Verlag Hans Huber, Hogrefe AG, Bern

The current state, however, resembles a sequential course of these segments that is still dominated by therapy. In its current state, the healthcare system is unable to meet the challenges emerging in society and public health (Hurrelmann et al., 2018). Hence, a shift towards the state represented in **Figure 1** is necessary. In light of societal changes such as the demographic change, shortage of skilled workers, and increase in the working lifetime, strengthening workplace health promotion is substantial (Hollederer, 2021). Whether for reasons of providing up-to-date health and safety measures, for economic reasons or for reasons of corporate responsibility, German companies increasingly offer WHP (Faller & Abel, 2017). Although the Prevention Act of 2015 provided further legal structures and secured financing for prevention and health promotion, there is still great potential for the improvement of WHP in Germany, both on a quantitative and qualitative level (Beck et al., 2015; Hollederer, 2021; Hurrelmann et al., 2018). In other words, a higher number of companies needs to actually implement WHP by means of occupational health management on the one hand. On the other hand, companies need to evaluate and sustain sufficient quality of these occupational health management and WHP measures.

Regarding effectiveness of WHP measures, effect sizes remain small or moderate in original research (Barthelmes et al., 2019; Rongen et al., 2013). Barthelmes et al. (2019) conducted a meta-review of 49 international reviews (including 900 individual studies) about the effectiveness and the benefits of WHP measures. The authors concluded that evidence for the (cost-)effectiveness of WHP is still limited, as measured by 'hard' evidence criteria[1] (Hartung et al., 2021). Many of these studies were conducted in the USA, transferability to Germany is limited and the strength of evidence is impeded due to methodical limitations (Barthelmes et al., 2019). Robroek et al. (2021) state that benefits of 'traditional' universal preventive WHP measures are marginal and their effectiveness and implementation is 'still disappointing'. Therefore, the authors claim that a drastic turnaround and better tailoring of WHP programs is necessary (Robroek et al., 2021). Generating evidence about WHP effectiveness through health promoting organizational development is challenging due to its lacking adherence to a cause-and-effect logic – however, this does not imply an absence of effect (Hartung et al., 2021). Despite its limitations, intervention research yields positive findings on the effectiveness and efficiency of WHP measures (Barthelmes et al., 2019). In fact, international research demonstrates outcomes such as reductions of sick leave rates, improvements in working capability and improvements in health outcomes resulting from successful WHP (Hollederer, 2021). Furthermore, WHP is able to achieve small scale changes in health behavior and findings indicate a positive return-on-investment (Hollederer, 2021). Measures aiming at both

[1] Barthelmes et al. (2019) used AMSTAR 2 (a measurement tool to assess the methodological quality of systematic reviews) and the RE-AIM model (reach, effectiveness, adoption, implementation and maintenance as data extraction dimensions) to examine the evidence of WHP measures.

structural conditions and employees' behavior are more effective and efficient compared to isolated measures (Barthelmes et al., 2019). Structural conditions in particular are emphasized in the Ottawa Charter and the Luxembourg Declaration as WHP is considered an integral participatory process of organizational development (ENWHP, 1997; WHO, 1986). In this dissertation, measures aiming at individual behavior and small-scale measures are also considered a part of WHP. Ultimately, achieving sufficient employee participation in WHP measures is an integral part of successful WHP implementation. A theoretical framework is necessary to grasp this phenomenon of interest, to distinguish multilevel factors of WHP participation and to put findings into perspective. Andersen's Behavioral Model of Health Services Use and the rationale for applying this model in this dissertation are therefore addressed in the next chapter.

2.2 Andersen's behavioral model of health services use and workplace health promotion participation

Prior to introducing the theoretical framework, a working definition for WHP utilization/participation needs to be established. Health services *utilization* can be defined as "the quantification or description of the use of services […] for the purpose of preventing and curing health problems, promoting maintenance of health and well-being, or obtaining information about one's health status and prognosis" (Carrasquillo, 2013, p. 909). *Participation* (in WHP measures) has commonly been defined as a registration in a program or attendance in a first meeting (Glasgow et al., 1993). However, the intention to participate, a continuous participation measure (e.g. percentage of attended meetings), behavior change attempts and drop-out rates were also used for definition and measurement of participation in previous studies. Thus, WHP participation can be seen as both a process and outcome measure (Glasgow et al., 1993). As a working definition for this dissertation, participation in WHP is defined by *employees' voluntary attendance in health-promoting measures offered by the employer at least once within a certain time span at the worksite* (Linnan et al., 2001). Participation and utilization are used as interchangeable terms for this dissertation.

Regarding access to healthcare services, Andersen's Behavioral Model of Health Services Use (abbreviated: Andersen's model) is the most frequently cited model (Ricketts & Goldsmith, 2005). Systematic and scoping reviews show that the model has been widely used in health care services studies, e.g. for the theoretical background, data collection and data analyses across various care settings, diseases of interest and target groups (Babitsch et al., 2012; Lederle et al., 2021). The majority of these studies applied quantitative designs and took place within medical healthcare settings (Lederle et al., 2021). Use of the model within occupational health contexts is especially rare (Champion et al., 1997). On the one hand, this is to be expected considering that the model was originally developed to explain utilization of healthcare. On the other hand, given the essential role of prevention and health promotion

within the healthcare system, it is surprising that the potential of Andersen's model for the context of WHP participation seems unused so far. However, applying the model as a theoretical framework for participation in WHP measures may be beneficial and necessary for various reasons. For one, the difficulty in defining 'participation' in WHP (both theoretically and empirically) calls for a more comprehensive theoretical understanding (Linnan et al., 2001). Empirically, the measurement of frequencies and (minimum) requirements determining 'active' WHP participation differs greatly across study designs. Andersen's model can provide an appropriate theoretical framework to better understand the subject of WHP participation. Since its initial publication in 1968, the model has undergone several revisions. The most current version from 2014 is presented in **Figure 2** (Andersen et al., 2014).

The model addresses three essential factors for the explanation of healthcare services utilization: predisposing factors (e.g. gender, education), enabling factors (e.g. income) and need factors (e.g. morbidity) (Andersen, 2008). These factors are applied both on an individual level and a contextual/aggregated level. The model explains use of healthcare measures by means of individual and contextual characteristics that predispose and enable people with health needs to seek healthcare measures. The most current version focuses facilitating and inhibiting factors of individuals' access to healthcare services (Andersen et al., 2014). Accordingly, characteristics on the contextual and individual level, health behaviors and outcomes influence access to healthcare. Within the model, contextual characteristics comprise aspects of the environment (e.g. health policy); individual characteristics comprise aspects of an individual person's life (e.g. genetics, beliefs); health behaviors comprise an individual's health activities (e.g. personal practices, use of services); and, finally, outcomes of healthcare utilization are represented by the health status, quality of life, and consumer satisfaction. Arrows account for the feedback loops and the iterative nature of the model's components (Andersen, 1995, 2008; Andersen & Davidson, 2007). On the one hand, contextual characteristics may affect health behaviors and outcomes in various ways, indirectly (through individual characteristics) or directly. On the other hand, outcomes may influence the predisposing, enabling, and need characteristics as well as the health behavior. In turn, health behavior may affect characteristics of the contextual and individual level and outcomes depend on both these levels. Despite continuous revisions, the main focus of the model remains on the individual's health behavior, especially on the use of health services, and the subsequent outcomes relating to health and satisfaction with measures (Andersen & Davidson, 2007). Regarding empirical application of the model, there is a large variation in how the model is operationalized and, regarding predisposing and enabling factors in particular, how variables are categorized (Babitsch et al., 2012). Study populations and contexts appear to have a strong impact on the associations postulated in the model, hence findings on variable associations are not always consistent (Babitsch et al., 2012; Chen & Gu, 2021).

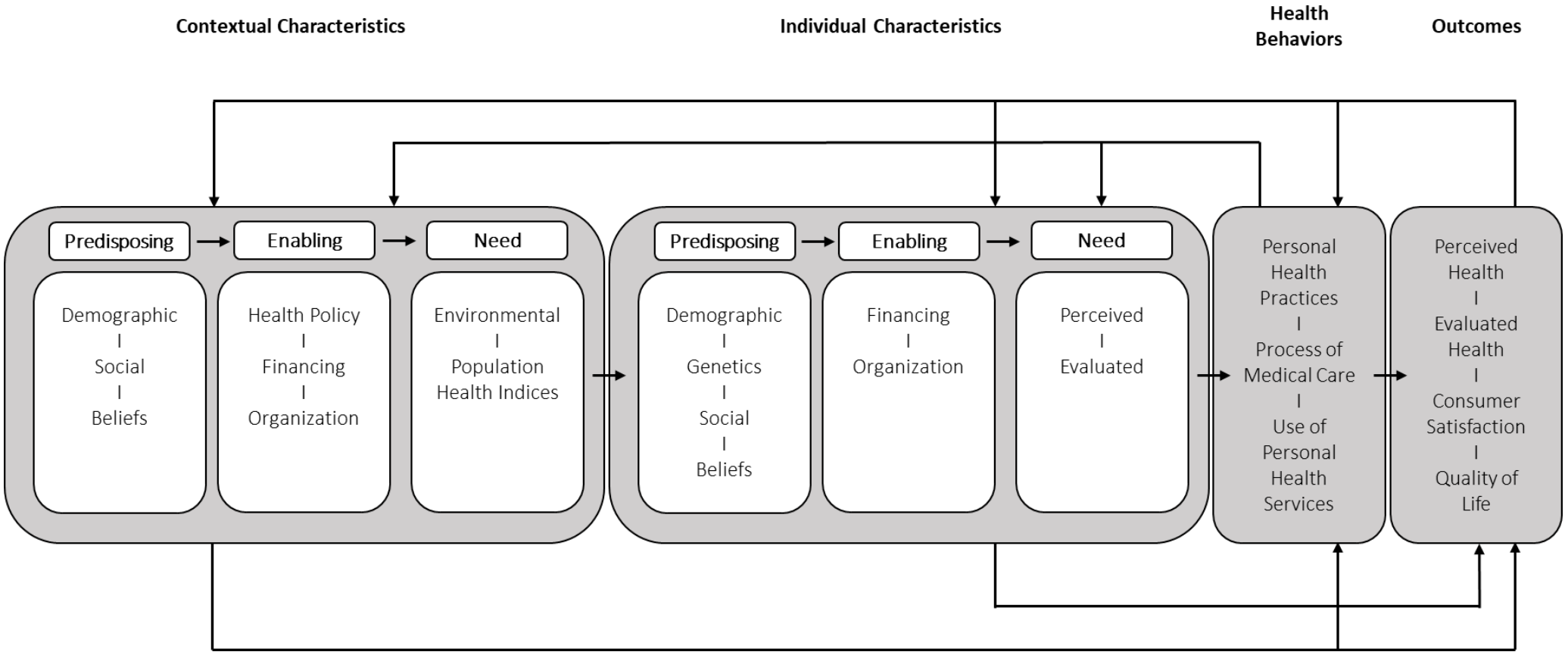


Figure 2. Andersen's Behavioral Model of Health Services Use – 6th revision

(Andersen et al., 2014, p. 35) © 2014 by John Wiley & Sons, Inc.

Regarding predisposing factors on the individual level, gender, age, education, marital status, ethnicity, residence (rural/urban), cultural norms and health beliefs were identified as significant predictors of healthcare utilization (Babitsch et al., 2012; Chen & Gu, 2021). Enabling factors on the contextual and individual level were typically measured by variables such as insurance coverage, income, social support, number of doctors and clinics in the district, travel time and costs, or waiting time. Studies indicate that most variance of general healthcare utilization is explained by need factors commonly measured by professionally evaluated health status and self-rated health status (Chen & Gu, 2021; Guggisberg & Spycher, 2005; Thode et al., 2005). However, this reflects the research state for the application of Andersen's model specifically to *healthcare services utilization* other than WHP. A more detailed representation of the research state will be given in chapter 3 since the phenomenon of interest is participation in WHP.

Evidently, various models can be utilized to provide a theoretical framework for WHP participation, such as models that focus psychological constructs of individuals' health behavior (Ajzen, 1991; Grossman, 1972; Prochaska & Velicer, 1997; Rosenstock, 1974; Schwarzer, 1992). However, we need a framework applying a multilevel structure including perceptions of both individual and organizational factors to account for the systems approach demanded in WHP research and practice (Robroek et al., 2021). Since WHP is embedded within an organizational context, i.e. the workplace, Andersen's model provides a more comprehensive framework to analyze factors of WHP participation as the model considers both individual and contextual dimensions. Although this dissertation does not aim at validating or disproving Andersen's model, its multilevel structure helps integrating findings in the context of workplace health promotion. As an addition, the Health Action Process Approach (HAPA) by Schwarzer (1992, 2008; Schwarzer & Fleig, 2014) is used as a supplementary model in the discussion (chapter 7.1). For this purpose, the HAPA and the reasoning for including the model in the dissertation are briefly presented in the next chapter.

2.3 Schwarzer's health action process approach (HAPA) as a supplement

The HAPA (see **Figure 3**) suggests that adopting, initiating and maintaining health behaviors should be considered within a process of motivational and volitional phases (Schwarzer, 2008; Schwarzer & Fleig, 2014). Self-efficacy is particularly important throughout the entire process, including planning and implementing health behavior change. During the motivational phase, action self-efficacy, outcome expectancies and risk perception are antecedents of forming the intention to change a health behavior (setting a target). During the volitional phase, the formed intention to change a specific health behavior is transformed into action (pursuing a target). The health behavior action and respective coping strategies are planned first and carried out subsequently. This means the specific behavior is initiated, maintained and re-adopted, and the individual controls their actions in this way. Coping self-efficacy is relevant for action

planning and coping planning, while recovery self-efficacy is relevant when the health behavior is carried out. Within the volitional phase, individuals who formed an intention but have not transformed the intention into action yet (the so-called intenders) are differentiated from individuals who already carry out the targeted behavior (the so-called actors). Thus, three groups of individuals are differentiated: the unmotivated (or non-intenders), the motivated (or intenders) and the actors. Health promotion measures can be developed based on the stage a person is situated in (Schwarzer, 2008; Schwarzer & Fleig, 2014). An individual may be confronted with barriers during the process of health behavior change, but they may also have supporting resources available to them. The person may eventually disengage from the enacted behavior.

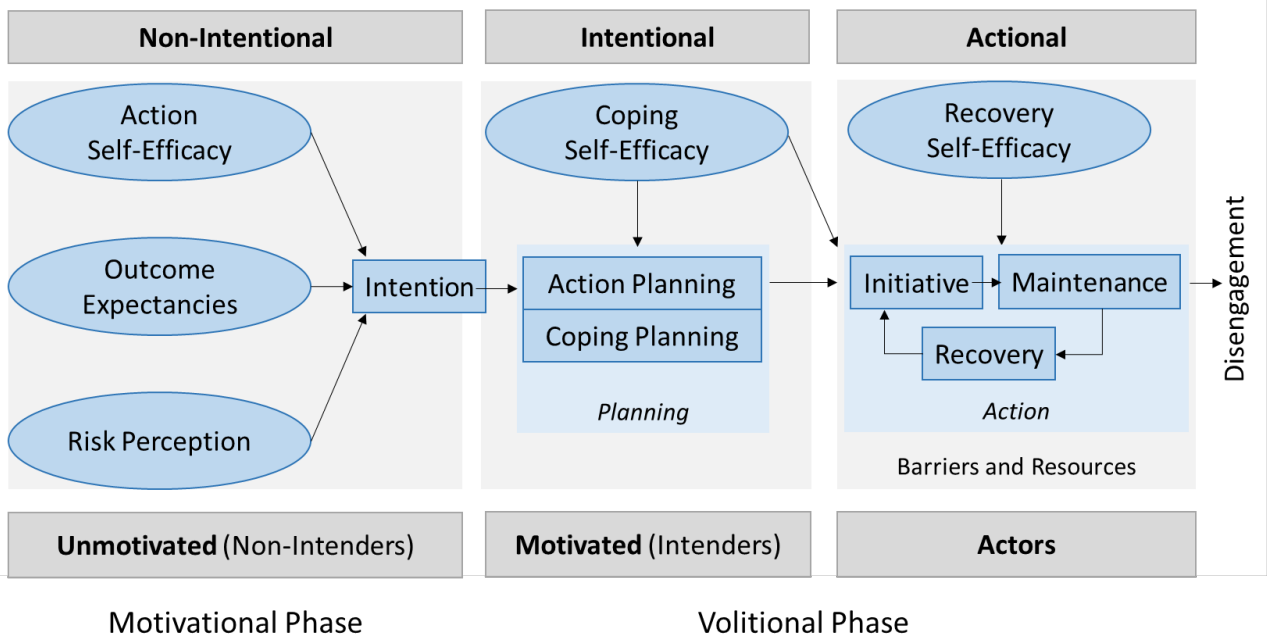


Figure 3. Schwarzer's Health Action Process Approach
(modified based on Schwarzer, 2008; Schwarzer & Fleig, 2014; Figure reproduced from Schwarzer and Fleig (2014) with permission from Springer Nature)

Within Andersen's model, constructs of the HAPA can be embedded within the levels of individual characteristics and health behavior. This way, a more differentiated theoretical basis is provided to discuss WHP participation later on (chapter 7.1). The HAPA is used as a supplement to account for the role of psychological constructs such as individuals' outcome expectancies and intentions situated before WHP participation. It is also used to integrate empirical findings and discuss theoretical implications for WHP participation. The HAPA is helpful as a supplementary model as it integrates both stages and continuous phases of health behavior change and recognizes the need to address health behavior phases based on the specific target group (Finne et al., 2021).

This concludes the theoretical background of this dissertation. The next chapter addresses the empirical research state about WHP participation and factors of WHP participation in more detail.

3 State of the empirical research

The current research state demonstrates that contexts, set-ups and target groups of WHP measures are highly heterogeneous, both in Germany and internationally (Faller, 2018; Pieper et al., 2019). Depending on the study design, the merging of occupational health management and WHP results in differing availability rates and contents of WHP measures (Faller, 2018; Hollederer, 2021). We must differentiate the prevalence and availability of WHP measures in organizations from employees' participation in WHP measures. In the following passages, descriptive numbers of WHP availability and participation rates are described (chapter 3.1.). This is described briefly for European countries and more extensively for Germany. Afterwards, empirical factors of WHP participation are described by categorizing international and national findings from previous studies into Andersen's model (chapter 3.2.).

3.1 Workplace health promotion: Availability and participation

According to van der Put and Mandemakers (2019), no representative datasets about the extent of WHP availability in European organizations exist so far. However, based on a data analysis of 40.584 European organizations, 29.5% of enterprises actively promote physical activity and healthy eating in the workplace (Verra et al., 2019). Additionally, the European Sustainable Workforce Survey (ESWS) using a sample of approximately 10.000 employees shows that most commonly reported WHP measures included healthy menus in the workplace cafeteria, access to sports facilities and health checks (van der Put & Mandemakers, 2019; van der Put et al., 2020). Concurrently, large disparities in WHP availability were identified between European countries and economic sectors (van der Put & Mandemakers, 2019). Concerning WHP participation, 29% of the *total* employee sample in the ESWS utilized healthy menus, 17% used sports facilities and 35% used health checks (van der Put et al., 2020). In a subsample of employees who *knew about the availability* of these WHP measures in their organization, 45% had used the healthy menus, 30% had utilized the sports facilities and 49% had utilized the health checks in the 12 past months (van der Put & van der Lippe, 2020). Regarding participation in such WHP measures, a systematic international review demonstrated that initial participation levels in 23 WHP studies had a median participation level of only 33%, with a wide range of 10% to 64% (Robroek et al., 2009). Disregarding the specific WHP type, the measures often face variable and low utilization rates (Dale et al., 2019; Robroek et al., 2009; van der Put & van der Lippe, 2020). This is also the case for Germany, which will now be described in more detail.

For Germany, Faller (2018) concluded in a systematic review that statements about the overall implementation of WHP in Germany are difficult as objectives, representativeness, and designs of studies differ greatly from one another. Two large representative data sources to determine the dissemination of WHP in Germany are available: One dataset is provided by the

Institute for Employment Research of the Federal Employment Agency (IAB). The other dataset is provided by the Federal Institute for Vocational Education and Training in cooperation with the Federal Institute for Occupational Safety and Health (BIBB/BAuA). While the IAB Establishment Panel comprises self-report data of employers/companies (i.e. reports of the respective human resource department leaders), the BIBB/BAuA Employment Survey comprises self-report data of employees. As presented in **Table 1**, data of both surveys show a moderate increase of WHP availability in Germany over the last twenty years: Company self-reports in the IAB state a development of 19% (in 2002) to 20% (in 2004) to 27% (in 2012) of available WHP measures in companies (Hollederer, 2007; Hollederer & Wießner, 2015). Meanwhile 38% (in 2006), 44% (in 2012), and 47% (in 2018) of employees in the BIBB/BAuA surveys confirmed the availability of WHP in their company (Beck & Lenhardt, 2016; Hollederer, 2021). Since the IAB Panel and the BIBB/BAuA Survey were conducted in different years over time, the most current and only year that overlaps in both surveys is 2012. An indirect statistical estimation was previously used by other researchers to infer the availability rate of WHP in companies from employee reports (BIBB/BAuA) and to compare these employee reports to company reports (IAB) for the year 2012 (Beck & Lenhardt, 2016; Hollederer, 2021). Both surveys concurred in the percentage of available WHP for 2012: The IAB shows a WHP availability rate of 27% and analyses based on the BIBB/BAuA show an estimated availability rate of 26% in companies. Thus, as of 2012, only a quarter of companies in Germany offered WHP.

Furthermore, WHP availability and participation must be differentiated by company size as the implementation of WHP increases significantly with company size (Beck & Lenhardt, 2016; Hollederer, 2021). The number of existing small companies far outmatches the number of existing large companies in Germany. Nonetheless, 45% of the German workforce are employed in large companies (Statistisches Bundesamt [Destatis], 2023a). Based on analyses of the BiBB/BAuA Surveys, **Table 2** shows the WHP participation rates in German companies by company size. Compared to small companies, the availability of WHP is more than five times as likely in large companies, but the participation rate in large companies decreases greatly (Hollederer, 2021). The BiBB/BAuA Survey 2018 shows that 68% of employees in large companies with 250 to 499 employees reported availability of WHP (**Table 1**), while only 56% of these employees participated in a WHP measure (**Table 2**). This trend increases for large companies with 500 to 999 and 1000+ employees (reported WHP availability: 71% and 75%; reported participation: 50% each). Beck and Lenhardt (2016) assume that WHP measures are available for all employees in small companies while WHP measures are developed for specific departments in large companies. Thus, small- and medium-sized companies need support in implementing WHP to begin with, while large companies need specific support in implementing WHP throughout various departments and in facilitating participation rates.

Table 1. Percentages of WHP *availability* in German companies by year and company size

Data basis	**Years: Reported WHP *availability***			
IAB (company reports)	2002[a]	2004[a]	2012[b]	2018
Total sample	19%	20%	27%	-
WHP availability by company size				
Number of employees	-	2004[a]	2012[b]	-
1-4		11%	16%	
5-9		25%	30%	
10-19		34%	42%	
20-49		47%	58%	
50-99		58%	74%	
100-199		71%	83%	
200-499		79%	94%	
500-999		86%	97%	
1000+		92%	97%	
Data basis	**Years: Reported WHP *availability***			
BIBB/BAuA (employee reports)	2002	2006[c]	2012[c]	2018[d]
Total sample	-	38%	44%	47%
WHP availability by company size				
Number of employees	-	2006[c]	2012[c]	2018[d]
1-9		15%	18%	17%
10-19		26%	29%	29%
20-49				34%
50-99		41%	45%	44%
100-249				52%
250-499		59%	67%	68%
500-999				71%
1000+				75%

Notes: No data about WHP is available from the IAB after 2012. Likewise, no data is available from the BIBB/BAuA for 2002. The difference in the presented WHP availability rates between the IAB and the BIBB/BAuA (2004/2006 and 2012) is due to methodical reasons, i.e. percentages based on employee reports might not reflect the number of companies offering WHP.

a. Data is taken from Hollederer (2007); WHP availability by company size (based on the IAB) was not explicitly reported for 2002

b. Data is taken from Hollederer and Wießner (2015)

c. Data is taken from Beck and Lenhardt (2016); fewer categories were used for company size (1-9, 10-49, 50-249 and 250+ employees) compared to Hollederers' analyses (d) (2021), thus the company size categories for the BIBB/BAuA analyses of 2006/2012 differ from categories of 2018

d. Data is taken from Hollederer (2021)

Irrespective of company size, employees' overall participation rate in WHP is roughly 25% in Germany (Beck & Lenhardt, 2016; Hollederer, 2021). That is to say, a quarter of respondents confirmed they participated in a WHP measure at least once in the last two years (as of 2018), no matter what kind of measure it was or how long it lasted (Beck & Lenhardt, 2016). Out of 47% of employees *who confirmed their company offered WHP* in 2018, 59% of these employees confirmed they had participated in a WHP measure in the last two years (Hollederer, 2021). In contrast, the self-reported participation rate was 65% in 2006 and 62% in 2012 (Beck & Lenhardt, 2016). Hollederer (2021) therefore states that despite the German Prevention Act and the Prevention Strategy, the receding participation rates put the slightly increasing availability of WHP into perspective.

Table 2. Percentages of WHP *participation* in German companies by year and company size

Data basis	**Years: Reported WHP *participation***		
BIBB/BAuA (employee reports)	2006[a]	2012[a]	2018[b]
Total sample	23%	25%	25%
Subsample confirming WHP availability in company	65%	62%	59%
***Participation* of subsample confirming WHP availability in their company – by company size**			
Number of employees	2006[a]	2012[a]	2018[b]
1-9	73%	71%	75%
10-19	72%	76%	74%
20-49			68%
50-99	69%	66%	65%
100-249			63%
250-499	59%	53%	56%
500-999			50%
1000+			50%

Notes:

a. Data is taken from Beck and Lenhardt (2016); fewer categories were used for company size (1-9, 10-49, 50-249 and 250+ employees) compared to Hollederers' analyses (b) (2021), thus the company size categories for the BIBB/BAuA analyses of 2006/2012 differ from categories of 2018; participation rate of the total sample in 2006/2012 is based on own calculations

b. Data is taken from Hollederer (2021)

Regarding industrial sectors, company reports from 2012 (IAB) show that the public administration sector and the mining/quarrying/electricity/energy/water supply sector offered WHP most often (Hollederer & Wießner, 2015). Accordingly, employee reports (BIBB/BAuA) confirmed WHP availability in the industrial sector and the public administration sector most often in 2012 (Beck & Lenhardt, 2016). For 2018, employee *participation* was reported most often in construction, other manufacturing and agriculture/mining/energy/water supply sectors (Hollederer, 2021). Regarding WHP types, IAB data from 2012 show that companies used employee surveys more often than sickness absence analyses or WHP measures such as in-house activities, training or advisory services (Hollederer & Wießner, 2015). In large companies in particular, more sickness absence analyses and training or advisory services were conducted. The representative cross-sectional GEDA 2014/2015-EHIS survey ('German Health Update') provides additional information about employees' WHP participation by gender and specific WHP types in Germany (Ludwig et al., 2020). Accordingly, employees *who knew about the availability* of such measures (approximately $^1/_3$ to $^1/_4$ of the sample, depending on WHP type) utilized measures for back health (women: 26%, men: 18%) and stress management/ relaxation (women: 34%, men: 25%) significantly less compared to healthy menus (women: 64%; men: 67%) (Ludwig et al., 2020).

Finally, another important data source for the dissemination of WHP in Germany should also be mentioned at this point: That is the annual prevention report of the National Association of Health Insurance Funds which only represents WHP activities that health insurances are involved with (Beck & Lenhardt, 2016). Since the first reported year in 2010, the number of company sites reached by WHP offers that were supported by statutory health insurance funds rose yearly (except for 2015 and 2020) (Medizinischer Dienst Bund [MD Bund] & GKV-Spitzenverband, 2022). By 2021, the estimated number of employees directly reached by WHP was approximately 1.8 million in 18.437 companies, albeit the authors suspect an underestimation due to missing values (MD Bund & GKV-Spitzenverband, 2022). This number of employees makes up approximately 4% of the working population in Germany (Destatis, 2023b). In 2021, the broader services sector (e.g., freelance, scientific, technical and other economic services) was reached the most. Compared to small- and medium-sized companies, large companies with more than 250 employees were reached second most often (after companies with 10-249 employees). Regarding contents of conducted WHP measures, 62% combined measures aiming at both structural conditions and individual behavior (MD Bund & GKV-Spitzenverband, 2022). While 29% of measures aimed exclusively at individual behavior, only 9% of measures aimed exclusively at structural conditions. The most prevalent WHP measures aiming at structural conditions included health-oriented leadership, health-promoting design of working conditions, environments encouraging physical activity, and strengthening of psycho-social resources. Most prevalent WHP measures aiming at individual behavior

included physical activity at work, stress management, strengthening of resources, and healthy eating (MD Bund & GKV-Spitzenverband, 2022). While the prevention report does not provide WHP availability and participation percentages like the IAB and BIBB/BAuA do (i.e., independent of health insurance involvement), the report gives a detailed overview of the activities the statutory health insurance engage in to facilitate implementation of WHP in German companies.

This concludes the research state about availability of and participation in WHP in Germany. The next chapter covers the empirical factors of WHP participation from previous studies, i.e. reasons that impede and facilitate participation in such measures.

3.2 Factors of participation in workplace health promotion measures

In theory, WHP participation depends on employees' knowledge about the availability of WHP measures in the company and on the fit between implemented WHP measures and employees' demands (van der Put & Mandemakers, 2019). However, various additional factors for WHP participation on the individual, interpersonal and organizational level were identified in previous studies. The assignment of such factors to certain levels is variable depending on the theoretical basis and is thus not always clear-cut. Some factors can be assigned to various levels, e.g. job characteristics such as work schedules or type of employment contract could be attributed to both an individual and organizational level. For the sake of transparency, this dissertation differentiates between *organizational factors* (as part of contextual characteristics) *and individual factors* based on Andersen's model. A categorization of empirical study findings about WHP participation factors based on the model is presented in **Figure 4**. Terms of the original model were adapted to fit the subject of WHP participation more adequately[2]. Use of WHP within the health behavior is considered as the outcome. The categorized organizational and individual factors of WHP participation will now be described in more detail drawing on international and national findings. Certain studies investigated both organizational and individual factors, thus the following distinctions between the two dimensions may overlap for certain findings. Numbers next to the studies (no. 1-20) that are described in the following sections indicate placement in Andersen's model in a non-chronological order (see **Figure 4**).

[2] More specifically, the dimensions ‚predisposing' and ‚need' and the subdimensions of ‚enabling' were removed from contextual characteristics. Instead, organizational worksite-related, job-related and WHP-related characteristics were added as subdimensions of enabling/impeding contextual characteristics. Furthermore, ‚genetics' (predisposing), ‚organization' and 'financing' (enabling) as well as ‚evaluated' (need) were removed from individual characteristics. Finally, ‚process of medical care' was omitted from the health behavior dimension and the outcomes dimension was removed. The remaining terms were adapted as presented in Figure 4.

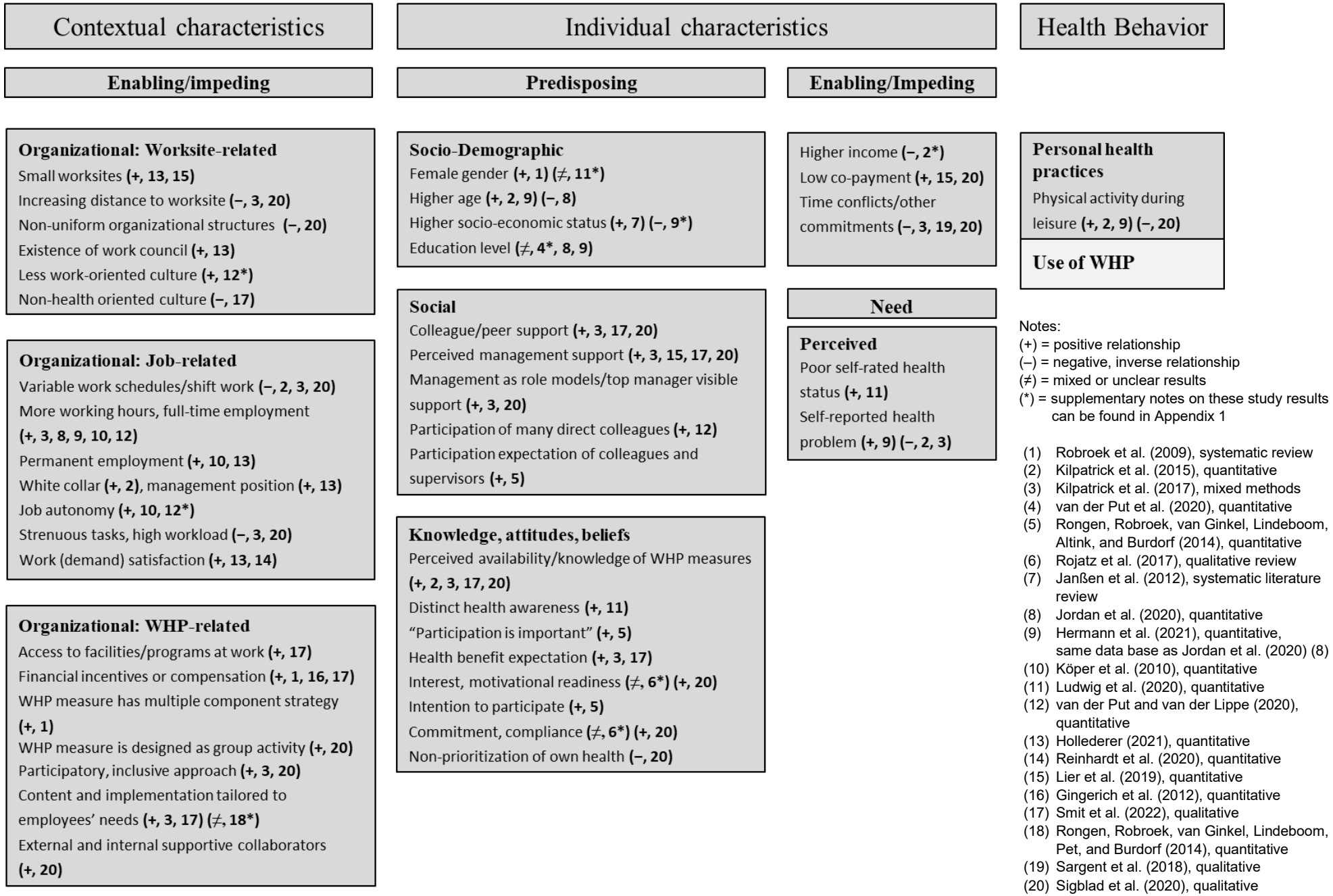


Figure 4. Empirical research state about WHP participation categorized into elements of Andersen's model (without arrows and 'Outcomes' dimension)

Findings focusing organizational factors

On the organizational level, various characteristics related to the worksite, the job and the WHP measure play a role for WHP participation. Regarding studies on the European level, van der Put and van der Lippe (2020) (**no. 12**) investigated how job and organizational characteristics contribute to employees' WHP participation in nine European countries (including Germany). The authors argued that their most important finding is the fundamental role of the organization for employees' WHP participation. When a large part of their direct colleagues utilizes WHP, employees will more likely utilize each WHP type themselves. Employees with more working hours and more autonomy who work in organizations characterized by a 'less work-oriented' culture are more likely to use healthy menus (see also Köper et al., 2010, **no. 10**). Furthermore, employees with more autonomy are more likely to utilize sports facilities, whereas a work-oriented organizational culture makes employees less likely to utilize health checks. However, effects of these variables for the likelihood of WHP utilization are much smaller compared to the *effect of colleague behavior*. Thus, van der Put and van der Lippe (2020) (**no. 12**) concluded that not only job characteristics like autonomy matter for facilitating WHP utilization – a health-promoting working culture must also be facilitated[3].

For Germany, Hollederer (2021) (**no. 13**) analyzed factors of both perceived availability and participation of WHP measures from employees' views (BIBB/BAuA Employment Survey). Regarding organizational factors, he found WHP participation differed significantly by limited term employment as a job factor (see also Jordan et al., 2020, **no. 8**; Hermann et al., 2021, **no. 9**; and Köper et al., 2010, **no. 10**). Limited term employees are significantly less likely to participate in WHP measures and the higher the threat of termination, the lower the WHP utilization. Furthermore, Hollederer (2021) (**no. 13**) found that participation differed significantly by threat of termination, being a direct supervisor and general work satisfaction (job factors), as well as by company size, economic sector, and existence of a work council (worksite factors). For emphasis, he found a high correlation between the existence of a work council and WHP participation. Furthermore, WHP participation is significantly higher if employees have a higher work satisfaction. If employees are dissatisfied with their work, WHP participation is especially low (Hollederer, 2021) (**no. 13**). Characteristics such as colleague behavior and support or a certain working culture were not available in this analysis.

Few other cross-organizational studies investigated organizational factors of WHP participation in Germany. For example, Reinhardt et al. (2020) (**no. 14**) investigated factors of WHP participation in the German Federal Ministry of Defense. They found that employees who were satisfied with their work demand were significantly more likely to participate in WHP measures. However, after controlling for individual characteristics, they also found that WHP

[3] The authors pointed out that the findings for autonomy and work-oriented culture may not be robust and should be interpreted with caution.

participation varies significantly across different departments. Another example is the cross-company study of Lier et al. (2019) (**no. 15**). Their findings show that participation in a corporate wellness program (n=61 German companies) was positively associated with low employee co-payments and organizational support, i.e. the degree to which leaders encouraged participation. Additionally, company size was negatively associated with employee participation, i.e. participation rate was highest in smaller companies and decreased gradually with increasing company size (Lier et al., 2019) (**no. 15**). In line with this finding, a retrospective cohort study in 24 companies in the USA found a significant association of companies' financial incentives for WHP with higher WHP completion rates, but not with registration rates (Gingerich et al., 2012) (**no. 16**). A systematic review also showed that WHP programs offering incentives, applying a multiple component strategy, and aiming at multiple behaviors yielded higher participation rates (Robroek et al., 2009) (**no. 1**).

Furthermore, Kilpatrick et al. (2017) (**no. 3**) found significant associations between the implementation (e.g. employees' involvement in designing the WHP), support of peers and support of the environment with participation in more WHP measure types. More specifically, employees were significantly more likely to participate in WHP measures if they were convinced that the organization prioritizes WHP and that management supports participation. In open-ended responses, part-time work, shiftwork and the workplace location were mentioned as barriers for participation (Kilpatrick et al., 2017) (**no. 3**). Despite not reaching statistical significance, findings of a Dutch six-months follow-up study in two organizations (n=738 employees) indicated that a higher fit between employees' preferences/needs and the offered WHP measures made participation more likely (Rongen, Robroek, van Ginkel, Lindeboom, Pet, & Burdorf, 2014) (**no. 18**).

Lastly, qualitative studies also investigated barriers and facilitators of WHP participation (Sargent et al., 2018; Sigblad et al., 2020; Smit et al., 2022). Based on 62 peer-to-peer interviews in the Netherlands, Smit et al. (2022) (**no. 17**) found that support from peers and supervisors and availability of resources like sports facilities and financial compensation facilitated participation. Conversely, the most prominent barriers reported for WHP participation included an unsupportive organizational culture where WHP programs are not tailored to employees' needs and lifestyle topics are not prevalent (Smit et al., 2022) (**no. 17**). In Australia, Sargent et al. (2018) (**no. 19**) found in their interview study that time restrictions were major barriers for participation – this implied the duration, scheduling and synchronization of WHP measures. Sigblad et al. (2020) (**no. 20**) complemented the research state by interviewing managers in Sweden: They found that characteristics of the WHP measure itself, such as the design of the WHP, supportive collaborators and financing played a role for participation. Other organizational factors included the organizations' operations, managers as role models, provided support and resources for participation (Sigblad et al., 2020) (**no. 20**).

Findings focusing individual factors

On the international level, Robroek et al. (2009) (**no. 1**) concluded in their systematic review of 23 studies (aiming at physical activity and/or nutrition at the workplace) that participation levels and determinants of initial participation in reviewed studies varied greatly. With the exception of gender, few statistically significant determinants were found on the individual level. The results showed that women are generally more likely to participate in WHP than men, with the exception of fitness center programs. Due to methodical limitations in the studies, no consistent effects were found for other demographic, health- and work-related variables (Robroek et al., 2009) (**no. 1**). An Australian study found that employees (n=3.228) with health conditions (smoking, cardiometabolic condition) and variable work schedules were less likely to participate in WHP measures (Kilpatrick et al., 2015) (**no. 2**). Participation became significantly more likely with higher age and less likely with higher income[4]. Compared to blue collar workers, administration workers were more likely to participate. Furthermore, compared to employees reporting they were not physically active during leisure, employees engaging in physical activity during leisure were more likely to participate in WHP. However, the authors emphasized that the *perceived availability* of WHP measures contributed far more to model fit than factors such as age, gender, and work schedule (Kilpatrick et al., 2015) (**no. 2**). Using the same data base, Kilpatrick et al. (2017) (**no. 3**) also found that time (e.g. other commitments, being busy at work) and health problems were significant barriers for WHP participation. Employees who trusted participation would result in a personal health benefit were significantly more likely to participate in WHP measures (Kilpatrick et al., 2017) (**no. 3**).

On the European level, van der Put et al. (2020) (**no. 4**) showed that lower educated employees were less likely to utilize healthy menus and sports facilities based on data from 259 organizations. In comparison to higher educated employees however, lower educated employees were more likely to utilize health checks. Empty models demonstrated that differences between organizations explain a large part of variation in the use of WHP (van der Put et al., 2020) (**no. 4**). Furthermore, findings of a Dutch six-months follow-up study in two organizations showed that employees (n=738) who believed that colleagues and supervisors expected them to participate in WHP measures and employees who believed participation is important were significantly more likely to participate (Rongen, Robroek, van Ginkel, Lindeboom, Altink, & Burdorf, 2014) (**no. 5**). The intention to participate also predicted actual participation. A qualitative review about factors of WHP implementation in member countries of the Organization for Economic Co-operation and Development (OECD) complements these findings (Rojatz et al., 2017) (**no. 6**). Here, employees' commitment, compliance and motivation were identified as further relevant factors at the participant level. Additionally, Smit

[4] The authors stated that the negative relationship of higher income with WHP participation is contradictory to findings from previous studies.

et al. (2022) (**no. 17**) found that knowing about and having positive experiences about the benefits of WHP participation facilitated employees' WHP participation. Barriers for participation included factors such as a lack of knowledge about WHP and a lack of personal resources. Sigblad et al. (2020) (**no. 20**) also found that awareness (knowledge) of WHP, work-life-balance (including time), and attitudes of employees played a role for WHP participation.

Regarding Germany, two recent studies investigated participation (n=12.072 employees) in specific WHP measures and individual determinants of participation on a large scale (GEDA 2014/2015-EHIS survey ('German Health Update'), Hermann et al., 2021; Ludwig et al., 2020). Ludwig et al. (2020) (**no. 11**) analyzed utilization of WHP measures addressing back health, stress management/relaxation and a canteen with healthy food. Results showed that women participated in back health and stress management/relaxation measures significantly more often than men. No significant difference between genders was observed for utilizing a canteen with healthy food. Furthermore, employees with a more distinct health awareness utilized all measures significantly more often compared to employees with a less distinct health awareness. Back health and stress/relaxation measures were used significantly more often by men reporting poor self-rated health compared to men reporting good self-rated health (Ludwig et al., 2020) (**no. 11**). Using the same data base, Hermann et al. (2021) (**no. 9**) focused specifically on back health measures. Their analyses indicate that different factors are relevant for utilizing back health measures for women and men. Women with a strong level of health awareness were more likely to participate in back health measures. Men above the age of 29, men with a low socio-economic status, men who engaged in endurance exercises in their free time, and men with subjective back problems had a higher likelihood of utilizing WHP for back health (Hermann et al., 2021) (**no. 9**). Still drawing on the same data base, Jordan et al. (2020) (**no. 8**) focused on use of canteens with healthy food in Germany. Analyses showed that employees with high education were more likely to eat at a canteen with healthy food choices compared to employees with medium or low education. Generally, the use of healthy canteen food declined significantly with age (Jordan et al., 2020) (**no. 8**).

Lastly, complementing and contradicting findings about individual factors of WHP participation should also be acknowledged at this point. Generally, there is consistent evidence that use of specific WHP measures differs by gender. That is, women use WHP measures more often, but not across all WHP types (Robroek et al., 2009) (**no. 1**). In the BIBB/BAuA Employment Survey, no significant differences in WHP participation were found between genders (Beck & Lenhardt, 2016) – as Hermann et al. (2021) (**no. 9**) point out, this was possibly due to a missing differentiation of WHP types. For example, Hollederer (2021) (**no. 13**) found significant differences in WHP participation by gender, educational level, and job position. Other studies showed that groups with a higher socio-economic status generally utilize preventive measures

more often (Janßen et al., 2012) (**no. 7**). However, findings from van der Put et al. (2020) (**no. 4**), Jordan et al. (2020) (**no. 8**) and Hermann et al. (2021) (**no. 9**) demonstrate that the role of the education level as a factor for WHP participation differs by *WHP type*. A strong level of health awareness, age, physical activity during leisure, and a low self-rated health status were significant factors of WHP participation in studies – yet, the significance of these factors also differed by gender or WHP type. In summary, deducing a general consistent effect of factors such as age, gender, education level and health status on WHP participation is difficult since findings are mixed. However, findings are more consistent for the positive association of knowledge about available WHP measures, health-oriented awareness and behavior, favorable self-efficacy and positive expectations about the benefits of WHP measures with participation. A substantial difficulty for deducing universal factors of WHP participation is the large variety in the composition of workforces, business sectors, organizations and WHP measures. This illustrates that individual factors of WHP participation also need to be considered from a target-oriented perspective of certain subgroups. Furthermore, considering organizational factors of WHP participation across specific sectors and companies is necessary.

In summary, the state of research provides evidence for both individual and organizational factors that are important for participation in WHP measures. Evidence is more consistent for certain factors, while others require further analysis. Research gaps that can be derived from the presented research state and research gaps that will be addressed in this dissertation are the subject of the next chapter.

3.3 Empirical research gaps

Target-orientation, systems approaches and delivery of WHP

Regarding research gaps about WHP, Robroek et al. (2021) claim further research must address target-orientation, systems approaches and delivery of WHP. More specifically, interventions need to be tailored and delivered better to the needs of certain target groups. Research utilizing a systems approach is necessary to figure out the ‘systems’ people live and work in and thereby understand the structural determinants and “causes of the causes” of unhealthy behavior (Robroek et al., 2021, p. 562). Furthermore, there is a lack of process evaluations in WHP implementation research which would help to understand reasons and mechanisms behind the (in-)effectiveness of interventions. More knowledge about determinants of successful implementation is required – investigating how participation of employees can be sustained is important to ensure the effectiveness of WHP measures (Robroek et al., 2021).

The role of organizational factors for WHP participation

Although employee perceptions of WHP are crucial for participation, we know little about factors contributing to whether employees truly perceive WHP offers in their organization or not (Kilpatrick et al., 2015). In the previous chapter, research gaps about the role of the organization for WHP participation became evident. Although there is no general agreement as to why participation rates are low, a lot of studies neglect the role the work environment might play (Bull et al., 2003). Thus, scholars emphasize that the role of the organization for WHP participation should be included much more in research (Clancy et al., 2018; van der Put & van der Lippe, 2020). Findings indicate that work satisfaction, organizational support and working culture play a significant role for higher WHP participation (Hollederer, 2021; Lier et al., 2019; van der Put & van der Lippe, 2020). Thus, further investigation of such organizational characteristics from the views of various organizational actors and sectors is necessary in research about WHP participation.

Research gaps about WHP participation in Germany

For Germany too, the disparity between WHP offers and WHP participation is yet unclear (Hollederer, 2021). Large-scale studies in Germany conclude that further research is needed about the workplace, the employment structure, target-group-specific and sector-specific WHP participation (Jordan et al., 2020; Ludwig et al., 2020). Addressing employees with a low socio-economic status, analyzing the implementation process of WHP measures, and making WHP measures more target-oriented are relevant challenges for research and practice (Beck & Lenhardt, 2016; Hollederer, 2021; Jordan et al., 2020). Hermann et al. (2021) complement research gaps such as work-related psychosocial risk factors, occupational status, lack of time, expectations of self-efficacy and self-motivation skills as determinants of WHP participation. Furthermore, not only the dissemination of WHP measures and WHP quality standards but WHP types, contents, quality, outcomes and reasons for non-participation need further investigation (Hermann et al., 2021; Hollederer, 2021). Generally, utilization and perceptions of WHP measures from employees' perspectives have been neglected in research (Nöhammer et al., 2009). Faller (2018) emphasizes that while it is important gathering quantitative data about 'which' WHP measures exist, different findings aside from quantitative ones are needed. Triangulation of qualitative and quantitative methods is important to understand 'how' WHP leads to success in real world settings, how WHP is implemented and how implementation is associated with interpretation patterns rooted in the organizational culture (Faller, 2018).

4 Research question and objectives

Based on the presented research gaps, the following research question is derived for the present dissertation: What are perceived underlying factors of workplace health promotion participation in German companies?

Given the lack of knowledge about the role of the work environment for WHP participation, organizational factors will receive more attention here. As WHP measures can be considered discretionary measures depending on voluntary participation, it is expected that WHP participation is more likely to be explained by "social conditions, health beliefs, and enabling resources" (Andersen & Davidson, 2007, p. 8). Framed by Andersen's behavioral model of health services use, specific research gaps within the scope of the research question are addressed. Knowledge is generated by means of integrating and discussing results of three individual studies. The primary objectives of the studies are as follows:

(1) The first study's primary objective is exploring occupational physicians' perspectives about factors of employees' participation in a musculoskeletal WHP measure. This contributes to knowledge about contextual characteristics of the participating companies, about the implementation process of a WHP within these companies and reasons for non-participation.

(2) The second study's primary objective is examining ICT-managers' self-reported participation in WHP measures and factors associated with their WHP participation. Knowledge about ICT-managers' working conditions and about relevant organizational characteristics for WHP participation (e.g. social support, working culture) can be generated. Furthermore, evidence on the target-orientation and delivery of WHP measures for ICT-managers can be gathered.

(3) The third study's primary objective is to investigate differences in upper-level ICT-managers' mental health related outcomes and work performance following a workplace mindfulness training. Implications resulting from the pre-post-analysis are integrated to discuss how WHP participation can be promoted. In this dissertation, this study is not included for the sake of the efficacy analysis of the mindfulness training, but for discussing the resulting theoretical and practical implications for the promotion of WHP participation.

While the objectives of the underlying studies differ from one another, findings are consolidated using the overarching research question. By doing so, factors of WHP participation in German companies (as the outcome variable of interest) will be complemented to the research state. All three studies provide knowledge on either types, contents or outcomes of certain WHP measures from the views of occupational physicians and managers as important actors within occupational health settings. Practical implications for facilitating target-orientation of WHP

measures and sustaining participation can be drawn by integrating study results. Thus, the dissertation also touches upon target-orientation and delivery of WHP, which were stated as directions for further WHP research (Robroek et al., 2021). By providing a multilevel structure, Andersen's behavioral model of health services use, combined with the HAPA, can help integrate these findings and thus touch upon structural determinants of WHP utilization and the 'systems' people live and work in (Andersen et al., 2014; Robroek et al., 2021; Schwarzer & Fleig, 2014).

A methodical remark should already be mentioned at this point: As becomes evident from the objectives, the investigated subjects in the empirical research papers of the author consist of occupational physicians and managers (chapter 6). Thus, WHP participation is investigated from the perspectives of these stakeholders. While this is not a direct approach to WHP participation of employees, both these groups can be considered appropriate subjects to address the research question. In this dissertation, a manager is considered a person holding a managerial or leadership position in a company leading their direct reports (Urrila, 2021). Based on the descriptions of the German Social Accident Insurance (DGUV), occupational physicians are considered physicians working in or for companies engaging in various domains of the interplay between health and work with a focus on prevention (Arbeitskreis 4.1 „Betriebsärztliche Tätigkeit" des Ausschusses Arbeitsmedizin der Gesetzlichen Unfallversicherung [Arbeitskreis 4.1 DGUV], 2014; Baker et al., 2020). Occupational physicians tend to tasks such as advising employees and employers (e.g. for improvement of working conditions or reintegration), occupational medical care, workplace inspections, or monitoring of diseases and accidents (Arbeitskreis 4.1 DGUV, 2014; Mosshammer et al., 2014). On the one hand, managers are important role models when it comes to participating in WHP, transferring knowledge, enabling and encouraging employees to utilize WHP measures (van der Put & Mandemakers, 2019). On the other hand, occupational physicians are key informants for employers and gatekeepers for employees regarding health prevention and occupational care (Michaelis et al., 2022). In the WHP activities facilitated by the statutory health insurance funds, both managers and occupational physicians are involved in steering committees of WHP activities (MD Bund & GKV-Spitzenverband, 2022). The prevention report 2022 shows that managers represent the more prevalent group in steering committees (MD Bund & GKV-Spitzenverband, 2022). Due to their responsibilities and their involvement within the occupational health setting, both managers' WHP participation and perspectives of occupational physicians are important for understanding the phenomenon of WHP participation (Michaelis et al., 2022; Sigblad et al., 2020). Thus, occupational physicians and managers may provide access to an insightful top-down perspective on WHP participation. The methods and databases used to achieve the stated research objectives are addressed in the next chapter.

5 Methods and data basis

Triangulation of methods was suggested for further research in workplace health promotion (Faller, 2018). Aside from quantitative surveys, qualitative research methods are gaining more importance and are therefore increasingly applied in health services research (Ullrich et al., 2022). Thus, both qualitative and quantitative methods stemming from social and organizational research are used to identify factors of WHP participation. An overview of methodical information about the three empirical studies underlying this dissertation is presented in **Table 3**. The research papers are provided in Appendix 3. The underlying empirical studies of this dissertation comprise both descriptive and observational analytic elements (Glasziou & Heneghan, 2009). The three studies were conducted in large companies – for the present dissertation, companies are considered large once they employ 250 or more workers (Günterberg & Wolter, 2003). In accordance with the research objectives 1-3 in the previous chapter, methods and abstracts of the underlying studies are presented in a consecutive order.

(1) First, cross-sectional interview data from the project BGM-innovative (BGMi) is used to elaborate participation in a randomized musculoskeletal measure at the workplace. A qualitative, process-oriented methodology is utilized for this first study. The project BGMi (duration: 2017-2021) aimed at facilitating coordinated tailored healthcare for company employees with musculoskeletal disorders across 22 German companies (Choi et al., 2021). Part of the scientific evaluation was a formative evaluation comprising telephone interviews with eight occupational physicians. These interviews were conducted in 2018, one year after the beginning of BGMi, using semi-structured interview guides. Occupational physicians were asked about their own and employees' experiences with the program, e.g. including conducive and restrictive factors of implementation, recruitment, cooperation, emotions and expectations regarding the program. For this dissertation, transcribed interview data were analyzed using a combination of conventional and directed content analysis (Hsieh & Shannon, 2005).

(2) Second, cross-sectional data of an online mixed-method survey with managers (n=179) of a large German Information and Communications Technologies (ICT)-company is analyzed. Quantitative and qualitative findings address managers' WHP participation and reasons for (non-)participation in WHP measures. Data was collected from November 2019 to January 2020. The online survey was conducted as a non-responder-analysis with managers who did not participate in a workplace mindfulness training that took place at the same time. However, independent of the training, an overarching perspective on managers' general WHP participation and working situation is applied in this survey. The purpose of utilizing a mixed-methods survey is achieving complementarity and expansion of both quantitative and

qualitative findings to extend the answer to the research objective (Creswell & Plano Clark, 2018; O'Cathain et al., 2007). Managers were asked about constructs such as reasons for not participating in WHP measures, preferences for WHP measures, and their perceptions of their health and working situation. Numerical data was analyzed using descriptive statistics and stepwise logistic regression. Conventional and directed content analysis was used to analyze open-ended answers (Hsieh & Shannon, 2005; Singer & Couper, 2017). Frequencies of coded texts were converted into descriptive percentages.

(3) Third, implications of a longitudinal pragmatic evaluation of an exploratory workplace mindfulness training (WMT) with ICT-managers are integrated to discuss how WHP participation can be promoted. This study was conducted within the same project described in study 2. The primary aim of the study was exploring differences in upper-level ICT-managers' mindfulness, well-being, health literacy and work performance at the beginning of the WMT (t0), immediately after (t1) and three months after the WMT (t2). A quasi-experimental pre-post-design was used. At three months follow-up (t2), participants were asked about subjective training benefits and whether they still applied the techniques learned in the training. Furthermore, participants were asked about barriers and facilitators of long-term mindfulness practice and further potential explanation of the training's effectiveness in open answers. Thirteen groups of managers (n=56 managers) completed the training and the three corresponding surveys consecutively from October 2019 to April 2021. Repeated measures ANOVAs and Bonferroni-adjusted post-hoc analyses were used for the main data analysis. Open-ended responses were analyzed using qualitative content analysis. As stated in chapter 4, the statistical results of the outcome evaluation are of secondary interest for the present dissertation. Rather, findings such as training outcomes and workplace barriers and facilitators of long-term mindfulness practice are theoretically discussed in light of WHP participation (chapter 7.1).

Table 3. Overview of the data basis, settings, objectives and data analysis methods in the three underlying research papers

Paper	Data basis	Organization(s)	Study objectives	Analysis sample	Analysis methods
P1	Qualitative cross-sectional data from the project 'BGM-innovative' (BGMi)	22 companies (primarily steel and metal manufacturing, trade, service, and automotive industry)	(1) to explore occupational physicians' perspectives on determinants of employees' participation in a musculoskeletal health promotion measure (2) to explore employees' individual characteristics, behavior, and outcomes of their participation from occupational physicians' perspectives	Eight occupational physicians	Conventional and directed content analysis (deductive and inductive) of semi-structured telephone interview transcriptions
P2	Quantitative and qualitative cross-sectional data from an online mixed-method survey	One Information and Communications Technologies (ICT) company	(1) to examine managers' self-reported participation in WHP measures and factors associated with WHP participation (2) to examine managers' perceptions of their working conditions	Upper-level managers (n=179)	Numerical data (quantitative): Descriptive statistics and stepwise logistic regression Open answers (qualitative): Conventional and directed content analysis (deductive and inductive) and calculation of sub-categories' frequencies
P3	Quantitative and qualitative longitudinal data from pre-post-surveys within a quasi-experimental mindfulness training	One Information and Communications Technologies (ICT) company	(1) to investigate differences in managers' mental health-related outcomes and work performance at the beginning of (t0), immediately after (t1) and three months after (t2) a workplace mindfulness training (2) to explore workplace barriers and facilitators of long-term mindfulness practice and further potential explanation of the training's effectiveness	Upper-level managers (n=56)	Numerical data (quantitative): Repeated measures analyses of variance (ANOVAs) with Bonferroni-adjusted post hoc analyses, linear regressions, descriptive statistics Open answers (qualitative): Deductive and inductive content analysis

6 Research papers underlying the dissertation

6.1 Paper 1: Occupational Physicians' Perspectives on Determinants of Employee Participation in a Randomized Controlled Musculoskeletal Health Promotion Measure: A Qualitative Study

Schubin, K., Schlomann, L., Lindert, L., Pfaff, H. & Choi, K.-E. (2020). Occupational Physicians' Perspectives on Determinants of Employee Participation in a Randomized Controlled Musculoskeletal Health Promotion Measure: A Qualitative Study. *International journal of environmental research and public health*, *17*(20), 7445. https://doi.org/10.3390/ijerph17207445

Journal: International journal of environmental research and public health

Impact factor at time of publication: 2.849

Abstract: Occupational physicians (OPs) are key figures for advising employees and employers about prevention and health at the workplace. However, knowledge of their views on participation in health promotion measures is sparse. This qualitative study aims to explore occupational physicians' experiences with employee participation in a randomized controlled workplace measure for musculoskeletal disorders (MSDs) in Germany. We conducted eight semi-structured telephone interviews with occupational physicians. Interviews were transcribed verbatim and analyzed using a combination of conventional and directed content analysis. Findings were mapped based on Andersen's behavioral model of health services use, resulting in four categories and 10 subcategories. (a) Contextual factors of the measure comprised impacts of the healthcare system and company environment, (b) individual factors of measure participation comprised demographic, social, belief, and MSD need characteristics, (c) health behavior during the measure included OPs' communication, employees' personal practices and measure participation, and (d) outcomes of participation included health status, satisfaction, and dissatisfaction with the measure. Findings imply occupational physicians' and employees' views should be investigated on a broader scale. Researchers should use present statements for the development of intervention studies, while political and managerial authorities can improve organizational conditions of prevention based on these findings.

6.2 Paper 2: How Managers Perceive and (Do Not) Participate in Health Promotion Measures—Results from a Cross-Sectional Mixed-Methods Survey in a Large ICT Company

Schubin, K., Pfaff, H. & Zeike, S. (2021). How Managers Perceive and (Do Not) Participate in Health Promotion Measures - Results from a Cross-Sectional Mixed-Methods Survey in a Large ICT Company. *International journal of environmental research and public health*, *18*(18), 9708. https://doi.org/10.3390/ijerph18189708

Journal: International journal of environmental research and public health

Impact factor at time of publication: 3.390

Abstract: Managers often face stress and high work demands. Yet they have received limited attention as targets of workplace health promotion measures (HPMs). This study's primary objective (1) is to examine managers' self-reported participation in HPMs and factors associated with HPM participation. The secondary objective (2) is to examine managers' perceptions of their working conditions. A cross-sectional mixed-methods online survey was conducted with a nonrandom sample of 179 managers in a large German ICT company. Stepwise logistic regression and qualitative content analysis were used for data analysis. Quantitative findings revealed that 57.9% of managers had not participated in HPMs yet. "Workload relief through digital tools" resulted as a significant predictor of managers' previous HPM participation (OR: 2.84, 95% CI: 1.42–5.66). In qualitative findings, workload, time, lack of knowledge, and lack of demand were reported as participation barriers (1). Managers reported that work facility traits, workload, social support, and corporate culture should be improved to make their working conditions more health-promoting (2). These findings suggest that providing adequate organizational working conditions may help improve managers' HPM participation rates and their perception of health-promoting work.

6.3 Paper 3: A Workplace Mindfulness Training Program May Affect Mindfulness, Well-Being, Health Literacy and Work Performance of Upper-Level ICT-Managers: An Exploratory Study in Times of the COVID-19 Pandemic

Schubin, K., Seinsche, L., Pfaff, H. & Zeike, S. (2023). A Workplace Mindfulness Training Program May Affect Mindfulness, Well-Being, Health Literacy and Work Performance of Upper-Level ICT-Managers: An Exploratory Study in Times of the COVID-19 Pandemic. *Frontiers in Psychology*, *14*, 931. https://doi.org/10.3389/fpsyg.2023.994959

Journal: Frontiers in Psychology

Impact factor at time of publication: 4.232

Abstract: Introduction: Mindfulness-based interventions have gained more importance in workplace health promotion due to increased psychological distress in the digital era. Although managers in the ICT-sector are at risk for lower mental health, few studies have evaluated the effects of workplace mindfulness trainings (WMT) on upper-level ICT-managers. Methods: By applying a mixed methods approach, the study aimed at exploring differences in upper-level ICT-managers' mindfulness, wellbeing, health literacy and work performance at the beginning of a WMT (t0), immediately after (t1) and 3 months after (t2) a WMT. Thirteen groups of managers (n = 56) completed the training and three corresponding surveys consecutively from October 2019 to April 2021. Managers rated their mindfulness (MAAS), well-being (WHO-5), health literacy, and work performance (HPQ). During the COVID-19-pandemic the training switched from a live on-site mode to a hybrid mode and finally to a digital mode. Repeated measures ANOVAs and Bonferroni-adjusted post hoc analyses were used for data analysis. Open-ended responses were content analyzed. Results: We found significant differences in managers' mindfulness [$F(2.106) = 3.376$, $p = 0.038$, $\eta_p^2 = 0.06$, $n = 54$], well-being [$F(2.106) = 73.019$, $p < 0.001$, $\eta_p^2 = 0.17$, $n = 54$], health literacy [$F(2.108) = 9.067$, $p < 0.001$, $\eta_p^2 = 0.15$, $n = 55$], and work performance [$F(2.80) = 7.008$, $p = 0.002$, $\eta_p^2 = 0.15$, $n = 41$] between t0 and t2. Significant differences between t0 and t1 were also found for well-being, health literacy and work performance, but not for mindfulness. Qualitative findings demonstrated positive training effects, barriers and facilitators to daily application of mindfulness practice. Discussion: The results suggest that compared to the beginning of the WMT, the post and follow-up measurements showed outcome improvements. The workplace mindfulness training may thus be a promising program to facilitate mental health and working capabilities among upper-level ICT-managers. Contextual workplace factors need to be considered to sustain long-term mindfulness practice of managers.

7 Discussion

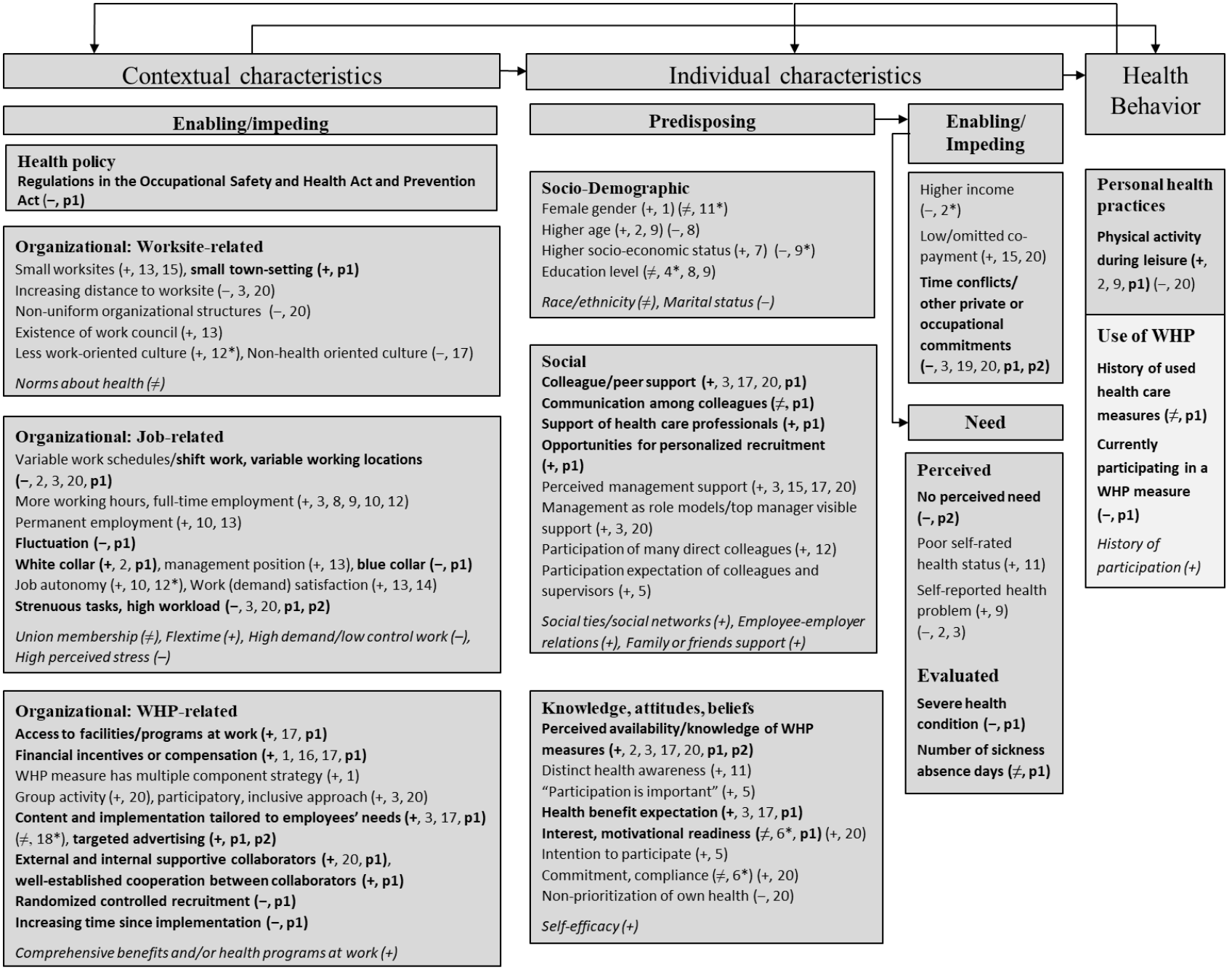
7.1 Integration of key findings in the research state and in the theoretical reasoning

The underlying studies aim at generating findings based on the following research question (see chapter 4): What are perceived underlying factors of workplace health promotion participation in German companies?

First, selected findings from research papers 1 and 2 (Schubin et al., 2021; Schubin et al., 2020) are categorized using Andersen's model in **Figure 5**. Findings are integrated following the logic of Andersen's model from left to right. Initially, findings are categorized into characteristics of the context, the individual and the health behavior. Second, selected findings from research papers 1 and 3 (Schubin et al., 2020; Schubin et al., 2023) are categorized using Andersen's model in combination with the HAPA model in **Figure 6**. The HAPA model is used as a supplement to expand the perspective of Andersen's model, to integrate further relevant findings and to discuss theoretical implications for WHP participation briefly. The 'Outcome' dimension is therefore transferred to Figure 6. Abbreviations in parentheses (p1, p2, p3) refer to findings from the respective research papers 1-3.

Findings focusing organizational factors

Focusing on organizational characteristics, findings demonstrate that the interviewed occupational physicians stated various factors associated with WHP participation. Physicians felt that their duties stated by the Occupational Safety and Health Act restrict their capacities for health promotion activities. Regarding worksite-related factors, they stated a small-town setting is conducive to participation which complements the beneficial role of small worksites (Hollederer, 2021; Lier et al., 2019). Regarding job-related factors, statements from occupational physicians affirm the negative association of shift work and complement variable working locations, fluctuation of staff and 'blue collar' positions as impeding factors for WHP participation. Physicians also complemented that making 'white collar' employees participate in WHP is easier. Both physicians (p1) and managers (p2) stated in qualitative findings that strenuous tasks and high workload impede participation. However, this contradicts certain quantitative findings – for example, no significant association was found for work intensity and WHP participation in paper 2. This coincides with findings from van der Put and van der Lippe (2020) who expected less use of WHP of employees with more work pressure but found no support for this relationship. Still, managers who thought digital tools help relieve their daily workload showed higher odds of having participated in WHP measures before (p2). This may hint at a conducive role of digital working methods that might function as job resources to these managers and relieve workload. Since this finding was based on one significant item only and statistical model fit was low, this finding should be interpreted with caution and as hypothesis-generating at most.



Notes:

(p1) = finding from paper1 (bold)
(p2) = finding from paper2 (bold)

Cursive = hypothetical factors of WHP participation not empirically investigated (complemented based on Linnan, 2001)

(+) = positive relationship
(–) = negative, inverse relationship
(≠) = mixed or unclear results
(*) = supplementary notes on these study results can be found in Appendix 1

Figure 5. Integration of own empirical findings and further theoretical factors into Andersen's model

Focusing WHP-related factors, physicians affirmed the benefit of access to facilities and programs at work, financial compensation and tailoring to employees' needs. More specifically, a conducive role can be attributed to targeted advertising of WHP measures as managers stated this was missing for them (p2) and physicians stated this was helpful for facilitating employees' participation (p1). Furthermore, physicians affirmed the benefit of external and internal supportive collaborators of WHP and a well-established cooperation between these collaborators (p1). In contrast, randomized controlled recruitment and increasing time since the initial implementation of the measure were experienced as impeding for increasing participation (p1).

Findings focusing individual factors

Moving on to individual characteristics, findings on the social level show that the conducive role of colleague and manager support is affirmed. Physicians stated being able to support employees during WHP participation and opportunities for personalized recruitment were helpful. According to the physicians, the role of communication among employees depends on employees' negative or positive opinions about a WHP measure. Looking at individuals' knowledge, attitudes and beliefs, the conducive role of perceived availability and knowledge of WHP measures (p1, p2) as well as 'realistic' expectations of health benefits (p1) is affirmed. For example, physicians had the opportunity to stimulate a change of employees' outcome expectations during interactions in WHP recruitment attempts (p1). By doing so, physicians were able to endorse employees' expectations of achievable health benefits from their professional perspective. As classified by Rojatz et al. (2017), employees' interest and motivation may be enabling or impeding for WHP participation depending on their level. As shown in previous studies, the present findings (p1, p2) reinforce the impeding role of time conflicts, private and occupational commitments for WHP participation (Kilpatrick et al., 2017; Sargent et al., 2018; Sigblad et al., 2020). Regarding need for WHP participation, certain managers stated a lack of perceived need kept them from participating (p2). Regarding the evaluated need from a professional view, physicians stated they did not recruit employees to the respective musculoskeletal WHP measure if health conditions were too severe. The number of sickness days also played a role for physicians' decision. Regarding health behavior at last, physicians stated employees who already engage in health-promoting activities during leisure were more inclined to participate in WHP. This is in line with findings of Kilpatrick et al. (2015) and Hermann et al. (2021). If employees already participated in a WHP measure, physicians did not encourage employees to participate in another. Additionally, physicians considered employees' history of utilized health care measures to decide whether to recruit them for the WHP measure. Finally, while the identified participation rate of managers in the author's studies (p2, p3) lies above median and average participation rates (Hollederer, 2021; Robroek et al., 2009), most managers in the samples had not participated in WHP measures before that point in time. Along with the disparity between calculated and realized employee case numbers for the

musculoskeletal WHP measure from research paper 1 (Moormann & Siebeneich, 2021) and physicians' dissatisfaction with low recruitment (p1), implications to conceptualize and disseminate such WHP measures differently may be deduced.

Theoretical pathways based on Andersen's model

Following the arrows according to the logic of Andersen's model in **Figure 5**, it is presumed that the identified factors of the organization and health policy regulations affect WHP participation directly or indirectly through individual characteristics. In turn, an employee's health behavior may affect aspects of the contextual level (e.g. perception of the workplace culture or work satisfaction) and the individual level (e.g. communication among colleagues about WHP or interest in WHP). Within individual characteristics, a link from predisposing to enabling/impeding to need factors would be presumed. However, this is questionable since assignment of variables to certain dimensions of the model are not always clear-cut (Babitsch et al., 2012). Rather, it can be argued that the social level and the level of knowledge, attitudes and beliefs can also work in an enabling or impeding way. Aside from the identified results, hypothetical factors of WHP participation and the direction of their relationship are presented in cursive in Figure 5 (Linnan et al., 2001). While there was no matching finding for these factors from own empirical findings, certain factors were possibly investigated in other studies not listed in the figure.

Andersen's model and the HAPA combined: Integration of findings and theoretical implications

As a supplement, it is helpful to combine elements of Schwarzer's HAPA model (1992, 2008; Schwarzer & Fleig, 2014) with Andersen's model (2014) to integrate the dimension of 'Outcomes' and further relevant findings of the research papers 1-3 in the context of WHP participation. The combination of both models in the context of WHP was called the Workplace Health Promotion Utilization Process Model (acronym WARM-UP). The integration of findings from research papers 1 and 3 into the combined model is presented in **Figure 6**. Here, the HAPA model can be seen as an expansion of Andersen's model, thus some factors overlap (e.g. self-efficacy and outcome expectancies were already categorized in Andersen's model and risk perception may be connected to perceived need for a WHP measure). The use of the investigated WHP measures resulted in an improvement of health and well-being ('Outcomes') – this was both a qualitative finding from physicians' perspectives (p1) for certain employees in the musculoskeletal measure and a quantitative finding from the pre-post-comparison of the mindfulness training with managers (p3). Furthermore, statements about satisfaction (p1, p3) and dissatisfaction (p1) are categorized as outcomes of participation. Different from the original models, 'follow-up beliefs and activities' were complemented as an outcome dimension since these were stated in both research papers (p1, p3).

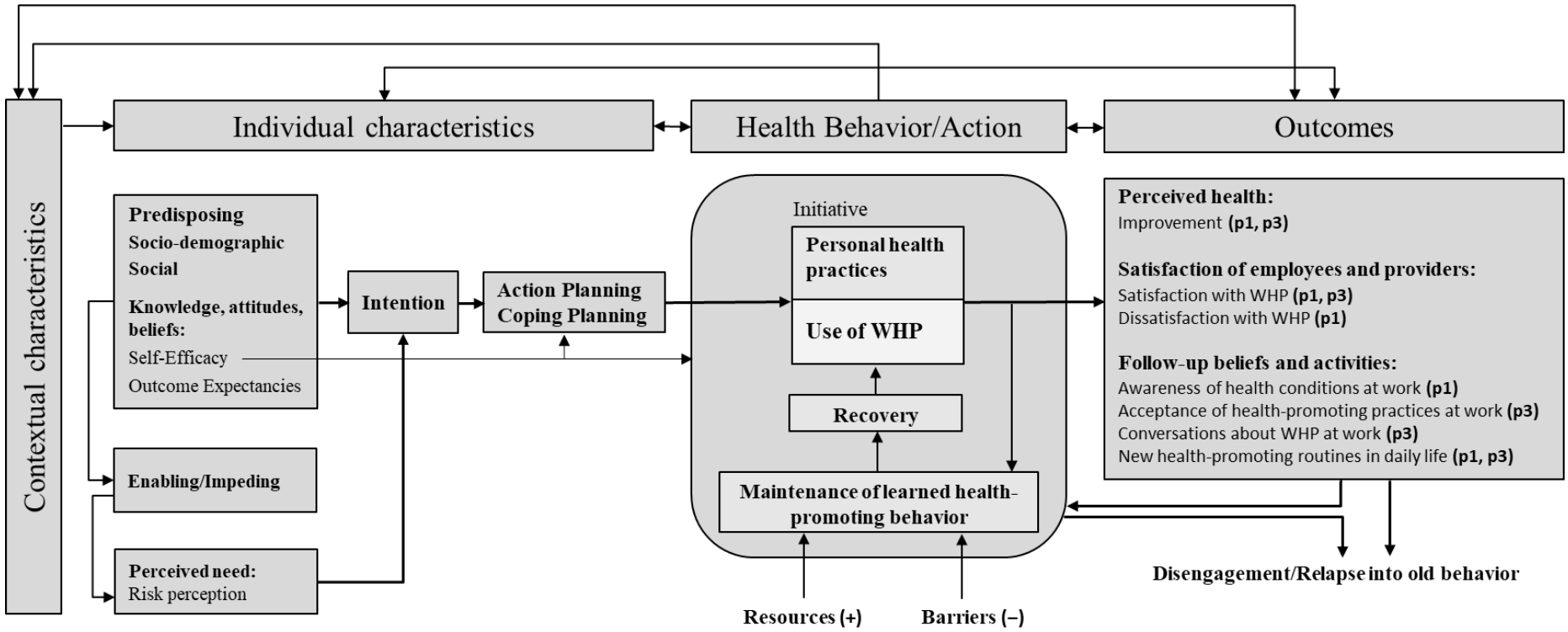


Figure 6. Workplace He**A**lth P**R**o**M**otion **U**tilization **P**rocess (WARM-UP): A combination of Andersen's model with the Health Action Process Approach (HAPA) and further integration of own empirical findings

These follow-up beliefs and activities included e.g. increased conversations about the WHP measure or increased awareness for health topics at work. The maintenance of health-promoting behavior learned in the WHP measures is subjected to barriers and resources identified in the findings (p1, p3). Differentiating these into personal, worksite-, job- and WHP-related factors (similar to organizational characteristics in Figure 5) may help identify factors an organization can address to support maintaining newly learned healthy behavior. For example, an accepting workplace culture or a lack thereof were stated as factors for health behavior maintenance. Sickness absence and work schedule conflicts were further reasons for dropping out of the measure after registration (p3). These findings can be taken into consideration to improve a health-promoting workplace and WHP implementation on the one hand. On the other hand, a theoretical assumption is that if health behavior maintenance yields success, repeated use of WHP and continuous integration into personal health practices might be more likely. However, if there is a lack of perceived beneficial outcomes or failure to maintain the learned health behavior after WHP use, employees may disengage or relapse into old behavior. Likewise, WHP participation and maintenance of learned health behavior that were experienced as successful may lessen employees' perceived needs to re-use WHP measures in the future, depending on the workplace culture and colleague behavior. In turn, outcome dimensions may now affect both individual characteristics (e.g. whether outcome expectancies were fulfilled or not) and the following health behavior.

Thus, the HAPA model contributes additional elements to the health behavior process, e.g. self-efficacy, outcome expectancies and risk perception as factors before the health behavior action of WHP participation takes place. A resulting implication would be to put effort into influencing accessible individual characteristics such as outcome expectancies e.g. through the objective benefit shown in a pragmatic evaluation such as a pre-post-comparison (p3). A subjectively perceived benefit of participation may follow up on this perceived objectified benefit. This entails both health improvement and social exchange benefits (e.g. conversations with colleagues about a WHP measure, p3). This way, non-intenders or yet unmotivated employees may be addressed and supported in forming intent and planning action during a potential roll-out of a measure. Lack of knowledge about the availability (Figure 5) and about evaluated results of a WHP measure (Figure 6, dissatisfaction) were criticized (p1, p2). Thus, effective company-internal communication seems especially important to impart such knowledge about the availability and evaluated evidence of a WHP measure. However, as information alone is not sufficient for sustainable health behavior change (Robroek et al., 2021), other factors need to be considered for WHP participation as well. The organizational characteristics categorized in Andersen's model and the social characteristics associated with WHP participation complement this individual-focused approach to health behavior. The benefit of using Andersen's model is that the model considers contextual characteristics of

utilization (aside from intra-individual perceptions and actions) and more differentiated subdimensions that consider the process a person undergoes for the use of health services in the respective health care system. This concludes the integration of findings and discussion of theoretical implications within Andersen's model and the HAPA.

In summary, the findings affirmed several factors introduced in the research state while complementing further or more specific factors in the models' dimensions. More specifically, the findings addressed research gaps such as reasons for non-participation in WHP (p1, p2), the implementation process of WHP measures (p1), the role of certain organizational characteristics for WHP participation (p1, p2) and for maintenance of health-promoting behavior (p3) (see chapter 3.3). Furthermore, the findings provide indications on how to make certain WHP measures more target-oriented for employees with musculoskeletal disorders (p1) and ICT-managers (p2, p3). Due to the study designs of the research papers 1-3, complemented factors of WHP participation should be seen as exploratory in nature. Finally, not all dimensions stated in the most current version of Andersen's model (2014) were used to represent findings from research papers 1-3. Therefore, the original model was adapted to fit the phenomenon of interest (WHP participation) more adequately by omitting, summarizing and re-naming sub dimensions.

7.2 Strengths and limitations

Main limitations of the underlying research papers and the resulting dissertation concern the dependence on the context-specific study settings, the sample sizes, the statistical modeling and the cross-sectional study designs (p1, p2). When interpreting the findings, the strong impact of the study populations and study context on variable associations (p2, p3) should be considered (Babitsch et al., 2012). While the generalizability of findings may be limited to the contexts the studies took place in (e.g. the randomized controlled trial design of the musculoskeletal measure in p1), diverse working conditions among the study participants, such as different business locations and working departments of physicians and managers, suggest a possible transferability to similar occupational groups and contexts. Regarding qualitative study parts, data saturation may be lacking due to available data from small sample sizes, e.g. only eight occupational physicians were recruited in (p1), conditional survey questions were partially used for (p2) and open-ended questions that were presented to ICT-managers in (p3) were voluntary. Furthermore, we face potential socially desired responses due to self-reports and a certain selection bias in the samples. More specifically, sample recruitment for (p1) depended on purposive sampling and voluntary participation of physicians, thus physicians might have been inclined to give more positive answers in the interviews due to their interest in the project and employment in their respective companies. Likewise, ICT-managers might have been inclined to put their company in a positive or negative light with

their answers. Additionally, since answering surveys was voluntary for ICT-managers in (p2) and (p3), the restricted subsamples of managers are subject to selection bias. Causal relationships between variables cannot be derived due to cross-sectional and qualitative study designs (p1, p2) as well as a one-group pre-post design (p3). Furthermore, test-statistical findings should be interpreted with caution, due to lacking validation or quality of certain scales (e.g. outcome scales like 'health literacy' and 'subjective training benefits' in p3), presence of potential confounders, low model fit or missing data (e.g. drop-outs due to practical reasons in p3). To give one example for item quality, ICT-managers (p2, p3) were asked if they had ever participated in a WHP measure before in their general past (as the statistical outcome variable) – this leaves a lot of space for interpretation about the specific type of WHP on the one hand, and about the frequency and duration of managers' participation on the other hand. Mandatory survey questions about previous participation in certain WHP types and further reminders during data collection might have enhanced the data quality (p2, p3). In turn, this might have enabled more conclusive statistical testing and differentiating findings about managers' WHP participation more rigorously e.g. by age, gender or management level. While comprehensive, the list of studies in the research state integrated into Andersen's model does not claim completeness; as such, more differentiated factors of WHP participation and relationships among these factors may have been neglected.

In contrast, main strengths of this dissertation lie within the use of two theoretical models and their enrichment with empirical findings in the context of WHP and a mixed methods approach. While population-based data was not used, the dissertation contributes to the research state by enriching Andersen's model with empirical findings combining different study designs in the context of WHP. More specifically, the integration within the Behavioral Model of Health Services Use in combination with the HAPA contributes a revisited and differentiated theoretical approach to WHP (Glasgow et al., 1993). Additionally, the top-down-approach of investigating WHP participation from the perspectives of occupational physicians and managers can be considered a further strength. Finally, triangulation of qualitative and quantitative methods added to more comprehensive findings and to the understanding of 'how' WHP is implemented (p1) and how it leads to success or not (p2, p3) within the investigated organizations.

7.3 Implications for research and practice

Implications for research

Further research may follow up on empirical factors that were not identified or studied in this dissertation or on factors where evidence is still hypothetical or unclear (see Figure 5). Since organizational factors were focused on the contextual level in this dissertation, macrosocial and environmental factors of WHP participation (as part of the contextual characteristics)

should be explored in the future (Linnan et al., 2001). These include the role of policies, seasonal differences, societal trends or the ongoing change of the working world – such aspects could be embedded in a more differentiated manner within contextual characteristics of Andersen's model. Statistical methods can be applied that test the pathways between the factors and WHP participation as postulated in Andersen's model, beyond the direct links (Chen & Gu, 2021). This may include the links between knowledge of available WHP measures, their use and effects on health (van der Put & Mandemakers, 2019). Additionally, future studies should address the shortcomings of research papers 1-3 (Schubin et al., 2021; Schubin et al., 2020; Schubin et al., 2023). These include acquiring higher sample sizes from various organizations, using longitudinal designs, more rigorous sampling methods (e.g. probability sampling for quantitative surveys), more validated measures, preventing drop-outs and missing data, as well as a more detailed, consistent collection and documentation of WHP participation data (Bensa & Širok, 2023). Theory-driven approaches are preferable to address the problem of low WHP participation (Linnan et al., 2001). For this, more primary data needs to be collected in theory-driven research, e.g. based on Andersen's model (Babitsch et al., 2012). Collecting data with more differentiated measures would provide more detailed findings about WHP participation – this is worthwhile in individual studies, representative national surveys or documentary sheets of the national prevention report. A more comprehensive understanding of participation in WHP may be necessary due to the difficulty of defining 'participation' (Linnan et al., 2001). In representative surveys in Germany, WHP participation is operationalized by asking respondents whether they participated in WHP measures in the last year or two (Beck & Lenhardt, 2016; Hollederer, 2021; Ludwig et al., 2020). It is, at the very least, questionable whether such a minimum threshold is sufficient to be considered as 'active' participation in terms of achieving sustainable effects of WHP measures. Data gathering may include continuous participation measures, success in maintaining behavior change (Schubin et al., 2023), drop-out rates and reasons for dropping out/ not participating (Rongen et al., 2013). Furthermore, a more current systematic review on factors of participation in WHP programs is necessary on the international level. To the best of the author's knowledge, the most cited review by Robroek et al. dates back to 2009. Due to the integration of findings from the research state into Andersen's model, this dissertation provides a basis for a future semi-systematic or integrative review about WHP participation (Snyder, 2019). Considering the heterogeneous conceptualization and interdisciplinary approaches to WHP measures, semi-systematic or integrative reviews may fit the subject of WHP participation more adequately. Aside from WHP participation, further research gaps in the field of WHP not investigated in this dissertation need to be addressed. On the one hand, there is a need for new WHP approaches to improve the health behavior of employees with low socio-economic positions in particular (Robroek et al., 2021). On the other hand, enabling small- and medium-

sized companies to implement WHP requires further investigation and effort (Hollederer, 2021). Finally, a common agreement on definitions, data collection methods and categorization of results as well as representative data is necessary to study the structure and quality of occupational health management and WHP measures in Germany (Beck & Lenhardt, 2016; Faller, 2018). Consequently, the degree of WHP participation (and whether participation can be defined as 'low' based on a consensual and evidence-based percentage threshold) could be measured systematically across companies. Considering the large heterogeneity and voluntariness to offer WHP measures, a large-scale dissemination of a common conceptualization of WHP measures and participation therein remains to be seen.

Implications for practice

Companies experiencing low WHP participation may use the empirically enriched models to shape more favorable conditions for increasing participation. Factors of WHP participation (Figure 5, Schubin et al., 2021; Schubin et al., 2020) may be used as starting points and identified resources and barriers (Figure 6, Schubin et al., 2023) may help maintain participants' health behavior change, re-use of WHP and beneficial outcomes. The fact that the findings are based on analyses of occupational physicians' and ICT-managers' reports needs to be considered when deriving practical measures based on these findings. Additionally, theoretically postulated principles for successful WHP may be followed when promoting participation rates, such as participatory organizational development, appropriate leadership, investment of sufficient resources, integration of WHP into all corporate divisions and a holistic approach (Hartung et al., 2021; Schubin et al., 2021; Schubin et al., 2023; Stock-Homburg & Groß, 2019). Considering target-orientation, systems approaches and delivery of WHP may complement these principles (Robroek et al., 2021).

Potential access to WHP needs to be established first before tackling realized access (Andersen & Davidson, 2007). This requires implementing occupational health management and WHP measures with sufficient quality throughout all divisions and hierarchical levels both in a single company and across companies in Germany. Furthermore, both the organizational and individual level of WHP need to be considered for a holistic approach to WHP participation. Changing organizational factors (worksite-, job-, and WHP-related) that enable WHP participation may be more tangible and direct for decision makers than individual factors (such as health behavior or self-efficacy). Including findings from other studies, the importance of the social dimension at work (e.g. direct colleagues and managers participate in and support WHP), acceptance in the working culture, reducing time conflicts and high workload, cost coverage and target-orientation should be pointed out to successfully promote WHP participation (Schubin et al., 2021; Schubin et al., 2020; Schubin et al., 2023). A practical implication to counter work schedule conflicts would be to provide resources to realize the

higher priority of a WHP measure, e.g. through an overarching workplace culture that accepts and endorses WHP participation (van der Put & van der Lippe, 2020). Due to the large variety of workforces and business sectors, the distinct contexts and characteristics of the respective target population, specifically their health and other relevant needs, should be considered to develop WHP measures and promote participation. Complementary elements of access may be focused to make WHP measures more target-oriented (e.g. accessibility, affordability, acceptability and accommodation) (Ricketts & Goldsmith, 2005). Regarding a participatory approach to WHP, only 31% of WHP activities supported by the statutory health insurance funds included approaches to actively promote participation (MD Bund & GKV-Spitzenverband, 2022). This calls for more efforts to promote active employee participation when collecting data, developing, implementing and disseminating WHP measures in companies.

Furthermore, certain individual factors of WHP participation may be addressed more easily by decision makers, such as knowledge and expectations (Schubin et al., 2021; Schubin et al., 2020). The implementation of WHP measures by itself does not imply employees' awareness of these measures (van der Put & Mandemakers, 2019). Possible dissemination strategies lie within use of different in-house communication channels to address non-participants and different adopters of WHP measures over time (e.g. based on Rogers' diffusion of innovations theory, Sahin, 2006). For example, occupational physicians and managers could strengthen employees' conviction of the need to participate in WHP. Other examples include reducing lack of information on the user and provider side of WHP (Thode et al., 2005). Presenting positive evaluation results of WHP measures to previous non-participants may help affect beneficial outcome expectancies to promote further participation rates. While information about WHP within companies should be disseminated sufficiently and efficiently, information alone does not suffice to create sustainable health behavior change (Robroek et al., 2021). Managers are crucial to inform employees about WHP (van der Put & Mandemakers, 2019), but as findings from this dissertation show, managers may experience barriers to WHP participation and to behavior change themselves (Schubin et al., 2021; Schubin et al., 2023). In light of managers' high workload, shared responsibility for health and well-being between the organization and the employees should be strengthened when communicating about WHP (van der Put & Mandemakers, 2019). Managers on all hierarchical levels should pay attention to their own participation in WHP and dissemination to their team members. Concurrently, organizational conditions should enable managers to do so. Finally, a participatory WHP approach may require all involved actors to question their previous understanding of their roles and behavior and the willingness to face both collaboration and conflict in the co-production of WHP measures (Hartung et al., 2021; Rossi et al., 2022).

8 Conclusion

This dissertation aimed at generating knowledge about perceived underlying factors of WHP participation in German companies. This was achieved by integrating and discussing results of three empirical studies within Andersen's behavioral model of health services use and within the combination with the HAPA model as a supplement. As the role of organizational characteristics and the disparity between WHP offers and WHP participation are not fully understood yet, perceived organizational factors – beside individual factors – received more attention in the discussion.

In summary, the findings suggest providing sufficient access to WHP programs at the workplace, financial compensation, tailored implementation and dissemination as well as establishing a firm network of collaborators for WHP to facilitate WHP participation. As implementation of WHP measures by itself does not imply employees' awareness of these measures, target-oriented advertising of WHP should be emphasized. Concurrently, impeding job-related factors such as variable working locations/ times or high workload should be counteracted, while facilitating favorable social conditions for WHP participation such as colleague support and opportunities for personalized recruitment. Furthermore, individual characteristics such as time conflicts and the health status (e.g. a perceived lack of need for WHP measures or severe health conditions) need to be considered for target-oriented promotion of WHP participation. While challenging, efforts can be made to affect non-participating employees' attitudes and beliefs (e.g. self-efficacy and outcome expectancies) in a way that makes them more inclined to participate. For this, organizational barriers and resources were provided as starting points that can be considered to maintain learned health-promoting behavior after WHP participation, facilitate re-use of WHP and keep up beneficial organizational outcomes aside from health benefits. Thus, the findings affirmed certain organizational and individual factors of WHP participation identified in the research state, while additional or more differentiated factors were contributed from the perspectives of occupational physicians and ICT-managers. Although the objectives and contexts of the underlying papers differed from one another, an overarching perspective was adopted by combining and adapting Andersen's model and the HAPA to generate theoretical implications for the promotion of WHP participation. The dissertation therefore contributes an empirically enriched theoretical approach that can be used by researchers for further enrichment and testing and, as an orientation, by practitioners for the promotion of WHP participation in companies.

As a final remark, more effort is still necessary to strengthen the impact of workplace prevention and health promotion by implementing sufficient WHP structures, sustained participation and effectiveness of WHP measures in Germany. Considering 'new work' and the changing working world, it remains to be seen how the shaping of and active participation in WHP measures on a large scale will be achieved by companies in the future.

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List of appendices

Appendix

Appendix 1. Notes on study findings in Figure 4 and Figure 5

(2) Kilpatrick et al. (2015), quantitative

*Note on higher income: The authors state the negative relationship with WHP use is contradictory to the research state

(3) Kilpatrick et al. (2017), mixed methods

*Note: The study was classified as ‘mixed methods’ since open survey answers were analyzed additionally to quantitative analysis using a qualitative method

(4) van der Put et al. (2020), quantitative

*Note on education level: The role of education for WHP use depends on the type of WHP measure. The same applies to the studies of Jordan et al. (2020) (8) and Hermann et al. (2021) (9)

(6) Rojatz et al. (2017), qualitative review

*Note: Interest, motivational readiness, commitment, and compliance may be enabling or impeding for WHP participation depending on their nature

(9) Hermann et al. (2021), quantitative, same data base as Jordan et al. (2020) (8)

*Note on socio-economic status: Back health measures were used by more men with low socio-economic status

(11) Ludwig et al. (2020), quantitative

*Note on female gender: Higher participation of females depends on the type of WHP measure

(12) van der Put and van der Lippe (2020), quantitative

*Note: ‘Less work-oriented culture’ and ‘Job autonomy’ may not be robust constructs according to authors

(18) Rongen, Robroek, van Ginkel, Lindeboom, Pet, and Burdorf (2014), quantitative

*Note: Tailoring to employees‘ needs was not a significant construct in statistical testing

Appendix 2. Erklärung über den Eigenanteil an den Publikationen innerhalb der Dissertationsschrift gemäß § 9, Abs. 4 der Promotionsordnung

Publikation 1

Schubin, K., Schlomann, L., Lindert, L., Pfaff, H. & Choi, K.-E. (2020). Occupational Physicians' Perspectives on Determinants of Employee Participation in a Randomized Controlled Musculoskeletal Health Promotion Measure: A Qualitative Study. *International journal of environmental research and public health*, *17*(20), 7445. https://doi.org/10.3390/ijerph17207445

Erstautorin: Kristina Schubin
Ko-Autor:innen: Lara Schlomann, Lara Lindert, Holger Pfaff, Kyung-Eun Choi

Beiträge der Erstautorin zu Publikation 1:

Erstellung der Publikation: Kristina Schubin hat bei der Erstellung der Publikation den wesentlichen Anteil geleistet und den grundlegenden Aufbau der Publikation selbst konzipiert. Sie organisierte regelmäßige Besprechungen mit den Ko-Autor:innen zu konkreten Inhalten der Publikation, Planung der Methodik sowie Diskussion der Ergebnisse im Prozess der Datenanalyse und der Manuskripterstellung. Sie verfasste den Entwurf des Manuskripts eigens und vollständig in englischer Sprache. Die zugehörige Literaturrecherche wurde ebenfalls vollständig von Frau Schubin getätigt. Die Konzeption und Erstellung der grafischen und tabellarischen Visualisierungen erfolgten ebenfalls vollständig durch Frau Schubin. Die Darstellung und Verschriftlichung des im Anhang der Publikation enthaltenen Interviewleitfadens und Codierschemas (Supplementary file) zur Gewährleistung der Replizierbarkeit der Studie sind darin inbegriffen. Die Anleitung einer studentischen Hilfskraft zur Unterstützung der grafischen Visualisierung in der Publikation erfolgte vollständig durch Frau Schubin. Weiterhin hat Frau Schubin Vorschläge zur Überarbeitung des Manuskripts durch die Ko-Autor:innen initiiert und deren Überarbeitungsvorschläge eigens in die Publikation eingearbeitet. Besprechungen mit den Ko-Autor:innen zu den Revisionsvorschlägen durch die Peer Reviewer in der ersten und zweiten Revisionsrunde wurden ebenfalls von Frau Schubin organisiert. Aufforderungen zur Überarbeitung aus den Peer Reviews wurden sowohl in der ersten Revisionsrunde als auch in der zweiten Revisionsrunde vollständig von Frau Schubin in das Manuskript eingearbeitet. Zudem hat sie den organisatorischen Prozess der Einreichung von der Auswahl des Journals, der Kommunikation mit den zuständigen Editor:innen, den Revisionen bis hin zur Veröffentlichung des Manuskripts vollständig übernommen.

Konzeption des Projekts: Frau Schubin hat wesentlich zu der Konzeptionierung der Datenauswertung, der Ergebnisdarstellung und Ergebnisinterpretation beigetragen. Dazu zählt die Konzeptionierung der Transkriptionsanalysen, Ergebnisdarstellung und -interpretation auf Basis des Verhaltensmodells der Inanspruchnahme nach Andersen. Frau Schubin formulierte die übergreifende Forschungsfrage der Publikation eigenständig mit Bezug zum eigenen Promotionsprojekt. Sie organisierte als wesentliche Instanz die Abstimmung und Kommunikation mit Ko-Autor:innen zu konkreten Inhalten der Publikation, Planung der Methodik sowie Diskussion der Ergebnisse im zirkulären Prozess der Datenanalyse und der Manuskripterstellung. Hierunter fallen sowohl Schriftverkehr als auch die Moderation regelmäßiger Besprechungs- und Diskussionsrunden mit Ko-Autor:innen zu Methodik und Ergebnissen der Publikation.

Datenevaluation und Interpretation: Frau Schubin hat die Analyse und das Management der Forschungsdaten (Transkriptionen) für die Publikation überwiegend selbst getätigt. Alle acht Interviewtranskriptionen, die der Publikation zugrunde liegen, wurden vollständig von ihr analysiert. Dies umfasste die Codierung der Transkriptionen und das Schreiben von Forschungsnotizen zu den Transkriptionen. Frau Schubin erstellte eigenständig in einem zirkulären Forschungsprozess das Kategoriensystem und die entsprechenden Definitionen, die Grundlage für die Datenanalyse waren, und stellte das Kategoriensystem mit den Ko-Autor:innen zur Diskussion. Außerdem verglich sie in Eigenarbeit die ihre eigenen Analysen mit den Analysen ihrer Ko-Autor:innen und überwachte den Prozess und die Speicherung der Datenanalysen. Außerdem konzipierte und tätigte sie vollständig die Darstellung und Übersetzung der qualitativen Textdaten für die Publikation. Frau Schubin trug zudem eigenständig die Informationen zur Beschreibung der Stichprobe für die Publikation zusammen. Die Entscheidung, welche Daten und Ergebnisse in welcher Form beschrieben werden (z.B. soziodemografische Daten der Stichprobe, Auswahl der Ankerbeispiele bzw. Zitate aus den Transkriptionen), tätigte Frau Schubin überwiegend selbst. Die Einordnung und Interpretation der Ergebnisse anhand des zugrundeliegenden Verhaltensmodells der Inanspruchnahme nach Andersen wurde ebenfalls vollständig von ihr getätigt. Weiterhin erfolgten die Interpretation der Ergebnisse anhand bisheriger Forschungsarbeiten, die Ableitung von Implikationen für Praxis und weitere Forschung sowie die Diskussion der Stärken und Limitationen der Studie vollständig durch Frau Schubin.

Beiträge der Ko-Autor:innen zu Publikation 1:

Frau Choi, Frau Lindert und Prof. Pfaff waren in der Projektleitung des Projekts „BGM-Innovativ“ tätig, aus dem die Publikation resultierte. Prof. Pfaff stellte die notwendigen Ressourcen zur Durchführung des Projekts zur Verfügung (z.B. Computerarbeitsplatz, Software). Prof. Pfaff war wesentlich in der Antragstellung des Projekts beteiligt. Frau Choi und Prof. Pfaff waren wesentlich an der Konzeptionierung des zugrundeliegenden Studiendesigns des Projekts „BGM-Innovativ“ beteiligt. Frau Lindert, Frau Choi und Prof. Pfaff holten das Ethikvotum für die Studie ein. Lara Schlomann und Lara Lindert gaben mündliche Anmerkungen zu inhaltlichen Anpassungen im Manuskript und ergänzten schriftlich Informationen im Manuskript sowohl vor der Einreichung als auch im Anschluss an das Peer Review Verfahren. Frau Lindert und Frau Schlomann wirkten zusammen mit Frau Choi mehrheitlich bei der Entwicklung der übergreifenden Methodik der qualitativen Studie und des Interviewleitfadens mit. Die Datenerhebung selbst erfolgte durch eine ehemalige Projektmitarbeiterin, die nicht an der Publikation beteiligt war. Frau Schlomann und Frau Lindert analysierten je drei Interviewtranskriptionen und beteiligten sich im Diskussionsprozess zur Datenanalyse und Manuskripterstellung. Frau Choi und Prof. Pfaff betreuten den Prozess der Datenauswertung für die Publikation. Beide gaben mündlich und schriftlich Vorschläge zur Anpassung und Ergänzung des methodischen Vorgehens und des Manuskripts. Alle Autor:innen haben am Manuskript mitgewirkt und gaben ihr Einverständnis für die Publikation des endgültigen Manuskripts.

Publikation 2

Schubin, K., Pfaff, H. & Zeike, S. (2021). How Managers Perceive and (Do Not) Participate in Health Promotion Measures - Results from a Cross-Sectional Mixed-Methods Survey in a Large ICT Company. *International journal of environmental research and public health*, *18*(18), 9708. https://doi.org/10.3390/ijerph18189708

Erstautorin: Kristina Schubin
Ko-Autor:innen: Holger Pfaff, Sabrina Zeike

Beiträge der Erstautorin zu Publikation 2:

Erstellung der Publikation: Kristina Schubin hat bei der Erstellung der Publikation den wesentlichen Anteil geleistet und den grundlegenden Aufbau der Publikation selbst konzipiert. Sie organisierte regelmäßige Besprechungen mit den Ko-Autor:innen zu konkreten Inhalten der Publikation, Planung der Methodik sowie Diskussion der Ergebnisse im Prozess der Datenanalyse und der Manuskripterstellung. Frau Schubin formulierte die übergreifenden Forschungsfragen der Publikation eigenständig mit Bezug zum eigenen Promotionsprojekt. Sie verfasste den Entwurf des Manuskripts eigens und vollständig in englischer Sprache. Die zugehörige Literaturrecherche wurde ebenfalls vollständig von Frau Schubin getätigt. Die Konzeption und Erstellung der grafischen und tabellarischen Visualisierungen erfolgten ebenfalls vollständig durch Frau Schubin. Die Darstellung und Verschriftlichung des im Anhang der Publikation enthaltenen Codierschemas (Supplementary file) ist darin inbegriffen. Weiterhin hat Frau Schubin Vorschläge zur Überarbeitung des Manuskripts durch die Ko-Autor:innen initiiert und deren Überarbeitungsvorschläge eigens in die Publikation eingearbeitet. Besprechungen mit den Ko-Autor:innen zu den Revisionsvorschlägen durch die Peer Reviewer wurden ebenfalls von Frau Schubin organisiert. Aufforderungen zur Überarbeitung aus den Peer Reviews wurden vollständig von Frau Schubin in das Manuskript eingearbeitet. Zudem hat sie den organisatorischen Prozess der Einreichung von der Auswahl des Journals, der Kommunikation mit den zuständigen Editoren, den Revisionen bis hin zur Veröffentlichung des Manuskripts vollständig übernommen.

Konzeption des Projekts: Frau Schubin hat wesentlich zu der Konzeptionierung des Projekts von der ursprünglichen Planung des Studiendesigns, der Datenerhebung und Datenauswertung bis zur Ergebnisdarstellung und -interpretation beigetragen. Frau Schubin war stellvertretende Projektleitung: Sie übernahm als wesentliche Instanz die Abstimmung und Kommunikation mit Ko-Autor:innen und Kooperationspartner:innen im Untersuchungsfeld (dem IT-Unternehmen) zur Organisation und zum methodischen Vorgehen im Projekt. Hierunter fallen sowohl Schriftverkehr als auch persönliche Besprechungen. Frau Schubin wirkte in großen Teilen an der Erstellung des Erhebungsinstruments (Fragebogen) mit und implementierte den Fragebogen vollständig im Online-Umfragetool LimeSurvey. Dies beinhaltete die Abstimmung zur Aufnahme und Formulierung konkreter Fragen und Skalen im Fragebogen mit Ko-Autor:innen sowie Projektbeteiligten aus dem IT-Unternehmen. Außerdem wirkte Frau Schubin zu einem großen Teil in der Erstellung und Prüfung der Studieninformation sowie der Einverständniserklärung für die Studienteilnehmenden mit. Zudem war sie in Teilen bei der Erstellung der schriftlichen Einladung zur Rekrutierung von potenziellen Studienteilnehmenden beteiligt. Frau Schubin war als wesentliche Instanz für das Einholen des Ethikvotums zum Projekt zuständig. Darunter fallen die Antragstellung inklusive der Erstellung und Zusammentragung der notwendigen Unterlagen (u.a. Anschreiben, Antrag, Studienplan, Fragebogen, Studieninfor-

mation, Einverständniserklärung). Im Prozess der Einholung des Ethikvotums wohnte Frau Schubin außerdem der Beratung durch die Ethikkommission bei. Zudem arbeitete sie Überarbeitungsaufforderungen durch die Kommission vollständig ein und reichte diese mehrmals erneut ein.

Datenerhebung, Datenevaluation und Interpretation: Frau Schubin initiierte und begleitete den gesamten Prozess der Datenerhebung bzw. der Generierung der Rohdaten, welcher über einen Zeitraum von zwei Monaten ablief (Sammeln von Daten durch einen Online-Fragebogen). Anschließend war sie wesentlich im Prozess der Datenaufbereitung beteiligt. Dies umfasste das Schreiben, Kommentieren und Prüfen der Syntax (Befehlssprache in der Statistiksoftware SPSS) zur Nachvollziehbarkeit der Datenaufbereitung und -auswertung. Zudem tätigte Frau Schubin die Bereinigung der Daten für die Analysen z.B. durch die Identifikation und Filterung fehlender Fälle, die Umcodierung und Zusammenfassung von Items sowie explorative Datenanalysen im Vorfeld der endgültigen Berechnungen. Außerdem überwachte sie den Prozess der Speicherung und Ablage der Forschungsdaten. Die für die Publikation notwendigen und darin enthaltenen Aufbereitungen und Analysen der statistischen Daten plante und tätigte Frau Schubin vollständig selbst. Außerdem konzipierte und tätigte sie vollständig die Aufbereitung, Darstellung und Übersetzung der qualitativen Textdaten in der Publikation. Die Entscheidung, welche Daten, Analysen und Ergebnisse in welcher Form in der Publikation beschrieben werden (z.B. soziodemografische Variablen, Skalen, Einordnung der Effektstärke), tätigte Frau Schubin überwiegend selbst. Die Anleitung von studentischen Hilfskräften zur Unterstützung der Datenauswertung und -visualisierung erfolgte wesentlich durch Frau Schubin. Die Interpretation und Einordnung der Ergebnisse auf Basis der eigenen Studienqualität und des bisherigen Forschungsstands wurden mehrheitlich von Frau Schubin getätigt. Darin waren die übergreifende Konzeption der Diskussion, die entsprechende Recherche des bisherigen Forschungsstands und die Beschreibung der Stärken und Limitationen der eigenen Studie inbegriffen.

Beiträge der Ko-Autor:innen zu Publikation 2:

Sabrina Zeike und Prof. Holger Pfaff leiteten das Projekt und waren maßgeblich an der Konzeption des zugrundeliegenden Studiendesigns und der Methodik der Studie beteiligt. Prof. Pfaff stellte die notwendigen Ressourcen zur Durchführung des Projekts zur Verfügung (z.B. Computerarbeitsplatz, Software). Prof. Pfaff und Frau Zeike waren beide in der Kommunikation mit den Kooperationspartner:innen zur Konzeptionierung des zugrundeliegenden Projekts beteiligt. Frau Zeike unterstützte den Prozess des Einholens des Ethikvotums, wirkte an der Antragstellung für das Ethikvotum mit und wohnte der Beratung durch die Ethikkommission bei. Prof. Pfaff wirkte in Teilen und Frau Zeike wirkte mehrheitlich bei der Erstellung des Fragebogens mit. Frau Zeike begleitete außerdem die Datenerhebung und übernahm in Teilen die für die Publikation notwendige Datenaufbereitung (z.B. Schreiben und Prüfen der Syntax). Sowohl Prof. Pfaff als auch Frau Zeike gaben mündliche und schriftliche Anmerkungen zu inhaltlichen, methodischen und formalen Anpassungen im Manuskript vor der Einreichung der Publikation. Beide gaben nochmals mündliche Rückmeldung im Anschluss an die Aufforderung zur Revision im Peer Review Verfahren. Alle Autor:innen haben am Manuskript mitgewirkt und gaben ihr Einverständnis für die Publikation des endgültigen Manuskripts.

Publikation 3

Schubin, K., Seinsche, L., Pfaff, H. & Zeike, S. (2023). A Workplace Mindfulness Training Program May Affect Mindfulness, Well-Being, Health Literacy and Work Performance of Upper-Level ICT-Managers: An Exploratory Study in Times of the COVID-19 Pandemic. *Frontiers in Psychology*, *14*, 931. https://doi.org/10.3389/fpsyg.2023.994959

Erstautorin: Kristina Schubin
Ko-Autor:innen: Laura Seinsche, Holger Pfaff, Sabrina Zeike

Beiträge der Erstautorin zu Publikation 3:

Erstellung der Publikation: Kristina Schubin hat bei der Erstellung der Publikation den wesentlichen Anteil geleistet und den grundlegenden Aufbau der Publikation selbst konzipiert. Sie organisierte regelmäßige Besprechungen mit den Ko-Autor:innen zu konkreten Inhalten der Publikation (z.B. Auswertungsmethodik) im Prozess der Datenanalyse, der Manuskripterstellung und der Revision. Frau Schubin verfasste den Entwurf des Manuskripts eigens und vollständig in englischer Sprache. Die Literaturrecherche und die Erstellung der grafischen und tabellarischen Visualisierungen wurde zum Großteil von Frau Schubin getätigt. Weiterhin hat Frau Schubin Vorschläge zur Überarbeitung des Manuskripts durch die Ko-Autor:innen initiiert und deren Überarbeitungsvorschläge eigens in die Publikation eingearbeitet. Aufforderungen zur Überarbeitung aus den Peer Reviews wurden zum größten Teil von Frau Schubin selbst eingearbeitet. Zudem hat Frau Schubin den organisatorischen Prozess der Einreichung vollständig übernommen – angefangen bei der Auswahl des Journals, der Kommunikation mit den Editor:innen und den Revisionen bis hin zur Veröffentlichung des Manuskripts.

Konzeption des Projekts: Frau Schubin hat wesentlich zu der Konzeptionierung des ursprünglichen Projekts beigetragen - dies beinhaltet die Planung des Studiendesigns, die Datenerhebung und -auswertung, die Ergebnisdarstellung sowie -interpretation. Frau Schubin übernahm zu Beginn des Projekts als wesentliche Instanz die Abstimmung und Kommunikation mit Ko-Autor:innen und Kooperationspartner:innen im Untersuchungsfeld (dem IT-Unternehmen und dem Trainingsanbieter) bezüglich der Organisation und des methodischen Vorgehens. Frau Schubin wirkte in großen Teilen an der Erstellung des Erhebungsinstruments (Fragebogen) mit. Dies beinhaltete die Abstimmung zur Aufnahme und Formulierung konkreter Fragen und Skalen im Fragebogen. Außerdem wirkte Frau Schubin in der Erstellung und Prüfung der Studieninformation sowie der Einverständniserklärung für die Studienteilnehmendem mit. Frau Schubin war als wesentliche Instanz für das Einholen des Ethikvotums zum Projekt zuständig. Darunter fallen die Antragstellung inklusive der Erstellung und Zusammentragung der notwendigen Unterlagen (u.a. Anschreiben, Antrag, Studienplan, Fragebogen, Studieninformation, Einverständniserklärung). Im Prozess der Einholung des Ethikvotums wohnte Frau Schubin außerdem der Beratung durch die Ethikkommission bei. Zudem arbeitete sie Überarbeitungsaufforderungen durch die Kommission ein und reichte diese erneut ein.

Datenerhebung, Datenevaluation und Interpretation: Frau Schubin begleitete maßgeblich den Prozess der Datenerhebung bzw. der Generierung der Rohdaten und war wesentlich in der Datenaufbereitung beteiligt. Die für die Publikation notwendigen Analysen der statistischen Daten tätigte Frau Schubin vollständig selbst. Dies umfasste das Schreiben, Kommentieren und Prüfen der Syntax. Außerdem begleitete sie den Prozess der Speicherung und Ablage der Forschungsdaten. Zudem wirkte Frau Schubin an der Aufbereitung und Auswertung der

qualitativen Textdaten mit. Die Interpretation und Einordnung der Studienergebnisse auf Basis der Studienqualität und des bisherigen Forschungsstands wurden wesentlich von Frau Schubin getätigt.

Beiträge der Ko-Autor:innen zu Publikation 3:

Sabrina Zeike und Prof. Holger Pfaff leiteten das ursprüngliche Projekt und waren maßgeblich an der Konzeption des zugrundeliegenden Studiendesigns und der Methodik der Studie beteiligt. Prof. Pfaff stellte die notwendigen Ressourcen zur Durchführung des Projekts zur Verfügung (z.B. Computerarbeitsplatz, Software). Prof. Pfaff und Frau Zeike waren beide in der Kommunikation mit den Kooperationspartner:innen zur Konzeptionierung des zugrundeliegenden Projekts beteiligt. Frau Zeike unterstützte den Prozess des Einholens des Ethikvotums, wirkte an der Antragstellung für das Ethikvotum mit und wohnte der Beratung durch die Ethikkommission bei. Prof. Pfaff wirkte in Teilen und Frau Zeike wirkte mehrheitlich bei der Erstellung der genutzten Fragebogen mit. Frau Zeike leitete außerdem die Datenerhebung und übernahm in Teilen die für die Publikation notwendige erste Datenaufbereitung (z.B. Schreiben und Prüfen der ersten Syntax). Laura Seinsche wirkte maßgeblich an der qualitativen Datenauswertung, dem qualitativ-methodischen Teil und den qualitativen Ergebnissen im Manuskript mit. Sowohl Prof. Pfaff als auch Frau Zeike gaben Anmerkungen zu inhaltlichen und methodischen Anpassungen im Manuskript vor der Einreichung und während der Revision. Frau Seinsche gab zudem inhaltliche und methodische Anmerkungen während des Revisionsprozesses und trug zur Überarbeitung des Manuskripts bei. Alle Autor:innen haben am Manuskript mitgewirkt und gaben ihr Einverständnis für die Publikation des endgültigen Manuskripts.

Hiermit bestätige ich, dass Frau Kristina Schubin den wesentlichen Beitrag an den in dieser Erklärung genannten Publikationen gemäß den Beschreibungen geleistet hat.

Köln, den 11.07.2023

Holger Pfaff

Prof. Dr. Holger Pfaff (Betreuer)

Kooperationen

Publikation 1:

Im zugrundeliegenden Projekt „BGM-Innovativ“ bestanden Kooperationen mit 15 Betriebskrankenkassen und 22 Betrieben, einem Dachverband an Krankenkassen, Trägern der deutschen Rentenversicherung, einer Rehabilitationsgesellschaft und dem Institut für Medizinische Statistik, Informatik und Epidemiologie der Universität zu Köln. Die Krankenkassen und Betriebe ermöglichten die Kommunikation mit und Rekrutierung der interviewten Betriebsärzt:innen für die Studie in der Publikation. Die Kooperationspartner:innen wirkten darüber hinaus jedoch nicht an der Erhebung, Analyse und Interpretation der Daten, dem Verfassen des Manuskripts oder der Veröffentlichung mit.

Publikation 2 und 3:

Es bestand eine Kooperation mit einem deutschen IT-Unternehmen, in dem die Untersuchung durchgeführt wurde, und einer deutschen Krankenversicherung. Die Kooperationspartner:innen beteiligten sich in der organisatorischen Planung des Projekts (z.B. Zeitraum der Datenerhebung, Versenden der Einladungen und Erinnerung zur Teilnahme an der Befragung per E-Mail) und der inhaltlichen Gestaltung der Fragebögen (z.B. Inhalt und Formulierung einzelner Fragen, Formulierung der Ansprache potenzieller Teilnehmender). Im Projekt zu Publikation 3 war zudem ein Trainingsanbieter für Achtsamkeitstrainings involviert, der das Training durchführte. Das Team des Anbieters war zusammen mit dem IT-Unternehmen für die Organisation des Trainings zuständig (z.B. zeitliche und räumliche Abstimmung, Kommunikation mit Trainingsteilnehmenden). Außerdem gab das Team des Trainingsanbieters Anmerkungen zur Überarbeitung der Fragebögen und verteilte die Fragebögen in physischer oder digitaler Form während der Datenerhebung an die Teilnehmenden. Die Kooperationspartner:innen wirkten darüber hinaus nicht an der Erhebung, Analyse und Interpretation der Daten, dem Verfassen des Manuskripts oder der Veröffentlichung mit.

Appendix 3. Copy of research papers 1-3

International Journal of
Environmental Research and Public Health

MDPI

Article

Occupational Physicians' Perspectives on Determinants of Employee Participation in a Randomized Controlled Musculoskeletal Health Promotion Measure: A Qualitative Study

Kristina Schubin *, Lara Schlomann, Lara Lindert, Holger Pfaff and Kyung-Eun Choi

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Received: 16 July 2020; Accepted: 9 October 2020; Published: 13 October 2020

Abstract: Occupational physicians (OPs) are key figures for advising employees and employers about prevention and health at the workplace. However, knowledge of their views on participation in health promotion measures is sparse. This qualitative study aims to explore occupational physicians' experiences with employee participation in a randomized controlled workplace measure for musculoskeletal disorders (MSDs) in Germany. We conducted eight semi-structured telephone interviews with occupational physicians. Interviews were transcribed verbatim and analyzed using a combination of conventional and directed content analysis. Findings were mapped based on Andersen's behavioral model of health services use, resulting in four categories and 10 subcategories. (a) Contextual factors of the measure comprised impacts of the healthcare system and company environment, (b) individual factors of measure participation comprised demographic, social, belief, and MSD need characteristics, (c) health behavior during the measure included OPs' communication, employees' personal practices and measure participation, and (d) outcomes of participation included health status, satisfaction, and dissatisfaction with the measure. Findings imply occupational physicians' and employees' views should be investigated on a broader scale. Researchers should use present statements for the development of intervention studies, while political and managerial authorities can improve organizational conditions of prevention based on these findings.

Keywords: occupational physician; workplace health promotion; employee; qualitative research; andersen model

1. Introduction

1.1. Evidence Base and Objectives

As numerous declarations point out, Workplace Health Promotion (WHP) can facilitate health and well-being among a broad population of workers [1–3]. Musculoskeletal disorders (MSDs) present a major challenge for WHP. In 2018, MSDs were the most frequent cause of incapacity to work among those insured by statutory health insurance in Germany. They were ranked first among those insured by company health insurance funds with 23.8% of all days of incapacity to work [4]. MSDs describe all diseases, complaints, or injuries of the musculoskeletal system, most often affecting spine and back. MSDs are among the most common causes of chronic pain, physical functional limitations, and a loss of quality of life worldwide [5]. Concurrently, employees seek medical help only when symptoms are present and when there has already been a loss in productivity or working capacity [6]. Research

suggests workplace physical activity interventions can promote health and worksite outcomes [7], but intervention acceptability and adherence need further investigation [8].

For WHP, occupational physicians (OPs) take on a special position at the workplace setting in preserving employment [9]. OPs are responsible for advising both employees and employers about occupational care, prevention, and the interplay of work and health. Based on the specific organizational conditions, OPs in Germany contribute to risk assessment, workplace inspections, monitoring, and evaluation of accidents and diseases [10]. On the one hand, their expertise and closeness to employees makes them key informants and referees for WHP and healthcare measures [11,12]. On the other hand, OPs are legally obliged to advise employers about employees' job rotation and occupational rehabilitation (§ 3 Act on Occupational Physicians, Safety Engineers, and Other Occupational Safety Specialists). Due to their expertise and key role for both individual-related and organization-related aspects, OPs could provide valuable perspectives about phenomena in employees' WHP participation and improvement thereof. However, it remains unclear how OPs perceive factors of employees' WHP participation in MSD measures.

Andersen's model of health services use can be utilized to analyze which individual and contextual factors are relevant for the use of healthcare services [13,14]. The model has been widely used for understanding and structuring results about access to and utilization of health services [15]. Modified versions have been adopted in qualitative studies to assess healthcare utilization from stakeholder perspectives other than actual users, e.g., relatives, caregivers [16–18], medical staff, service providers, and key informants [19–21]. For instance, a qualitative study similar to the present one investigated medication adherence in patients with rheumatoid arthritis by interviewing rheumatologists, and mapped discovered determinants into Andersen's model [22]. While awareness of the model has only been developing recently in Germany, it has, for example, been used to investigate predictors of outpatient care utilization [23]. We use the model as a framework for data analysis.

Regarding qualitative evidence about employees' perspectives on (non-)participation in WHP activities, time and financial constraints were mentioned as major barriers [24]. An explorative, qualitative study aimed specifically at employees' adherence to physical activity in a workplace setting [25]. It found employees' low sense of control over factors influencing their intent, lack of incentive and self-efficacy, and negative cost-benefit ratio explained employees' non-adherent behavior. In a qualitative study on managers' perceptions of employees' WHP uptake, further factors on the individual level, the WHP offer itself, and organizational factors were identified [26]. Understanding these factors can be facilitated and complemented by exploring OPs' perspectives, especially considering the lack of perspectives on organizational factors. Therefore, the present study is guided by the following question: What factors do occupational physicians perceive regarding employees' participation in a musculoskeletal health promotion measure? More specifically, this study has the objectives of 1. to explore OPs' perspectives on determinants of employees' participation in a workplace MSD measure, and 2. to indirectly explore employees' individual characteristics, behavior, and outcomes of their participation from OPs' perspectives.

1.2. Underlying RCT Study

The present explorative study is embedded within the process evaluation of a randomized controlled trial (RCT) of a musculoskeletal health promotion measure (MHPM). Implemented across 22 German companies in 2017 and tested in a four-year trial, the measure aims to counteract lacking intersectional MSD care. The business sectors comprise of steel and metal manufacturing, automotive industry, technology ventures, trade and service, administrative, and government agencies. The RCT has a multimodal needs-based intervention design focused on physical training. Employees are assigned to one of three modules comprising of early intervention (Module A), rehabilitation (Module B), or reintegration (Module C). Employees who agree to participation are randomly assigned to either assisted self-management (control group) or case management (treatment group) in a module. In the treatment group, case managers offer more work-related diagnostics and support as contact persons

to employees. Self-management represents current standard care in Germany. A more detailed description of modules and the MHPM program is provided in Supplementary File 1.

Case managers are the main responsible agents for the coordination of MHPM interfaces, recruitment, and assistance during the RCT. Findings of previous focus groups with these case managers showed randomization proved challenging for recruitment. Perceptions of the intervention's group superiority, mismatching of participants, necessity of randomization, expectations and reactions of employees, and adapted communication of case managers complicated recruitment [27]. OPs' experiences with employees' participation in the RCT were not explored yet. However, OPs play an essential role in the program. They are responsible for taking the medical history of eligible employees, checking their inclusion and exclusion criteria, informing them about modules. and assist recruitment by referring to case managers with a recommendation for a specific module.

2. Materials and Methods

A qualitative exploratory study based on an interpretive framework using semi-structured interviews was used [28]. Qualitative investigation, against quantitative investigation, was chosen since OPs' views on WHP and employees' measure participation are mostly unexplored. This methodological approach allows for an exploration of a fairly small number of individuals' experiences. Directed content analysis in combination with conventional content analysis was used for data analysis [29]. Since content analysis is a flexible method to analyze text data, it allowed triangulation of specific content analysis approaches. While data analysis originally began with a general inductive approach, researchers realized during iterative data analysis, that coding patterns resembled elements of Andersen's model of health services used [13,14]. Following a reflection and discussion of this, the research team decided on combining an inductive approach with a deductive approach, while remaining open for the contents of the data, as analysis "cannot be purely deductive or inductive" [30] (p. 205). Since the lacking state of research about OPs' views called for a conventional content analysis approach, but the theoretical state of research regarding Andersen's model allowed a directed approach, these analysis methods were combined to match the research purpose.

Furthermore, semi-structured, individual telephone interviews were chosen to give OPs greater freedom of choosing interview time and place, and to generally lower the administrative threshold for OPs' participation. Telephone interviews were considered an appropriate method due to the nationwide residence of OPs, as well as the eased reachability and administration of data gathering [31]. Individual semi-structured interviews allowed a more personal, yet systematic interaction setting, and reduce social desirability that e.g., occurs in focus groups. Additionally, telephone interviews further served to avoid recreating a face-to-face consulting situation OPs regularly have with patients, and instead create a more neutral interaction between the OP and researcher [32].

2.1. Ethical Approval

The University of Cologne's Faculty of Medicine's Ethics Commission reviewed and approved the study (project identification code: 17-171). This study adheres to COREQ guidelines for reporting qualitative research [33].

2.2. Accessing the Sample

Purposive sampling was used for the selection of participants. The selection criterium was OPs' participation in the RCT as referees for the recruitment of employees. Other selection criteria were not applied to maximize OPs' participation in this study. There was a total of 21 OPs in the trial who were all invited to attend interviews. All OPs were initially approached by e-mail and subsequently contacted by telephone. Eight out of 21 OPs agreed to participate in telephone interviews. Reasons for non-participation were as follows: 3 OPs did not want to participate, and 3 OPs did not consent to audio-recording. Further, 2 OPs were unavailable due to other obligations, 2 OPs were sick during data collection, 2 OPs could not be reached by e-mail or phone, and 1 OP was on parental leave. OPs who

were sick and unavailable at the time of initial data collection did not respond to further recruitment attempts. Interviews were conducted individually with 8 OPs in June and July 2018, 12 months after measure implementation.

2.3. Setting, Procedure and Data Collection

Data was collected using the audio-recording of telephone interviews. Interviews were conducted by the former research team member LN (sociologist, M.A.), who called OPs from the facilities of the Institute for Medical Sociology, Health Services Research, and Rehabilitation Science. The interviewer left the research team after data gathering and could therefore not be included in the study's further process. She used a semi-structured, pilot-tested interview guide developed by LL (rehabilitation scientist, M.A.), LS (health economist, M.Sc.), and KEC (psychologist, Ph.D.). All involved researchers were skilled in planning and conducting qualitative research, e.g., through prior academic studies, on-the-job-training, and professional experience. All researchers were female. The interviewer did not establish a relationship with OPs prior to the study's commencement.

Information about the interviews' purpose and process, researchers' roles as measure evaluators, anonymity, confidentiality conditions, and voluntary participation was given beforehand. Informed written consent was acquired prior to data collection. Additionally, OPs who consented filled in a short demographic questionnaire before or during interview conduction. Only the interviewer and OP were present during data collection. Using the interview guide, OPs were asked about facilitating and inhibiting factors for employees' measure participation, work organization in the MHPM, personal contact with employees about RCT recruitment, inter-professional cooperation, and OPs' overall impressions of MHPM structures and processes. OPs' questions about researchers' characteristics and involvement in the study (e.g., personal interest) were answered during interviews. Field notes were made in between and afterwards. The shortest interview lasted approximately 32 min, while the longest was 61 min. The mean duration was approximately 42 min. Interviews were transcribed verbatim by an external provider. Data was managed using MAXQDA 2018.

2.4. Conceptual Model for Data Analysis

Andersen's model postulates contextual factors, individual factors, health behavior, and outcomes as dimensions of health service use [13,14]. Three factors on the individual and contextual level influence health behavior and care utilization outcomes: Predisposing factors, enabling factors, and need. Predisposing factors comprise of demographics, social characteristics, and health beliefs, while enabling factors enhance or inhibit resources available for measure utilization, such as financing or care organization. Need comprises perception and professional evaluation of individuals' functional state, risk of illness, and need for care. Health behavior comprises of individuals' personal health practices, process of medical care, and use of personal health services. Finally, outcomes comprise of perceived health, evaluated health, and consumer satisfaction after measure utilization. The adapted categories and subcategories derived from the model in our study are presented in Figure 1.

2.5. Data Analysis

Three researchers, consisting of KS (rehabilitation scientist, M.A), LS, and LL, coded the data using MAXQDA 2018. Extensive peer-review and field notes were used to ensure intersubjectivity of results so as to counteract interviewer absence and possible bias in data analysis. Data was analyzed using a combination of conventional and directed content analysis [29]. Categories were first derived from the data and Andersen's model was later used to adapt these categories and understand their relationships within a theoretical framework. Definitions of the model's components were used as a source to map and frame discovered themes. Inductively developed categories that existed were discussed and added to the coding scheme to adapt the model's terms based on the themes in the data. Changes to the coding scheme were repeatedly discussed and reviewed within the research team.

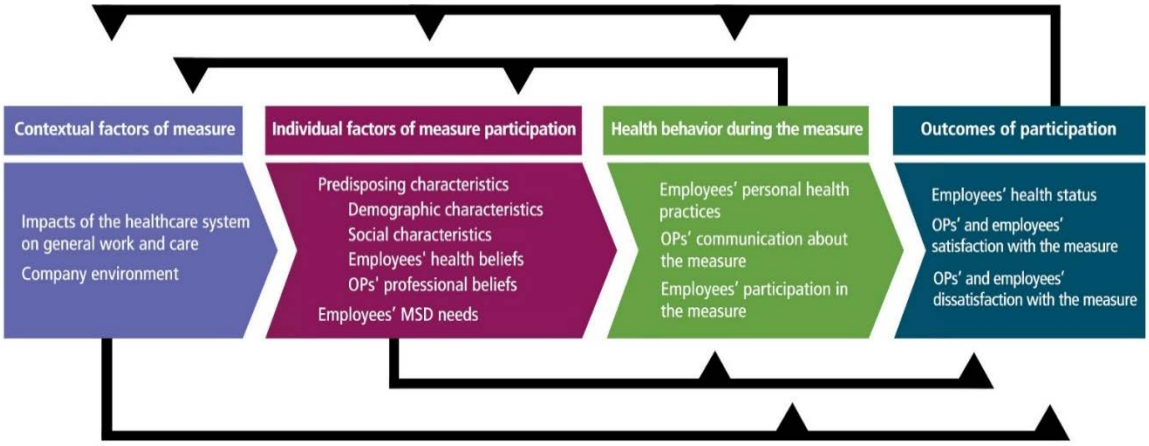

Figure 1. Developed categories based on Andersen's model of health services use. OPs: Occupational Physicians; MSD: Musculoskeletal Disorders.

Initially, one interview was coded by KS, LS, and LL in teamwork to check mutual understanding of the coding scheme and overlapping of codes. Any disagreements were solved through discussion and reflection. Afterwards, three remaining interviews were coded by KS, and two remaining interviews were coded by LS and LL each. KS repeated the coding process for all materials to ensure intersubjective agreement. KEC and HP supervised data analysis and presentation of results. All coders discussed and agreed on data interpretation. Finally, quotes representative for the findings were selected, and translated from German to English. OPs had the opportunity to comment or correct transcripts, but none provided feedback.

3. Findings

The final sample consisted of eight interviewed OPs. Interviewed OPs' age ranged from 41 to 62 and work experience as OPs ranged between 4 and 40 years. OPs' general working conditions varied depending on their business location. Five OPs worked full time and five were female. Six OPs were involved in the measure since its implementation and OPs' invested working time for the MHPM ranged between 0.5 and 4 h weekly. Six OPs concurrently served up to five business locations.

Interview guide and coding scheme are provided in Supplementary File 2. OPs reported a broad scope of factors relevant for employee participation in the measure. The analysis yielded four main categories and 10 subcategories (see Figure 1). The main categories comprised of: (a) Contextual factors of the measure, (b) individual factors of measure participation, (c) health behavior during the measure, and (d) outcomes of participation.

Data did not only comprise statements focusing the MHPM, but general contextual and individual factors outside the MHPM as well. Therefore, the categories "contextual factors" and "individual factors" rather focus on statements about general conditions relevant for MHPM participation, while the categories "health behavior" and "outcomes" focus on MHPM-specific statements. OPs did not report enabling and inhibiting factors for MHPM usage in a separate manner, but rather spoke of "scopes" and "spectrums" comprising both enabling and inhibiting factors. Thus, different from the original model [13,14], enabling resources were not added as separate categories, but were inherent in the presented categories.

3.1. Contextual Factors of the Measure

Two subcategories emerged in OPs' views on contextual factors of employees' MHPM participation. The first one addressed the impacts of the overarching national healthcare system on OPs' work and care, while the second one addressed the companies' established WHP structures and processes.

3.1.1. Impacts of the Healthcare System on General Work and Care

Few statements about the healthcare system comprised of OPs' duties stated by legal occupational care standards. OPs, especially those working part-time, reported a lack of time for the MHPM due to their legal duties and daily routine. They wished for better work schedule regulation in the Prevention Act and faster reactions of stakeholders like the statutory pension insurance.

> *The most important thing is the Occupational Safety and Health Act, and I am already busy with simple check-ups, with specific impositions, where standards must be met, and the rest falls short. I would have liked to have much more time for it [the MHPM], but I do not get to it because I do not have the time.* (P5)

Further statements comprised some MSD patients' helplessness, choice overload, and negative feelings about the healthcare system. Some OPs stated that other medical professionals "put patients off" by passing the responsibility to gather medical information onto them. *They [employees] [. . .] do not have to find out everything on their own, which is really hard in the healthcare system. [. . .] A lot of them do not gain access to aid programs through general practitioners or specialists.* (P4)

3.1.2. Company Environment

Generally, OPs reported their company's WHP system had diverse offers. WHP structures and processes, including cooperation with health insurances and external providers, were perceived as already well established.

> *The health insurance and the company itself have a very elaborate occupational health management. [. . .] I know other companies, where there is nothing at all, and people lunge at the [MHPM] project and say: 'Oh, this is great.' In our company, we say: 'Yes, this is pretty nice, too.'* (P8)

OPs perceived interconnectedness and effective physical and communication paths between professionals as especially enabling for care processes in general. Other enabling factors comprised internal marketing for the MHPM through spreading of target-oriented information by key persons (e.g., department managers, multipliers, and health insurance), advertising material (newsletters, bulletin boards, posters, and flyers), and regular meetings with managers and employees. Employees' access to WHP measures and MHPM facilities was considered better in rural or smaller-town settings due to low physical distances and more personal contacts. OPs perceived workers' council as a necessary obstacle before MHPM implementation.

3.2. Individual Factors of Measure Participation

Two subcategories emerged regarding OPs' views on individual factors of employees' MHPM participation. The first subcategory addressed predisposing characteristics comprising employees' demographic and social characteristics, health beliefs, and OPs' professional beliefs. The second subcategory comprised employees' musculoskeletal health needs assessed by OPs.

3.2.1. Predisposing Characteristics

Generally, OPs reported a broad scope of individual employee characteristics. They stated MHPM recruitment and adherence depended on employees' profession, working conditions, familial ties, education, health issues, available time, motivation, and other private reasons.

Demographic characteristics: Shift structure, fluctuation, and work overload were considered problematic in terms of ageing employees with decreasing and limited working capability. MHPM participation was perceived as easier for white-collar employees, and more difficult or impossible for blue-collar employees working shifts or working internationally. Blue-collar employees in heavy physical labor were, however, seen as the MHPM's main target group.

> *I can probably get office people to do something for their health two times a week faster than people working on the assembly line for nine hours, who are really tired in the evening [. . .]. But there are also motivated people on the assembly line who say: 'Nah, that is important to me and that is why I invest the time.'* (P1)

Social characteristics: Familial ties, e.g., being a young parent, were a prominent reason for employees' inability to participate in the MHPM. OPs saw relationships between employees both positively and negatively for MHPM participation. On the one hand, OPs thought word-of-mouth did not facilitate MHPM participation appropriately, e.g., due to differing shifts, language barriers of foreign employees, and expressed criticism of measure conditions of employees. Some OPs did not see workplace settings in smaller towns fit for a RCT. *In companies, even in large companies like ours, communication is just always there among each other. This is a small village, where somehow [. . .] everybody knows somebody, who knows somebody, who has participated in it [the MHPM]* (P1). On the other hand, participating employees informed coworkers about the MHPM, and motivated them to participate themselves.

Employees' health beliefs: This theme comprises of OPs' perspectives of a spectrum of employees' WHP attitude, temperament, health behavior willingness, and employees' WHP knowledge. OPs thought employees were generally well informed about general WHP opportunities. However, they perceived employees' knowledge about different opportunities in MSD aid, such as out-patient measures or in-patient rehabilitation, was lacking. While most employees' expectations regarding improvement of MSD after MHPM participation were realistic, some were too high and unrealistic, according to OPs. Towards OPs, some employees were open-minded, grateful, and happy about the opportunity to participate, while others were resistant, unimpressed, uncertain, and reluctant to engage. *Unfortunately, it is like that with all things in real life, whether you have overweight people, high blood pressure patients, smokers . . . If willingness does not exist, you will not seize them.* (P2)

OPs' professional beliefs: Some OPs described a fundamental attitude and personality structure inherent in their profession. OPs saw putting effort into the MHPM as a way to live up to their own standards of staying up-to-date and innovative. One OP highlighted their own duty to give a "boost of motivation" regarding the MHPM, and to generally demand health-oriented improvements in workplace structures. Some OPs were aware of a role conflict caused by the MHPM, since they wished to provide good care as OPs, but had to refer employees to recruitment at the same time.

> *There are, of course, two hearts beating within my chest, but the direction of the beat is clear. As an occupational physician, I prefer assigning someone in need of rehabilitation as soon as possible using my available options, and I do not say: 'Great, I will put them on a stockpile so they become a perfect control group.' [. . .] That is how I see it. The patient is closer to me than statistics.* (P7)

3.2.2. Employees' MSD Needs

According to OPs, there was a scope of MSD severity and needs. OPs estimated need for intervention during mandatory and optional appointments by asking about employees' general working situation, medical and personal background. *As soon as I say the words—spine, joint problems —they latch onto it immediately.* (P5)

If OPs considered employees "ready" and if OPs felt it "made sense" to participate, they suggested MHPM modules depending on the severity of employees' health status, number of sickness days, and previously taken measures. Some OPs assigned employees requiring immediate intervention to other MSD measures to prevent inability to work. Assignment to the present MHPM was not reasonable to OPs if employees did not have MSD needs, if MSD complaints and needs were too severe, or if employees currently participated in a different MSD measure.

3.3. Health Behavior during the Measure

Health behavior comprised of three subcategories consisting of OPs' views on employees' personal health practices, OPs' communication about the measure, i.e., interaction and cooperation therein, and views on employees' participation in the MHPM.

3.3.1. Employees' Personal Health Practices

Statements about employees' other personal health practices were few. Most frequently, OPs stated health-conscious employees, who already took care of their health in private, were more inclined towards MHPM participation. *We could have an excellent discussion whether it is how it always is, whether those, who are already health-conscious, participate in the measure.* (P7)

Fewer employees were reported to already have experience in regular physical exercise or rehabilitation. Another frequent statement was that some employees who were not fond of assignment to control group, revisited OPs asking for an alternative MSD measure. One OP reported some employees unwilling to proactively do something for their health preferred measures like a syringe, a pill, or a massage.

3.3.2. OPs' Communication about the Measure

OPs considered actively approaching and motivating employees to participate in the MHPM to be their main contribution. Generally, OPs gave a broad informational overview of the MHPM, then referred employees to case managers "50 meters down the hallway". Questions were mostly settled beforehand and OPs did not monitor employees continuously in the MHPM. OPs felt explaining, convincing, and motivating certain employees was challenging. Due to the study design, they could not "advertise" MHPM modules appropriately. However, most OPs reported explaining the concept in an "open and neutral" manner and did not "sugarcoat" possible control group assignment.

> *When I try motivating employees to visit the case manager, I do not necessarily make their mouths water. I do not promise them heaven and earth, but explain what these modules are all about and I emphasize they run the risk of ending up in the control group.* (P7)

If employees' expectations about health improvements were too high, OPs communicated expected outcomes in a more realistic manner. In some cases, OPs emphasized the urgency of taking a timely MSD measure, which made some employees feel pressured. The frequency of OPs' reported communication with case managers varied from two to three times a month. OPs reported there was little to no contact with other facilities' OPs regarding the MHPM.

3.3.3. Employees' Participation in the Measure

As indicated in employees' personal health practices, OPs believed the MHPM reached those particular employees, who considered doing something for their musculoskeletal system or were already doing so. *We are pretty realistic about this. We reach those who already toyed with the idea: 'Oh, I have to do something'. We do not reach the couch potatoes with this either.* (P8)

Admission rates were perceived as higher following MHPM implementation and decreased over time. OPs reported lower perceived case numbers in smaller facilities. Few employees in self-management were able to manage on their own and needed more intense professional guidance for adherence. However, OPs felt employees in rehabilitation needed the most support. Case number was considered very low for reintegration, i.e., for employees whose jobs were at risk due to severe MSDs. While overall drop-outs were perceived as low or non-existent, the number of employees unwilling to participate in the MHPM in the first place was considered higher than the number of willing employees.

3.4. Outcomes of Participation

Outcomes comprised of three subcategories consisting of OPs' views on employees' health status following MHPM participation, and OPs' and employees' satisfaction and dissatisfaction with the measure.

3.4.1. Employees' Health Status

OPs reported some employees consulting them after MHPM usage benefited in health and working performance. OPs stated those employees became attached and used to the measure, hence they maintained exercising regularly afterwards: *People often come to us and say: 'I have been in rehabilitation, it felt good and I want to continue [...]'* (P1). However, even if health status improved, OPs perceived most employees did not continue exercising afterwards. While willingness for health behavior maintenance generally existed, OPs reported that the omitted coverage of costs induced unwillingness to maintain exercising in gym facilities. Drifting away from newly learned health-promoting behavior was perceived as the "normal course" by OPs.

> *I cannot go to each machine every day and explain this to employees with weaknesses. This must get inside their heads. [. . .] This [maintenance of behavior after rehabilitation] will be very difficult to convey because, as soon as they come home, their old habits are back within a month or two and that is the problem.* (P5)

3.4.2. OPs' and Employees' Satisfaction with the Measure

Overall, OPs were satisfied with the MHPM's general conditions, such as financing, implementation, availability of information, target-orientation, internal and external cooperation, speed of administrative processes, and multi-level structure. The MHPM was considered promising, "trend-setting". Regarding cooperation, case managers were perceived as especially skilled and helpful since they "took a lot off OPs' hands", reduced administration efforts, and supported employees during the measure.

Furthermore, OPs felt a bigger freedom of action since they were able to offer a more direct, specific MSD care path. Some OPs considered the MHPM a relief of choice overload patients and practitioners encounter in healthcare. *I do not have to send them around anymore and say: 'Go to the general practitioner, go to the specialist, try some physical therapy' or something, but I can simply suggest a promising, viable way. That has changed and I find that very, very helpful* (P4). Additionally, OPs considered the MHPM an opportunity to facilitate awareness of MSDs and WHP in the company.

According to OPs, employees generally reported being satisfied, especially in treatment groups, early intervention, and rehabilitation. OPs perceived that employees liked the closeness of facilities, and the custom-tailored character of the measure. *They [employees in self-management] enjoy someone attentively looking after them now and offering them something. This is mostly positive* (P2).

3.4.3. OPs' and Employees' Dissatisfaction with the Measure

OPs reported disappointment, dissatisfaction, and sadness about low case numbers, employees' lacking maintenance of learned behavior, and stagnating enthusiasm about the MHPM in the company. They criticized the reintegration module for its negative cost-benefit ratio, and quality of rehabilitation follow-up care. Existence of control groups, especially in the reintegration module, hindered OPs in assigning employees. *This module is about whether you need to assign someone to another workplace. That is where I see the problem... what do we do with a person who enters the placebo group? I cannot leave them out in the rain* (P3). Some OPs felt the MHPM was "a step backwards" for the improvement of employee healthcare. Additionally, OPs reported uncertainty about the final "conclusion" of the MHPM. Furthermore, OPs wished for more and earlier feedback on employees' progress to be able to advertise it better. Most OPs reported they only gained knowledge about that by meeting an employee "coincidentally" later.

OPs reported employees were dissatisfied because the MHPM was time-consuming and success did not come quickly. Across all modules, potential and actual control group assignment was perceived as frustrating, demotivating, and disappointing. *They [employees] say things like: 'I went through all this stuff and now I am supposed to wait a year?' [. . .] If it [control group] befalls them, they do not find it that great. That is understandable* (P7).

4. Discussion

In this qualitative study, we investigated OPs' views on employee participation in a RCT of a musculoskeletal measure at the workplace, contextual and individual factors, and reported outcomes. Findings are discussed considering previous quantitative and qualitative research.

By mapping categories to Andersen's model, we identified employee-, occupational physician-, and organization-related determinants. Unlike other models, such as the Theory of Planned Behavior [34], the Transtheoretical Model [35], or the Health Belief Model [36], Andersen's model suited the explanation of our findings since its multilevel structure allows the incorporation of both individual and contextual determinants of WHP participation [15]. However, findings need to be considered in light of the bias this deductive approach implicates, and with sufficient skepticism due to the perspectives of OPs and researchers. Since the measure is embedded within a RCT, group assignment and RCT context need to be considered regarding the conclusions of this study.

Factors of WHP participation mentioned by OPs were complementary to factors mentioned by employees [25] or managers [26] in qualitative studies. Regarding participation in WHP measures, time and financial constraints were mentioned as major barriers by employees before [24]. Our findings underline that time and omitted financial incentives are impeding factors for participation and maintenance of health-promoting behavior from OPs' perspectives. Furthermore, a low sense of control, lack of self-efficacy, and negative cost-benefit ratio were mentioned by employees' as reasons for non-adherent behavior before [25]. Employees' uncertainty about group assignment in the present RCT and some employees' negative feelings about the healthcare system support the finding that a lack of perceived control and self-efficacy affect measure participation negatively [37]. However, findings of the category "employees' health status" imply experiencing improvement of MSD complaints may facilitate self-efficacy and maintenance of health-promoting behavior. Managers' perceptions of employees' WHP uptake in another qualitative study comprised awareness of WHP, and attitudes as individual factors [26]. The existence of a scope of employees' differing attitudes facilitating or impeding participation correspond with our findings of OPs' views. OPs in our study especially emphasized the role of previous health-promoting behavior for measure participation. Regarding awareness, some OPs perceived employees are sufficiently informed about WHP, while others perceived they are not. This rather supports findings that employees' knowledge about WHP and MSD measures needs to be facilitated on a broader scale [6]. The scope of individual characteristics reported by OPs further supports researchers' demand for target-orientation and inclusion of employees in decision-making processes in WHP [38,39].

In a different quantitative study, organizational determinants of employees' WHP participation were focused on: Strong organizational support had a positive impact, while employees' co-payment and firm size had a negative impact on participation [40]. In line with other findings, OPs' statements in our study suggest social environment and support have an essential impact on employees' perception of a measure, e.g., through encouraging or skeptical communication of colleagues or contact persons [22,26]. While physician-patient relationship did not emerge as a major theme in our study, findings on OPs' communication with employees suggest the significance of their interaction for employees' perceptions of health needs [21]. OPs' statements further implicate inter-professional communication with OPs, e.g., with rehabilitation professionals or case managers, remains insufficient in Germany [12,41,42]. Disparities in perceptions of cooperation in the present RCT underline the meaning of practical development of shared goals and cooperation in occupational healthcare settings [27,43].

Regarding firm size, OPs' disappointed expectations about admission numbers indicate that further measures are needed to increase participation in larger companies. While OPs were mostly satisfied with general organizational conditions regarding the MHPM, OPs' criticism in our study also suggests organizational conditions such as their involvement in inter-professional communication or their working conditions need to be improved for better WHP quality. Challenges reported by managers in executing WHP in another qualitative study were mostly at the organizational level as well [26]. This underlines the meaning of organizational influences on measure participation and change therein.

Lastly, few studies have investigated participant recruitment challenges in occupational health care [37]. Regarding the present RCT study design, recruitment and lacking enrollment were identified as a common problem for multicenter RCTs before [44]. Case managers as main responsible agents for MHPM coordination reported similar challenges as OPs due to group assignment and group terms [27]. Researchers should therefore consider WHP-specific contexts, OPs' roles, and employees' negative perceptions of control groups for participation in future study designs. Researchers may also use knowledge e.g., from findings of categories "company environment", "OPs' communication about the measure", and "OPs' and employees (dis-)satisfaction" to better understand how to engage OPs in the recruitment of research participants.

5. Strengths and Limitations

This study's strengths comprise of the application of Andersen's model to a WHP context and OPs' views on employee participation, where research is sparse. To the best of our knowledge, Andersen's model has not been adopted for qualitative analysis of OPs' perspectives in the context of WHP yet. Thus, present findings have value regarding their explorative character. Study limitations comprise relatively low sample size, data saturation, lacking generalizability, and transferability of findings to routine WHP. Nonetheless, basic elements for meta-themes in the data can arise as early as six interviews [45]. While implications are limited to the context of the RCT design, diverse working conditions among OPs, e.g., different business locations, constitute a strength regarding transferability of findings. This is underlined by OPs reporting about WHP and employee participation on a general level, independent of the underlying study design. While this study was conducted in Germany, there are aspects of this study that can be useful regarding OPs and WHP worldwide. Yet, this study illuminated solely OPs' perspectives. Purposive sampling was determined by OPs' involvement in the MHPM and may have caused selection bias. Hence, socially desirable answers due to OPs' employment in companies and strong interest in the topic could not be controlled. However, interviewing OPs also constitutes a study strength since employees might have been more socially biased in answers had they been asked directly. Additionally, recruiting physicians for health services research is challenging due to their lack of time and capacity [46–48]. Thus, the difficulty of accessing a sample of OPs adds further value to the study.

Higher data saturation can be achieved in future studies, preferably using face-to-face interviews, as these provide further important observational and contextual information. Due to one-time data collection, change of OPs' perceptions over time was not explored. Results of this study could, however, be compared to findings of repeat interviews.

6. Conclusions

This explorative, qualitative study illustrates OPs' perceptions about a broad range of individual and contextual factors for employees' participation in a RCT of a musculoskeletal health promotion measure. The study complements the research on Andersen's model, underlining that WHP and RCT participation is a multilayered phenomenon that is affected by employee-, physician- and organization-related determinants.

Further studies can apply sample selection criteria for OPs based on this study and investigate the topic on a broader scale, and consider OPs' statements for the development of intervention study

designs at workplace settings. Researchers may use category findings to account for barriers and facilitators for participant recruitment on a physician and organizational level when developing RCTs. Additionally, OPs, occupational health care professionals, and employees can use findings to better understand their behavior, each other, and their organization.

The findings implied there is potential for improvement in legal and organizational matters in prevention of MSDs and WHP, e.g., regarding the execution of the Prevention Act, inter-professional communication, OPs' working conditions, or target-orientation in WHP measures. Stakeholders such as company managers, authorities in social security organizations, or policy makers can use findings for the development of WHP programs that address these issues. However, further studies should investigate other stakeholders' and employees' perspectives on WHP participation to probe these implications.

Supplementary Materials: The following are available online at http://www.mdpi.com/1660-4601/17/20/7445/s1: description of RCT modules and program (supplementary file 1), interview guide, and coding scheme (supplementary file 2).

Author Contributions: L.L., L.S., H.P., and K.-E.C. contributed to study conception and design. H.P. and K.-E.C. undertook funding acquisition. L.L. and K.-E.C. undertook project administration. The paper was written and visualized by K.S. Data was analyzed and interpreted by K.S., L.S., and L.L. under guided supervision of K.-E.C and H.P. All authors have read and agreed to the published version of the manuscript.

Funding: This study is part of a larger evaluation study that was funded by the Innovation Committee of the Federal Joint Committee (G-BA), grant number: 01NVF16027. Funders reviewed and approved the initial research proposal, but had no role in the conception, interpretation or publication of the current study.

Acknowledgments: We would like to acknowledge Loretta Nophut (L.N.), who contributed to the development of the interview guide and interview conduction. We would also like to thank Thomas Moormann and Birgit Leineweber for project leading. Moreover, we would like to thank the occupational physicians, the entire network of health insurance funds and businesses involved in the program.

Conflicts of Interest: The authors declare no conflict of interest.

Abbreviations

WHP	Workplace Health Promotion
MSDs	Musculoskeletal Disorders
OPs	Occupational Physicians
RCT	Randomized Controlled Trial
MHPM	Musculoskeletal Health Promotion Measure

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International Journal of
Environmental Research and Public Health

MDPI

Article

How Managers Perceive and (Do Not) Participate in Health Promotion Measures—Results from a Cross-Sectional Mixed-Methods Survey in a Large ICT Company

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Abstract: Managers often face stress and high work demands. Yet they have received limited attention as targets of workplace health promotion measures (HPMs). This study's primary objective (1) is to examine managers' self-reported participation in HPMs and factors associated with HPM participation. The secondary objective (2) is to examine managers' perceptions of their working conditions. A cross-sectional mixed-methods online survey was conducted with a nonrandom sample of 179 managers in a large German ICT company. Stepwise logistic regression and qualitative content analysis were used for data analysis. Quantitative findings revealed that 57.9% of managers had not participated in HPMs yet. "Workload relief through digital tools" resulted as a significant predictor of managers' previous HPM participation (OR: 2.84, 95% CI: 1.42–5.66). In qualitative findings, workload, time, lack of knowledge, and lack of demand were reported as participation barriers (1). Managers reported that work facility traits, workload, social support, and corporate culture should be improved to make their working conditions more health-promoting (2). These findings suggest that providing adequate organizational working conditions may help improve managers' HPM participation rates and their perception of health-promoting work.

Keywords: manager; health promotion; participation; company; work; occupational health

Citation: Schubin, K.; Pfaff, H.; Zeike, S. How Managers Perceive and (Do Not) Participate in Health Promotion Measures—Results from a Cross-Sectional Mixed-Methods Survey in a Large ICT Company. *Int. J. Environ. Res. Public Health* **2021**, *18*, 9708. https://doi.org/10.3390/ijerph18189708

Academic Editor: Paul B. Tchounwou

Received: 13 August 2021
Accepted: 10 September 2021
Published: 15 September 2021

1. Introduction

Despite researchers' agreement that managers should be role models regarding health-promoting behavior [1], we know little about managers' participation in workplace health promotion measures (HPMs). Since the working world is changing rapidly [2–4], there is a continuous need to assess factors influencing availability of and participation in HPMs across occupational groups [5]. Managers in particular face high workload [6], (techno-) stress [4,7–9], and the challenge of leading digital transition in organizations [10–12], making them special targets for HPMs. Workplace health promotion is defined by all joint measures of employers, employees, and society aimed at improving health and wellbeing at the workplace [13,14]. While the participation rate in HPMs is a key indicator for their effectiveness, it typically amounts to only 20–40% of staff participating [15,16]. Some previous findings suggest that managers are more likely to participate in HPMs or report HPM availability more often compared to nonmanagerial employees [17–19]. Still, how managers perceive implementation of workplace health promotion [20–23] or what factors influence employees' HPM participation from managers' perspectives [24–28] has been investigated far more thoroughly than managers' own HPM participation. Hence, this study aims to add to this state of research.

Existing multilevel theories about workplace health promotion and use of health services suggest that factors on the individual, interpersonal, and organizational level influence HPM participation [29–31]. We employ Andersen's model of health service

utilization to guide our statistical regression analysis and discuss findings [31]. Andersen's model explains health care utilization using individual and contextual characteristics that predispose or enable people with health needs to seek health care measures. Predisposing characteristics, enabling resources, impeding factors, and perceived health can be used as categories to examine individual and organizational level factors associated with managers' HPM participation. Although we do not intend to validate or disprove Andersen's model, its multilevel structure helps put findings into perspective and extends previous research.

The current state of research demonstrates that contexts, measures, and target groups of HPM participation studies are highly heterogeneous. On the individual level, there are mixed findings whether employees of older age, female gender, higher educational level, and a good health status are generally more likely to participate in HPMs [15,16,18,32–35]. However, there is consistent evidence that health-oriented awareness and behavior [16,36], work demand satisfaction [32], knowledge about availability of HPMs, motivation, self-efficacy, and expected outcomes [25,36–38] affect participation positively. On the organizational level, factors such as the company's physical environment [33,39], social and cultural environment [35,37,39,40], working structures [18,24,37], the HPM design [15,36,41], fit to employees' needs and preferences [34], and financial incentives [39,42] influence participation. Consequently, both individual and organizational factors should be considered in the study of managers' HPM participation. As there is lacking understanding how organizational-level characteristics predict participation in HPMs and effectiveness of HPMs [36,39], organizational factors such as managers' working conditions should be studied more intensely.

Thus, the primary objective (1) of this study is to examine managers' self-reported participation in HPMs and factors associated with their HPM participation. The secondary objective (2) is to examine managers' perceptions of their working conditions. For this, we employ a mixed-methods exploratory survey [43]. Using a mixed-methods survey aims at enhancing both quantitative and qualitative findings. The purpose is to achieve complementarity and expansion of findings to extend the answer to the research objectives. Consequently, quantitative and qualitative findings should address components of both objective (1) and (2). While the study is quantitatively driven, the authors assign an equal status to quantitative and qualitative findings (QUAN + QUAL [44,45]). Compared to existing research, this mixed-methods study adds value by focusing on managers as a particular target group of workplace health promotion.

2. Materials and Methods

2.1. Study Context

This article is part of a larger study with two components; we focus on the second. The first study component was the outcome evaluation of a mindfulness training program for managers. The training was pilot-tested in a large German ICT company from October to December 2019. The evaluation aimed at assessing training effects on participant outcomes such as health status or mindfulness. However, we do not investigate this component in the present article. Instead, we focus on the second component: the analysis of a nonparticipation survey that was conducted in the same ICT company from November 2019 to January 2020. The purpose of the survey was to provide guidance for the company's health managers to improve the occupational health management and ICT managers' overall participation in HPMs. Managers who did not participate in the mindfulness training represented this survey's target group. Consequently, the data basis for this article consists of a restricted subsample of all managers who did not participate in the specified training. However, independent of the training, this article aims to examine these managers' general participation in HPMs (objective 1) and their health and work situation (objective 2). Thus, this article does not address nonparticipation in the specified training in particular but employs an overarching perspective on managers' general HPM participation and working conditions. The ICT company offers a wide range of HPMs such as workout in gyms, running events, or measures aiming at mindfulness and resilience. Approval for

this study was granted by the Ethics Committee of the Medical Faculty of the University of Cologne (project identification code: 19-1476).

2.2. Survey Development

The authors developed and pilot-tested a survey cooperating with three upper-level health managers in the ICT company. The survey assessed managers' perceptions of factors for (non)participation in HPMs, preferences for HPMs, and perceptions of their health and working conditions. A mixed-methods survey approach was chosen to obtain distributions of managers' characteristics, while at the same time providing managers with the opportunity to share their experiences in more depth. The survey combined Likert scales, closed questions with categorial response options, and open-ended questions. The survey did not include obligatory questions. During pilot-testing, one manager offered a slight adaptation of the wording and online layout of the survey via email. In a meeting with the authors, another manager made more explicit suggestions for questions regarding perceived working conditions and factors of (non)participation in HPMs. Overall, the pilot-testing managers considered the survey short and comprehensible. The final survey comprised 29 questions in total. Out of these, five questions were open-ended and 14 were conditional. Out of 24 closed questions, six questions offered an additional open-response item. Five questions each aimed at demographical and occupational information, health-related characteristics, and work-related characteristics. Data on HPM participation were collected with a total of 13 questions.

2.3. Sample and Data Collection

In this study, 1705 upper-level managers from a German ICT company served as the study population. Upper-level managers were defined as executives with high responsibilities leading lower-level managers. These managers were invited to participate in the survey with a company internal one-time email sent by the Human Resources Department. The email contained a link to the online survey which was administered using the web-based tool LimeSurvey (LimeSurvey GmbH, Hamburg, Germany). Data were collected from November 2019 to January 2020. Out of 239 managers accessing the survey, 179 completed the full 7-page questionnaire. Managers who did not complete the survey were excluded from the analysis sample (n = 60). Out of all excluded cases, 46 managers quit the survey immediately after accessing the landing page. The remaining 14 cases quit the survey on the following pages. Thus, 179 participants served as the analysis sample (response rate = 10.5%). The participants agreed to analysis and anonymous publication of collected data for research purposes. The data sets were not passed on to the company.

2.4. Measures

2.4.1. Sociodemographic Characteristics, Health- and Work-Related Scales

The collected sociodemographic data comprised age groups (<18 years, 18–24 years, 25–44 years, 45–64 years, and >65 years), gender (female and male), and management level (top, middle, and low) as category variables. Managerial experience (in years) was included as a continuous variable. For category variables, participants had the opportunity to choose "not specified" as a response.

Health- and work-related characteristics were measured by means of self-rated scales. Data were collected on the current subjective wellbeing, overall health status, and work intensity. Subjective wellbeing was measured using the German version of the World Health Organization Well-Being Index (WHO-5) [46]. The WHO-5 is a validated and widely used self-observation measure assessing psychological wellbeing within the last two weeks. The WHO-5 comprises five positively worded items on a six-point Likert scale, e.g., about one's mood or vitality (0 = "not present" to 5 = "constantly present"). Based on established WHO-5 cutoff scores indicating poor or high psychological wellbeing [47,48], we dichotomized subjective wellbeing to distinguish managers with poor wellbeing (WHO-

5-score $\leq$ 50) from those with high wellbeing (WHO-5-score > 50). The scale's internal consistency was Cronbach's α = 0.89.

The overall self-rated health status was measured by a five-point Likert scale with one item, based on the German Socio-Economic Panel (SOEP) [49]. Participants were asked to rate their current health status: "In general, how would you describe your current health status?" (1 = "bad" to 5 = "very good").

Lastly, a scale was used to measure work intensity. The scale was based on the Compendium of Valid Employee Key Performance Indicators (MIKE) [50]. The scale aims to evaluate the relationship between working situation and a person's health and thus identify a possible misfit of decision latitude and work intensity [51]. The scale consists of six items, e.g., "I am frequently under time pressure at work" or "I often have to complete many tasks simultaneously". Participants rated their level of agreement with each item on a four-point scale (1 = "strongly disagree" to 4 = "strongly agree"). In this study, we included an additional item ("My job is very mentally demanding") to account for the psychological aspect of mangers' work intensity in the ICT industry. The internal consistency of the resulting seven-item scale was Cronbach's α = 0.79.

2.4.2. HPM Participation and Working Conditions

A mixture of closed questions with dichotomous response options and open-ended questions aimed at exploring managers' HPM participation and perceptions of their working conditions. Managers were asked "Do your working conditions promote healthy working?" (yes, no). Regardless of the answer, managers were then presented with an open-ended question: "From your perspective, which improvements are necessary to make your working conditions more health-promoting?". Managers were also asked "Do digital tools help you in relieving your daily workload?" (yes, no), to account for the impact of ICT demands in managers' work. All managers were asked "Have you participated in HPMs before?" (yes, no) to assess previous HPM participation. If managers reported they had participated in HPMs before, they were presented with the opportunity to name up to three measures they had previously attended ("Which workplace HPMs have you attended?").

The remaining questions in the survey were conditional. Managers were presented with these questions depending on their response in a previous question. If managers specified they did not know about the initial mindfulness-based training that was currently offered in the company, managers were then asked "Do you wish to participate in HPMs more often?" (yes, no, don't know). If managers did wish to participate more in HPMs, they were asked "What keeps you from doing so currently?" (open-ended question). This was followed by the question "Which HMPs would interest you?" (category multiple response option). Managers could then choose multiple responses from "Face-to-Face workshops", "Digital measures", "Individual coaching", "Formal exchange with colleagues", "Blended learning", and "Other" (with an additional open field to specify other HPM modes). If managers specified that digital tools help relieve their daily workload, they could then name specific digital tools in the subsequent open-ended question "Which digital tools help relieve your daily work?"

2.5. Data Analysis

The analysis of quantitative and qualitative data was conducted independently. Analysis of qualitative data followed analysis of quantitative data. The findings are integrated in the discussion.

2.5.1. Quantitative Analysis

Descriptive statistics were used to report sample characteristics. Stepwise multivariate logistic regression models were used to analyze odds ratios for managers' previous HMP participation. The sequence of added variables was based on Andersen's model of health service utilization [31]. In this study, we defined health service utilization as previous participation in HPMs. Andersen's model suggests a sequence in which variables on the

individual and contextual level affect health service utilization. Variables are allocated to predisposing characteristics, enabling resources or need factors, and then included in a subsequent modelbuilding process. This approach enables identifying when an effect is explained by another effect in predicting previous participation in HPMs. In addition to an enabling resource, we added an impeding factor to the model.

The dependent variable in the regression was defined by the dichotomous response to the question "Have you participated in HPMs before?" (yes, no). Three regression models were progressively adjusted. Model 1 comprised predisposing individual characteristics (age group, gender, and management level). For the regression analysis, age was dichotomized into two groups (25–44 years and 45–64 years). Further, the management level was dichotomized (low and high) by summing the middle and lower management level to provide sufficient sample size per category. Model 2 added subjective wellbeing. Due to its high validity and established cutoff scores [48], the dichotomous variable wellbeing (WHO-5-score low vs. high) was chosen as a predictor indicating health services need. Finally, Model 3 added one enabling resource (workload relief through digital tools) and one impeding factor (work intensity). Workload relief through digital tools ("Do digital tools help you in relieving your daily workload?"; yes, no) was added as an enabling organizational factor since studies indicate that use of technology influences the perception of work intensity [52,53]. Digital work may also facilitate health if it optimizes work organization [54]. In contrast, work intensity was chosen as an impeding organizational factor for HPM participation.

Work intensity was included as a continuous variable, while all remaining included variables were dichotomous. Further variables were not included to avoid overloading the final model. Missing values were not imputed. The odds ratio (OR), corresponding 95% confidence intervals (95% CI), *p*-values, Cox–Snell pseudo-R^2, and Nagelkerke's pseudo-R^2 were estimated for all models. The statistical analysis was conducted using IBM SPSS Statistics version 27 for Windows (IBM, Armonk, NY, USA).

2.5.2. Qualitative Analysis

For qualitative analysis of open-ended answers, directed and conventional content analysis was used [55]. Content analysis allows flexible analysis of text data and a subsequent quantitative perspective on findings. First, we applied a deductive approach: We used the open-ended questions in the survey as the basis for coding and structuring analysis by deducing the main category names from these questions. More specifically, responses to the following questions were analyzed: "From your perspective, which improvements are necessary to make your working conditions more health-promoting?" (1), "What keeps you from doing so [participating in HPMs] currently?" (2), and "Which HMPs would interest you?" (3). Names and definitions for subcategories resulting from this analysis were not predetermined, but emerged from the data. One of the authors (K.S.) and a graduate student in rehabilitation sciences conducted qualitative analysis. K.S. reviewed coding and content classification. The coding scheme is available in Supplementary File Table S1. Frequencies of coded texts were converted into descriptive percentages for better interpretation [45]. Finally, example responses were chosen for each subcategory and translated into English. Qualitative data were organized using MAXQDA 2018 (VERBI Software, Berlin, Germany).

3. Results

3.1. Sociodemographic, Health-, and Work-Related Characteristics

A total of 179 managers served as the analysis sample. Due to occasional missing responses, the sample size varied depending on the available data for certain variables (between 164 and 179 full responses). Table 1 presents the sociodemographic, health-, and work-related characteristics of the sample. The majority of managers (84.3%) was 45–64 years old and male (67.1%). Respondents mostly worked in middle level management (65.2%) and had an average managerial experience of 11.94 years (SD: 6.67).

Regarding health-related characteristics, the mean subjective wellbeing of managers was 59.98 on a range of 0 to 100 (SD: 20.99). Out of these, 32.2% of managers were classified with low wellbeing (WHO-5-score $\leq$ 50) and 67.8% with high wellbeing (WHO-5-score > 50). On average, managers considered their current health status fair (Mean: 3.56; SD: 0.86, on a scale of 1 to 5). The average work intensity of managers was perceived as higher (Mean: 3.15; SD: 0.4, on a scale of 1 to 4).

Table 1. Descriptive Statistics of Managers' Sociodemographic, Health-, and Work-Related Characteristics.

Variable	*n*	Item	Distribution			%
Sociodemographic Characteristics						
Age Group (yrs)	178					100
		25–44	26			14.6
		45–64	150			84.3
		n. s.	2			1.1
Gender	173					100
		Female	57			32.9
		Male	116			67.1
Management Level	178					100
		Top	39			21.9
		Middle	116			65.2
		Low	19			10.7
		n. s.	4			2.2
	n (%)	Mean	SD	Minimum	Maximum	Median
Managerial Experience (yrs)	178 (100)	11.94	6.67	1	35	11.00
Health- and Work-Related Characteristics						
	n (%)	Mean	SD	Minimum	Maximum	Median
Wellbeing	174 (100)	59.98	20.99	0	100	64.0
Low	56 (32.2)					
High	118 (67.8)					
Health Status	175 (100)	3.56	0.86	1	5	4
Work Intensity	179 (100)	3.15	0.4	2	4	3.14

Abbreviations: yrs = Years; n. s. = Not Specified; SD = Standard Deviation. Note: Age groups "younger than 18 years", "18–24 years", and "65 years and older" were not selected by participants and are thus not presented.

3.2. Quantitative Descriptive Findings: Working Conditions and HPM Participation

More than half of managers (61.6%, *n* = 109) considered their working conditions health-promoting and thought digital tools helped relieve their daily workload (55.4%, *n* = 97, see Figure 1). Similarly, the majority of managers (57.9%, *n* = 103) had not participated in HPMs before. Managers, who were asked if they wished to participate in HPMs more often (*n* = 83), mostly affirmed that wish (66.3%, *n* = 55). The remaining managers did not know (25.3%) or declined (8.4%). Across all HPM modes, managers who wished to participate in HPMs more often preferred face-to-face workshops (68.5%), digital measures (59.3%), and individual coaching (57.3%) (multiple response option). Respondents were less interested in formal exchange with colleagues, blended learning, or other HPM modes (see Figure 2).

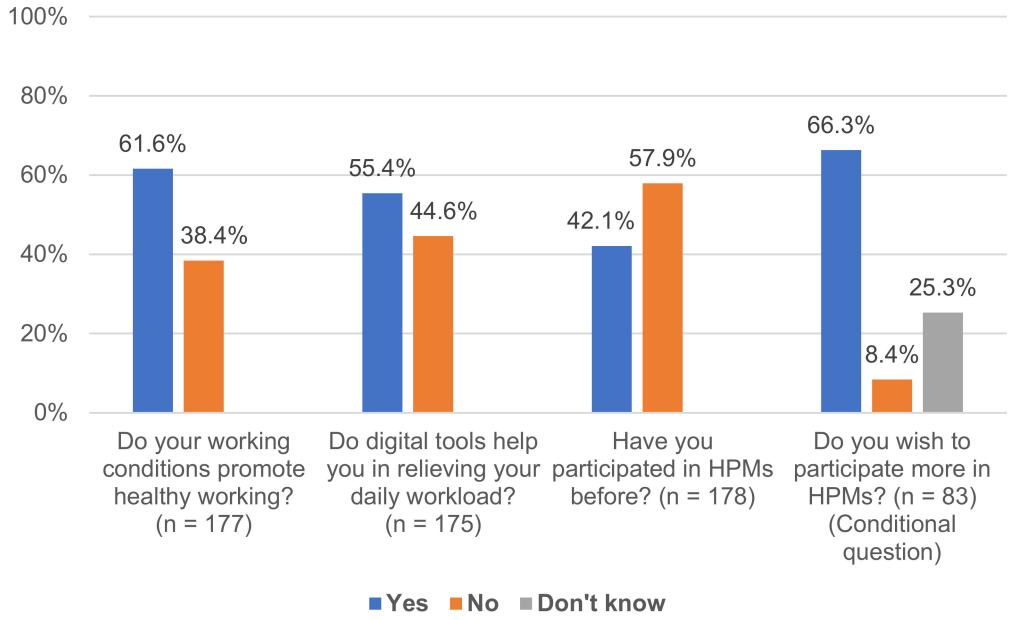

Figure 1. Frequencies of Managers' Perceived Working Conditions and HPM Participation.

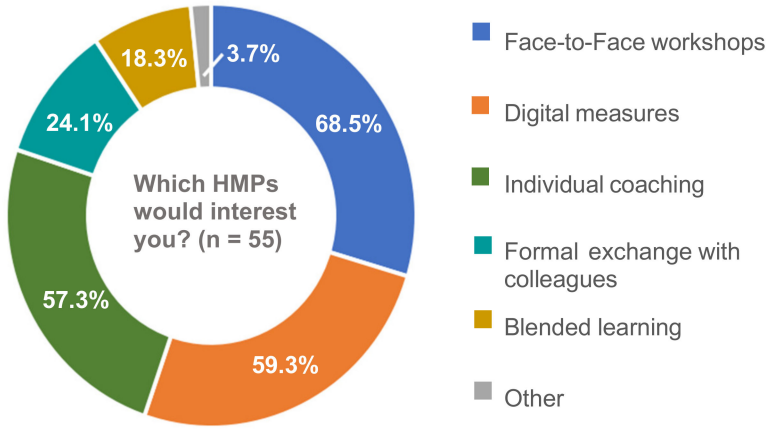

Figure 2. Frequencies of Managers' Interest in HPM Modes (conditional question, multiple response option).

3.3. Logistic Regression: Association of Individual and Organizational Variables with HPM Participation

Table 2 presents the results of the stepwise logistic regression analyses for included variables associated with managers' previous HPM participation. The overlap of complete values for all included variables resulted in an analysis sample of $n = 160$. Model 1 included age group, gender, and management level as predisposing individual characteristics. Model 2 added wellbeing (WHO-5) as an indicator for health services need. Neither model 1 nor model 2 were significant. Model 3 included "workload relief through digital tools" as an enabling resource and work intensity as an impeding factor for previous HPM participation. Model 3 was significant (Chi-Square = 13.43, $p = 0.037$). While work intensity did not show a statistically significant association, "workload relief through digital tools" showed a significant association with previous HPM participation (OR: 2.84, 95% CI: 1.42–5.66, $p = 0.003$). Hence, managers, who thought digital tools helped relieve their daily workload, had about 2.9 times higher odds of having participated in HPMs before. Regarding fit of the final model, values for Cox–Snell pseudo-R2 (0.081; Cohens f^2: 0.088) and Nagelkerke's pseudo-R^2 (0.108; Cohens f^2: 0.12) indicated a small effect [56,57].

Table 2. Progressively Adjusted Logistic Regression Models for Variables Associated with Managers' Previous HPM Participation (n = 160).

	Model 1 (Crude Model)			**Model 2**			**Model 3(Full Model)**		
Variables (n = 160)	OR	95% CI	p	OR	95% CI	p	OR	95% CI	p
Age (refcat: 45–64 yrs)	0.527	[0.206, 1.346]	0.181	0.528	[0.206, 1.348]	0.181	0.437	[0.166, 1.153]	0.094
Gender (refcat: male)	1.700	[0.859, 3.366]	0.128	1.718	[0.866, 3.411]	0.122	1.528	[0.752, 3.104]	0.241
Management level (refcat: low)	0.828	[0.378, 1.811]	0.636	0.820	[0.374, 1.797]	0.621	0.742	[0.330, 1.668]	0.471
Wellbeing (refcat: low)				1.163	[0.584, 2.313]	0.668	0.905	[0.427, 1.918]	0.794
Workload relief through digital tools (refcat: no)							2.838	[1.422, 5.661]	0.003 *
Work intensity							0.843	[0.353, 2.013]	0.700
Goodness of fit	**Model 1**			**Model 2**			**Model 3**		
Cox–Snell pseudo-R^2	0.025			0.026			0.081		
Nagelkerke's pseudo-R^2	0.034			0.035			0.108		

Note: refcat = Reference Category; yrs = Years; OR = Odds Ratio; CI = Confidence Interval; * $p < 0.05$.

3.4. Qualitative Findings: Working Conditions and HPM Participation

The qualitative analysis resulted in 410 coded text segments, three categories, and 15 subcategories. Table 3 presents categories, subcategories, frequencies of coded text segments, and response examples for open-ended questions.

Out of all participants, 113 managers (63.1%) answered the question "From your perspective, which improvements are necessary to make your working conditions more health-promoting?". This yielded 194 coded texts in the first category. The most frequently reported suggestions concerned work facilities, commute, and HPM offers (37.1%), as well as high workload and available time (32%). Leadership, teamwork, and social support made up 17.5% of managers' suggestions, while 10.3% concerned corporate culture. Only 3% of texts stated that improvements are not necessary regarding health-promoting working conditions.

Examples for the most frequently mentioned digital tools that help relieve managers' daily work included specific software such as office tools, web conference tools, instant messaging clients, and cloud systems. Fifty-five managers wished to participate in HPMs more often. Out of these, 49 managers provided a written answer to the conditional question "What keeps you from doing so [participating in HPMs] currently?".

Furthermore, out of 93 managers, who knew about the mindfulness training offered in the company, 40 managers provided written answers about reasons for nonparticipation or lacking interest in the training. These findings resulted in the category "Barriers to HPM participation", yielding 97 coded texts. The most mentioned barriers were conflicting schedules and daily workload (26%), lack of time (25%), and lack of specific information and knowledge (25%). Lacking demand and other reasons (12.4% each) were stated less frequently. In responding to the conditional question "Which workplace HPMs have you attended?", 70 managers (of 75 who had attended HPMs before) named one measure or more. This yielded 115 coded texts. Measures that were most frequently mentioned addressed resilience, mindfulness, and stress relief (31.3%). This was followed by measures addressing physical fitness and health at work (25.5%) and medical measures and occupational safety measures (20.9%). Measures for healthy leadership (12.2%) and other measures, such as coaching, were mentioned less frequently (10.5%).

Table 3. Categories, Frequencies, and Response Examples: Managers' Suggestions for Health-Promoting Working Conditions, Barriers to HPM Participation, and Previous HPM Participation.

Category	% (*n*)	Example Responses
Suggested improvements for more health-promoting working conditions	100 (194)	
Work facilities, commute, and HPM offers	37.1 (72)	Fixed workplaces; better (open-plan) office design—more quiet zones, better indoor climate, more foliage plants; less traveling; more sports and exercise offers (during working hours); significant improvement of culinary selection for healthier nutrition; water dispensers instead of coffee machines
Workload and time	32.0 (62)	High workload, too many simultaneous topics; less stress and pressure; reduction in complexity and ambiguity; clearer prioritization; conflicting schedules; less work compression on each individual; less but better prepared information; breaks and rest periods are still often considered a weakness . . . ; better work–life balance for managers, too; respect private times; no calls and mails after 6 p.m.
Leadership, teamwork, and social support	17.5 (34)	Rules for teamwork; more appreciation; more respect towards staff; positive, motivating, inspiring atmosphere—even in hard times; more face-to-face meetings and less virtual teamwork; interaction with colleagues; selfishness of individuals should be fought instead of encouraged; change in management style of some colleagues
Corporate culture	10.3 (20)	The company should develop a culture in which employee health is a real value; the human being must be emphasized in the company again; improve feedback culture; rejuvenation of the organization; more digitalization in the ENTIRE company, not only in parts; we do a lot regarding overtime compensation for employees, for managers there are no comparable compensations. In my opinion, it always comes across as somewhat strange when managers say to their manager, "But I have worked quite a lot of overtime now . . . ", that is not our corporate culture
Working conditions are ideal	3.1 (6)	Nothing. It is already ideal; I think the shortage rather lies within me, less within the employer/working conditions; There are few things to improve regarding working conditions. I should improve my mindfulness, awareness, and health orientation (taking breaks, eating, managing my energy) . . .
Barriers to HPM participation [CQ]	100 (97)	
Conflicting schedules and daily workload	25.8 (25)	Too many other things to do; scheduling conflicts; constant need to prioritize daily business and special tasks; high workload
Lack of time	24.7 (24)	TIME!; time shortage; time resources not available
Lack of specific information and knowledge	24.7 (24)	There is a lack of targeted addressing and targeted appointment offers; Appointments + offers not known, no communication about offers across locations; I did not know this existed
No perceived demand	12.4 (12)	Need not recognized
Other	12.4 (12)	I wonder, whether the real working conditions in the company allow an implementation of what has been learned; no offer at the location or in working vicinity
Previous HPM participation [CQ]	100 (115)	
Resilience, mindfulness, and stress relief	31.3 (36)	Resilience workshop; mindfulness workshop; work–life balance seminar; stress management seminar
Physical fitness and health at work	25.5 (29)	Mobile fitness coach; back training; company fitness center; company health days
Medical measures and occupational safety	20.9 (24)	Medical checkup at the workplace; vaccinations; ergonomics and safety training
Leadership	12.2 (14)	Healthy leadership; virtual leadership; leading in agile environments
Other	10.5 (12)	Personal coaching; coaching for business unit; online training

Note: % (*n*) refers to the number of coded texts. Frequencies of coded texts do not equal frequencies of quantitative cases; CQ = The category is based on a conditional question.

4. Discussion

This study's primary objective (1) was to examine managers' self-reported participation in HPMs and factors associated with their HPM participation. The secondary objective (2) was to examine managers' perceptions of their working conditions. In light of previous evidence, we will first summarize and discuss findings for objective (1) and then objective (2). Quantitative and qualitative findings will be discussed for each objective using an integrative approach by complementing findings that are consistent or conflicting. Our sample corresponds with representative gender distributions of managers in Germany [58]. However, the older age group is more predominant compared to larger managerial samples [59,60].

4.1. Managers' HPM Participation (1)

Quantitative findings revealed that 57.9% (n = 103) of managers in the sample had not participated in HPMs yet. Most managers, who had not participated in HPMs before, wished to participate more often. Despite a large range in participation levels reported in previous research, managers' HPM participation rate of 42% in this study lies slightly above the median employee participation rate of 33% that was identified in a systematic review of Robroek et al. (2009) [15]. While a systematic review does not exist for Germany, a recent representative study demonstrated that 20–30% of employees in Germany utilize workplace HPMs [16]. Thus, our findings concur with studies indicating that managers may be more likely to report and participate in available HPMs [17–19]. However, due to our restricted subsample of managers, a selection effect is likely. Interestingly, previous participation in mental health measures was mentioned most often by managers in qualitative findings. Indeed, a fairly large percentage of managers (32%) was classified with low wellbeing (WHO-5-score $\leq$ 50)—a mark that has been used in clinical studies to initiate a screening diagnosis of depression [48]. Prior studies using the WHO-5 revealed a similar yet smaller rate of 19–25% of managers having low wellbeing [61–63]. These findings could indicate a higher need for mental health measures among the occupational group of managers.

4.2. Association of Individual and Organizational Factors with Managers' HPM Participation (1)

Using regression analysis, we found that managers, who thought digital tools help relieve their daily workload, were 2.9 times more likely to have participated in HPMs before. Sociodemographic variables, wellbeing, and work intensity did not show a significant association with previous HPM participation. Qualitative findings revealed that managers reported high workload, lack of time, lack of knowledge, and lack of demand as barriers for HPM participation.

For brevity, only findings from the final regression model will be discussed. Andersen's model explains health service utilization by predisposing, enabling, and need factors at individual and contextual levels [31]. Most factors included in the regression analysis, i.e., age, gender and management level, fall into the predisposing factors on the individual level. Wellbeing was used as a need factor on the individual level. These variables were not significant in our models. The nonsignificant associations add to the conflicting evidence for whether sociodemographic variables [15,18,33,34], health status and need [15,16,31,32,35,37] influence HPM participation. Furthermore, "workload relief through digital tools" was assigned as an enabling resource and work intensity was assigned as an impeding factor on the organizational level in our final regression model. Since roughly 50% of analyzed factors of HPM participation do not reach statistical significance in studies [15], it is surprising that solely "workload relief through digital tools" displayed a significant association. This could be due to the small sample or presence of other confounders. Barriers to managers' HPM participation mentioned in qualitative findings may hint at additional impeding factors. These could be assigned to the contextual, i.e., organizational level ("workload", "lack of time", and "lack of knowledge"), and a lacking need on managers' individual level ("no perceived demand"). The qualitatively reported barriers align with prior evidence indicating that time restrictions [24,37], knowl-

edge about HPM availability [25,36,37], and fit to needs and preferences [34] influence HPM participation. Findings of the most frequent category "Suggested improvements for more health-promoting working conditions" do not address HPM participation. Following the logic of Andersen's model however, one could argue whether its subcategories (work facility traits, high workload, social support, and corporate culture) can be allocated to enabling resources or impeding factors for HPM participation on the organizational level. One particularly interesting question for future studies is the role of superiors' social support for managers' HPM participation, as managers hold a special position between their own superiors and employees. This requires further exploration and testing.

4.3. Managers' Working Conditions (2)

Quantitative findings revealed that 61.6% of managers (n = 109) considered their work health-promoting. The average work intensity of managers in our sample was high (3.15 on a four-point scale). In qualitative findings, managers reported that work facility traits, high workload, social support, and corporate culture should be improved to make their working conditions more health-promoting.

Based on the quantitative findings, one could argue most managers in the sample may perceive their work as health-promoting while having high work demands [6]. Future studies could investigate whether managers generally consider their work more health-promoting compared to other occupational groups. Still, the qualitative findings provide indications for possible improvements of managers' working conditions in the ICT sector, such as work facility traits, working structure, and the social and cultural environment. One particularly interesting finding is managers' ICT exposure. Criticism of workload and information overload was prominent in the subcategory "workload and time". Additionally, 45% of managers denied that digital tools help relieve their daily workload. These findings may strengthen evidence that managers have higher odds of exposure to ICT demands [8] and choice overload [62]. The association of workload and use of digital work media might be a relevant dimension for improving healthy working conditions for managers in particular.

5. Strengths and Limitations

There are various limitations to this study that need to be acknowledged when interpreting the findings. This study used a cross-sectional design and thus cannot represent longitudinal causal relationships of variables. Explanatory power and validity of the non-complex statistical regression are restricted to self-reported variables and the restricted subsample. Data saturation is limited due to the sample size and use of conditional questions in the survey. Reminders (e.g., according to Dillman [64]) may have enhanced the response rate (10.5%), though participation in workplace surveys is generally moderate or low [65]. Furthermore, managers' HPM participation was addressed within their general perceived past and selection bias likely created an overestimation of the participation rate. For future studies, using probability sampling is recommended to decrease bias and increase the representativeness of samples. We face the risk of confounding, as further possibly relevant variables were not included in regression analyses. Nonetheless, this study adds value by contributing to the scarcely investigated HPM participation of managers. One particular strength of the study is the mixed-methods survey approach, consolidating the comprehensiveness of findings by supplementing qualitative and quantitative findings. The dependence on secondary data and the strong impact of the population and the study context on variable associations should be taken into account [66]. As this study was quantitatively driven, future mixed-methods studies should emphasize qualitative data gathering and qualitative analysis informed by theoretical constructs of HPM participation to enhance the logical reasoning of findings. While the study was conducted in just one ICT company and the generalizability of the findings may be limited, the investigated company is fairly large and managers were located at a variety of departments across Germany.

Future studies are advised using larger samples including various organizations, more validated measures, and longitudinal designs for these purposes.

6. Conclusions

Our mixed-methods study provides insights into managers' participation in workplace health promotion measures and perceptions of their working conditions. Managers, who thought digital tools help relieve their daily workload, were more likely to have participated in HPMs. Workload, time, lack of knowledge, and demand were reported as participation barriers. Furthermore, managers reported that work facility traits, workload, social support, and corporate culture should be improved to make their working conditions more health-promoting. Though future studies need to confirm these findings, this study provides starting points to improve managers' work environment and participation in health promotion measures. Given their impact as role models, it is important to assess whether occupational health management and health promotion measures reach managers adequately. In light of digitalization and remote work, researchers and corporate health professionals are prompted to pay closer attention to managers' working conditions to suit this particular target group in future health promotion measures.

Supplementary Materials: The following are available online at https://www.mdpi.com/article/10.3390/ijerph18189708/s1, Table S1: Coding Scheme: Suggestions for Health-Promoting Working Conditions, Barriers to HPM Participation, and Previous HPM Participation.

Author Contributions: Conceptualization, K.S., S.Z. and H.P.; methodology, K.S., S.Z. and H.P.; formal analysis, K.S.; investigation, K.S. and S.Z.; resources, H.P.; data curation, K.S. and S.Z.; writing—original draft preparation, K.S.; writing—review and editing, K.S., S.Z. and H.P.; visualization, K.S.; supervision, S.Z. and H.P.; project administration, S.Z. All authors have read and agreed to the published version of the manuscript.

Funding: The work was supported by two cooperating project partners: a German health insurance and a German ICT company. For data protection reasons, the funders wish to remain anonymous.

Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Ethics Committee of the Medical Faculty of the University of Cologne (project identification code: 19-1476, approved 31 October 2019).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The datasets generated and/or analyzed during the current study are not publicly available as they contain sensitive data that belong to the ICT company. Quantitative data are available in anonymized form on reasonable request.

Conflicts of Interest: The authors declare no conflict of interest. Three corporate health managers in the ICT company gave advice during pilot-testing of the survey. The Human Resources Department of the company sent the company internal email inviting participants to the online survey. Otherwise, the funders had no role in the design of the study, the collection, analyses, or interpretation of the data, in the writing of the manuscript, or in the decision to publish the results.

Abbreviations

HPMs	Health Promotion Measures
ICT	Information and Communication Technologies

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PUBLISHED 20 April 2023
DOI 10.3389/fpsyg.2023.994959

OPEN ACCESS

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SPECIALTY SECTION
This article was submitted to Positive Psychology, a section of the journal Frontiers in Psychology

RECEIVED 15 July 2022
ACCEPTED 20 February 2023
PUBLISHED 20 April 2023

CITATION
Schubin K, Seinsche L, Pfaff H and Zeike S (2023) A workplace mindfulness training program may affect mindfulness, well-being, health literacy and work performance of upper-level ICT-managers: An exploratory study in times of the COVID-19 pandemic. *Front. Psychol.* 14:994959. doi: 10.3389/fpsyg.2023.994959

A workplace mindfulness training program may affect mindfulness, well-being, health literacy and work performance of upper-level ICT-managers: An exploratory study in times of the COVID-19 pandemic

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Introduction: Mindfulness-based interventions have gained more importance in workplace health promotion due to increased psychological distress in the digital era. Although managers in the information communication technology sector (ICT)-sector are at risk for lower mental health, few studies have evaluated the effects of workplace mindfulness trainings (WMT) on upper-level ICT-managers.

Methods: By applying a mixed methods approach, the study aimed at exploring differences in upper-level ICT-managers' mindfulness, well-being, health literacy and work performance at the beginning of a WMT (*t*0), immediately after (*t*1) and 3 months after (*t*2) a WMT. Thirteen groups of managers (n=56) completed the training and three corresponding surveys consecutively from October 2019 to April 2021. Managers rated their mindfulness (MAAS), well-being (WHO-5), health literacy, and work performance (HPQ). During the COVID-19-pandemic the training switched from a live on-site mode to a hybrid mode and finally to a digital mode. Repeated measures ANOVAs and Bonferroni-adjusted *post hoc* analyses were used for data analysis. Open-ended responses were content analyzed.

Results: We found significant differences in managers' mindfulness [$F(2.106)=3.376$, $p=0.038$, $\eta_p^2=0.06$, $n=54$], well-being [$F(2.106)=73.019$, $p<0.001$, $\eta_p^2=0.17$, $n=54$], health literacy [$F(2.108)=9.067$, $p<0.001$, $\eta_p^2=0.15$, $n=55$], and work performance [$F(2.80)=7.008$, $p=0.002$, $\eta_p^2=0.15$, $n=41$] between *t*0 and *t*2. Significant differences between *t*0 and *t*1 were also found for well-being, health literacy and work performance, but not for mindfulness. Qualitative findings demonstrated positive training effects, barriers and facilitators to daily application of mindfulness practice.

Discussion: The results suggest that compared to the beginning of the WMT, the post and follow-up measurements showed outcome improvements. The workplace mindfulness training may thus be a promising program to facilitate mental health and working capabilities among upper-level ICT-managers. Contextual workplace factors need to be considered to sustain long-term mindfulness practice of managers.

KEYWORDS

mindfulness, manager, training, workplace, intervention, well-being, health literacy, work performance

1. Introduction

As the working world is changing rapidly, managers have to operate in workplace settings that are becoming increasingly volatile, uncertain, complex, and ambiguous (Rodriguez and Rodriguez, 2015). Even before the COVID-19 pandemic, managers were confronted with (techno-)stress (Harms et al., 2017; Stadin et al., 2021), high workload (Eurofound, 2017), and with leading the so-called digital transition in companies (Westerman et al., 2015). Such work-related stress factors pose a risk for both the physical and mental health (Sohail and Rehmann, 2015; Hirschle and Gondim, 2020). This constitutes a call for action: As the workplace is an important setting to promote health among a broad worker population, workplace health promotion measures can be useful to facilitate managers' mental health resources and support them in their occupational challenges.

Mindfulness in particular may be an effective leader self-development approach to develop capabilities that managers require to handle challenges, people, and change successfully (Hougaard and Carter, 2018; Urrila, 2021). We define a manager as a person holding a managerial or leadership position in a company leading their direct reports (Urrila, 2021). Furthermore, we define upper-level managers as persons in these positions who have high responsibilities and lead lower-level managers. Mindfulness describes a trait, a state, a set of mind-training practices and a multidimensional set of cognitive skills that can be enhanced with practice (Baer and Lykins, 2011). Kabat-Zinn (2003) defines mindfulness as "the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment." Mindfulness interventions typically originate from Buddhist meditation practices (Kabat-Zinn, 2003) and employ a combination of practices such as meditation, psychoeducation, and experiential group training (Kersemaekers et al., 2018). For managers as a specific target group, prior studies suggest mindfulness improves their personal well-being, work performance and leadership quality (Roche et al., 2014; King and Haar, 2017; Urrila, 2021). Furthermore, studies indicate leader mindfulness also benefits their employees, e.g., through improved well-being, job satisfaction, work performance and improvements on an interpersonal level (Verdorfer, 2016; Arendt et al., 2019; Reb et al., 2019; Schuh et al., 2019). On the one hand, mindfulness may improve managers' capabilities that are not defined as leadership capabilities *per se*, but that nonetheless promote better leadership. Examples include better regulations of managers' emotions and attention (Hülsheger et al., 2013; Dietl and Reb, 2021), better decision-making and problem-solving (Butler and Gray, 2006). On the other hand, mindfulness may improve leadership-specific capabilities such as leading in complex work environments (Reitz et al., 2020), handling change (Goldman-Schuyler et al., 2017) or 'post-conventional' leadership (Baron and Cayer, 2011). In light of the demands of the modern working world, strengthening their own health and capability to perform is essential for managers. In the ICT sector, managers may be particularly exposed to higher ICT demands and an ever-changing work environment (Zeike et al., 2019; Stadin et al., 2021). Thus, facilitating mindfulness of ICT-managers may be particularly important to promote their personal well-being and capabilities.

Despite sound clinical evidence and a growing amount of research on the role of mindfulness in workplace settings, exploring mindfulness in management settings is relatively new (Donaldson-Feilder et al., 2019; Urrila, 2021). So far, there is good evidence that mindfulness-based interventions positively affect mental health and well-being outcomes across various occupational settings. Two meta-analyses of randomized controlled trials demonstrated that workplace mindfulness interventions effectively diminish negative outcomes such as stress, depression, burnout, mental distress, and somatic complaints while promoting positive outcomes such as mindfulness, well-being, compassion, job performance and job satisfaction (Lomas et al., 2019; Vonderlin et al., 2020). For managers in particular, two systematic reviews concluded that mindfulness interventions have the potential to increase managers' well-being, resilience, and leadership capabilities (Donaldson-Feilder et al., 2019; Urrila, 2021). While the quality and nature of the analyzed interventions varied, advancing the development of leaders through leader-tailored mindfulness trainings was encouraged. Particularly, more follow-up assessments of mindfulness trainings and examinations of work performance effects should be conducted (Vonderlin et al., 2020).

This study's primary objective is to investigate differences in upper-level managers' mental health-related outcomes and work performance at the beginning of ($t0$), immediately after ($t1$) and 3 months after ($t2$) a workplace mindfulness training in a German ICT-company. More specifically, we explore differences in managers' trait mindfulness, psychological well-being, health literacy, and work performance using self-reported measures in an exploratory one-group pre-post design. Furthermore, we explore workplace barriers and facilitators of long-term mindfulness practice and further potential explanation of the training's effectiveness by embedding qualitative analysis of managers' open-ended answers. Considering that mindfulness interventions in corporate and management settings are still few, this study can add value by contributing knowledge about the efficacy of a mindfulness training for upper-level managers in an ICT-company setting.

2. Theoretical background

Considering the sound evidence for mental health and well-being benefits of mindfulness interventions, we employ a resource-oriented theoretical approach: We assume a direct relation of organizational and personal resources promoted during the training with an increase in managers' capacities to cope with demands of their personal health and workplace challenges. First, underlying theoretical principles of the training that were specified by the training provider are described. These principles are not empirically investigated in this study, but are described to make the training approaches more understandable. Second, we apply the Job Demands-Resources (JD-R) model to elaborate on the theoretical background for the expected increase in outcome variables.

2.1. Training goals and underlying principles

The training 'Healthy and Mindful Leadership' was developed and conducted by an external training provider. Accordingly, the training program had three main goals: (1) promoting managers' understanding as to why strengthening health literacy is necessary in light of the

digitalized working; (2) strengthening managers in their function as role models for employees; (3) strengthening managers in their function as health literacy promoters for employees. Mindfulness was a key element within the program. More specifically, establishing mindfulness practice and strengthening mindfulness was considered fundamental for managers' health literacy, stress management, work performance and health. Aside from mindfulness, another means of achieving the goals was imparting knowledge about the impacts of digitalized work and promoting mindful handling of digital work media.

The providers' rationale for the training program was based on the health-oriented leadership (HoL)-concept of Franke et al. (2014) and the immunity-to-change approach of Kegan and Lahey (2009). Based on the HoL-concept, 'healthy leadership' is a way of leading in which the manager not only focuses on work performance, but also on promoting their own and employees' health ('self-care' and 'staff-care'). More specifically, managers' self-care comprises (1) the value the manager attributes to their own health, (2) the level of mindfulness enabling managers to notice when they demand too much of themselves, and (3) the conscious behavior and actions that promote health (Franke et al., 2014).

Mindfulness as a meta-competency is an essential key to healthy leadership, as understood by the training provider. The 'immunity to change'-approach of Kegan and Lahey (2009) was used as an additional training principle. Accordingly, the provider assumes that mindfulness facilitates 'personal transformation and creative skills'. More specifically, habituated reactive behavior should be transformed into new, creative behavior to enable healthy leadership and health promotion. The presumption is that mindfulness and self-awareness help with promoting creative behavior. The training provider took up four steps of behavior transformation (Kegan and Lahey, 2009): (1) from reactive unhealthy behavior that the manager is *un*aware of, (2) toward reactive unhealthy behavior that the manager is *aware* of, (3) toward new creative behavior that is only achievable with a high level of awareness and willpower, (4) toward creative behavior that is achievable with a lower level of awareness after the new behavior became a habit. The training provider assumed that entrenched behavior can be noticed, consciously stopped in the moment and be replaced by new behavior through mindfulness and increased self-awareness.

2.2. Job demands-resources model

The Job Demands-Resources (JD-R) model by Bakker and Demerouti (2007) is a framework explaining how work-related factors can influence employee well-being, health, and performance. Accordingly, the impacts of work-related factors are explained through two different mechanisms (Bakker et al., 2004): First, a motivational process based on the effect of job resources can help explain outcomes such as work performance. Second, a health impairment process caused by job demands can describe resulting health outcomes such as exhaustion. On the one hand, job characteristics are classified as job demands, which are "physical, social or organizational aspects of the job that require sustained physical or mental effort and are therefore associated with physiological and psychological costs" (Demerouti et al., 2001). On the other hand, job resources "help reach work-related goals, reduce job demands and the associated costs, and stimulate personal growth and development" (Tummers and Bakker, 2021). Job resources enhance efficient coping with work demands and are thus able to weaken the link between job demands and serious health outcomes (Xanthopoulou et al., 2009; Lesener et al., 2019). Aside from organizational job resources, personal resources complete the JD-R model. These personal resources (e.g., resiliency, optimism, and self-efficacy) function as motivators for employees to reach their goals and influence the ability to make use of job resources (Bakker and de Vries, 2021).

A combination of low job resources and high job demands may lead to burnout. Hence, organizations should optimize job characteristics through increasing job resources and improving job demands. Furthermore, Bakker and de Vries (2021) suggest that organizational resources such as healthy leadership and personal resources may support employees in regulating their job strain in an effective way. For example, an organization can provide a training for managers to enhance their personal resources by developing new skills and enable them to cope with job demands (Bakker and Demerouti, 2007). In the context of JD-R theory, leadership can impact job demands, job resources and personal resources in different ways (Tummers and Bakker, 2021). Accordingly, there is an indirect link between leadership and job outcomes *via* job demands and job resources (Schaufeli, 2015). For example, leaders can prioritize work tasks, when employees experience high workload or they may increase job resources by giving employees more autonomy.

We view mindfulness as a personal resource of managers (Grover et al., 2017) and well-being as an outcome of the motivational process according to the JD-R model. Taking previous findings on the impact of mindfulness training on these outcomes into account, we hypothesize:

> *Hypothesis 1a* (H1a): The mindfulness training significantly increases managers' self-reported level of mindfulness from baseline (t0) to post-intervention (t1).
>
> *Hypothesis 1b* (H1b): The mindfulness training significantly increases managers' self-reported level of mindfulness from baseline (t0) to 3-months follow-up (t2).
>
> *Hypothesis 2a* (H2a): The mindfulness training significantly increases managers' self-reported level of well-being from baseline (t0) to post-intervention (t1).
>
> *Hypothesis 2b* (H2b): The mindfulness training significantly increases managers' self-reported level of well-being from baseline (t0) to 3-months follow-up (t2).

Furthermore, we argue that health literacy is a personal resource similar to mindfulness that can support managers in dealing with job strain in an efficient manner (Fiedler et al., 2018). Health literacy can be defined as "the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health" (Nutbeam, 1998). For managers, health literacy can be considered an important construct due to its' substantial contribution to well-being and the workplace as a valuable setting for its' promotion. We argue that if managers know their own limits regarding their health, they can develop healthy and sustainable coping mechanisms that will prevent exhaustion. Since managers are subject to ICT demands, the mindfulness training might promote managers' health literacy through

becoming aware their own behavior and acquiring knowledge about impacts of digitalized work on health. We hypothesize:

> *Hypothesis 3a* (H3a): The mindfulness training significantly increases managers' level of self-reported health literacy from baseline (t0) to post-intervention (t1).
>
> *Hypothesis 3b* (H3b): The mindfulness training significantly increases managers' level of self-reported health literacy from baseline (t0) to 3-months follow-up (t2).

Lastly, work performance can be regarded as another outcome of the motivational process according to the JD-R model. Accordingly, mindfulness practice can be considered a means to strengthen and manage personal resources better, such as well-being and health literacy, that ultimately affect work performance. Prior research suggests mindfulness affects managers' work performance positively (Shonin et al., 2014; King and Haar, 2017). Assuming that mindfulness practice is a personal resource affecting managers' perceived work performance, we hypothesize:

> *Hypothesis 4a* (H4a): The mindfulness training significantly increases managers' level of self-reported work performance from baseline (t0) to post-intervention (t1).
>
> *Hypothesis 4b* (H4b): The mindfulness training significantly increases managers' level of self-reported work performance from baseline (t0) to 3-months follow-up (t2).

Finally, we assume that the effectiveness of health promotion measures depends on their contextuality which requires exploration (Craig et al., 2018). Contextual aspects in specific industries, such as workplace challenges of upper-level ICT-managers, might affect an intervention's acceptability and outcome scores, requiring an intervention and evaluation tailored to the targeted group and environment (Glomb et al., 2011; Sutcliffe et al., 2016). Case studies can help explain contextual factors under which participants act and can answer questions of "how" and "why" managers choose to practice mindfulness or not (Yin, 2003). A qualitative approach is useful for investigating the reasons behind certain behavior, beliefs and attitudes of people and providing comprehensive results (Patton, 2002). Thus, qualitative insights can substantiate the quantitative results in this study. This approach adds value by identifying managers' daily life experiences and actual application of mindfulness trainings at the workplace. By embedding a qualitative approach, we strive to gain more knowledge about two explorative questions regarding the contextual factors and effectiveness of the intervention:

(1) What barriers and facilitators in the workplace regarding a sustainable mindfulness practice do managers experience?
(2) What other possible effects are reported following the training?

3. Materials and methods

3.1. Sample and procedure

A mixed-methods approach with a quantitative one-group pre-post design embedding subsequent qualitative analyses was used for this study (Schoonenboom and Johnson, 2017). Outcome measures at the beginning of a workplace mindfulness training (*t*0), immediately after the last half-day group session (*t*1) and 3 months after (*t*2) the mindfulness training were compared. All upper-level managers (approximately 1800) in a large German ICT-company were invited to participate. Participation was limited to a maximum of 12 participants per group with a total of 13 available groups, resulting in 156 managers who were admitted to the training. Thus, not all managers who registered for the training could be admitted. The trainings were conducted in consecutive groups. Participants were recruited using announcements on the company intranet website and announcements of upper-level health managers in executive committee meetings. The managers were told they could participate in a free 2-months mindfulness training during working hours. Participation in the training and in the self-report surveys was voluntary. The authors developed the survey cooperating with three coaches who conducted the training and three upper-level health managers in the ICT-company. The survey included Likert scales (for the outcomes mindfulness, well-being, and health literacy), closed questions with categorial response options, and open-ended questions. Work performance as an outcome was collected using one item. Mandatory questions were not included. Responses to open-ended questions were used for qualitative content analysis. Open-ended questions addressed (1) workplace barriers and (2) workplace facilitators for daily mindfulness practice, (3) positive effects of the training, 4) suggested changes of workplace conditions, and (5) open feedback. The open-ended questions are provided in Supplementary material S1.

Training participants were invited to complete the surveys at the beginning of the training (t0), immediately after the last half-day group session (*t*1) and 3 months after (*t*2) the training. At the start of the study, the surveys were administered both paper-pencil-based (*t*1) and online (*t*0, *t*2) using the web tool LimeSurvey (LimeSurvey GmbH, Hamburg, Germany). After the training switched to a fully digital mode in October 2020, all following surveys (*t*0, *t*1, *t*2) were administered online. Data was collected pseudonymously and matched between time points using a personal code stated by the participant. Aside from the free mindfulness training, no other incentives were offered to the participants. Finally, the training and surveys were conducted consecutively with 13 groups of managers between October 2019 and April 2021. A total of 56 managers (36% of all registered managers) finished the training and all three surveys. Using *t*0 data, mean differences on outcome variables and differences in the distribution of demographics were examined between participants who dropped out after the *t*0 survey and participants who engaged in all surveys (*t*0, *t*1, *t*2). Independent *t*-tests (for continuous variables) and fisher's exact tests (for remaining demographics) showed no significant differences between the drop-outs ($n = 54$) and completers ($n = 56$). For further quantitative analyses, we decided against using or imputing data of drop-outs due to the large proportion of missing data on outcome variables (>40% for *t*1 and *t*2) (Jakobsen et al., 2017). Thus, for quantitative analyses, we used complete cases only. For qualitative analyses, we used all available open responses (including drop-outs) to enrich findings. Due to the COVID-19 pandemic, the group sessions described in the next section first switched to a hybrid mode (one live and one digital session) in September 2020 and finally to an entirely digital mode in October 2020. Thus, seven groups ($n = 33$) participated in the live on-site training mode, two groups participated in the hybrid mode ($n = 10$)

and four groups ($n = 13$) participated in the digital mode of the group sessions.

3.2. Intervention: "Healthy and mindful leadership" training

The training followed four steps: (1) Raising self-awareness, (2) raising awareness of healthy leadership, (3) self-management through mindfulness, and (4) planning and taking actions. The steps were realized using individual 30 min-coaching sessions *via* video calls, independent practice, and group training sessions (either live on-site, hybrid or digital). Refer to Figure 1 for the outline of the training program. The training was conducted by three coaches who had 10 or more years of experience in coaching and teaching in the field of mindfulness and leadership in international companies. The first step of the training program started with raising self-awareness (1). The program began with a kick-off-coaching between each manager and one of the coaches to clarify aims, benefits, procedures and expectations of the training. In the coaching, managers were instructed to self-monitor their health behavior and digital behavior for 7 days without judging it. This self-observation phase aimed at helping managers become aware of and consciously perceiving their present reactive behavior patterns. The managers and coaches analyzed these observations in a subsequent individual coaching session to facilitate self-awareness and understanding of the manager's current situation. Participants were also given a physical and digital textbook with an overview and background information of the training program.

Afterwards, 1.5-days group sessions were conducted in which managers were sensitized for the subjects of health, impacts of digitalization, self-management, and managers' own function as role models. This corresponds with step (2) of the training program: raising awareness of healthy leadership. In the sessions, this included providing information about the increase in sickness absences due to mental disorders, the demands of the digitalization of the working world as both a change and a risk for health, digital stress, managers function as role models in workplace health promotion and the importance of leading oneself and others in a healthy and mindful way. Furthermore, information was provided about the benefit for managers and the scientific evidence about the impact of mindfulness-based breathing and meditation on well-being and performance. Additionally, tools to cope with the impact of digital work, such as information overload, multitasking, and work interruptions, were suggested. This included structuring the working day in a more effective and healthy way and reducing self-interruptions by practicing mindfulness.

The experiential group sessions focused on learning and applying such mindfulness and breathing exercises to help managers establish new behavior. Applying the knowledge and the learned exercises in everyday life afterwards corresponds with step (3) of the training program: self-management through mindfulness. By using the knowledge and mindfulness exercises as tools, managers are supposed to manage their resources better, facilitate calmness and composure, and thus be enabled to lead themselves better in everyday life. In the subsequent '21-days challenge,' participants were tasked with implementing new behavior in their everyday life based on the exercises of the 1.5-days group session and their own behavioral goals. This corresponds with step (4) of the training program: planning and taking actions. For this, managers were instructed to develop an individual action plan for behavioral change in the 1.5-days group session by answering the questions: 'What will I do? How and why will I do it? What challenges will I face and how will I master them?' Based on the immunity-to-change approach, managers were taught about challenges of behavior change and provided with tips for establishing new behavior. Here, practicing mindfulness aimed at becoming aware of implicit convictions and thinking patterns keeping the manager from establishing behavioral change. The aim of the '21-days-challenge' was that new, creative behavior, that was initially used consciously, becomes unconscious behavior and a natural part of

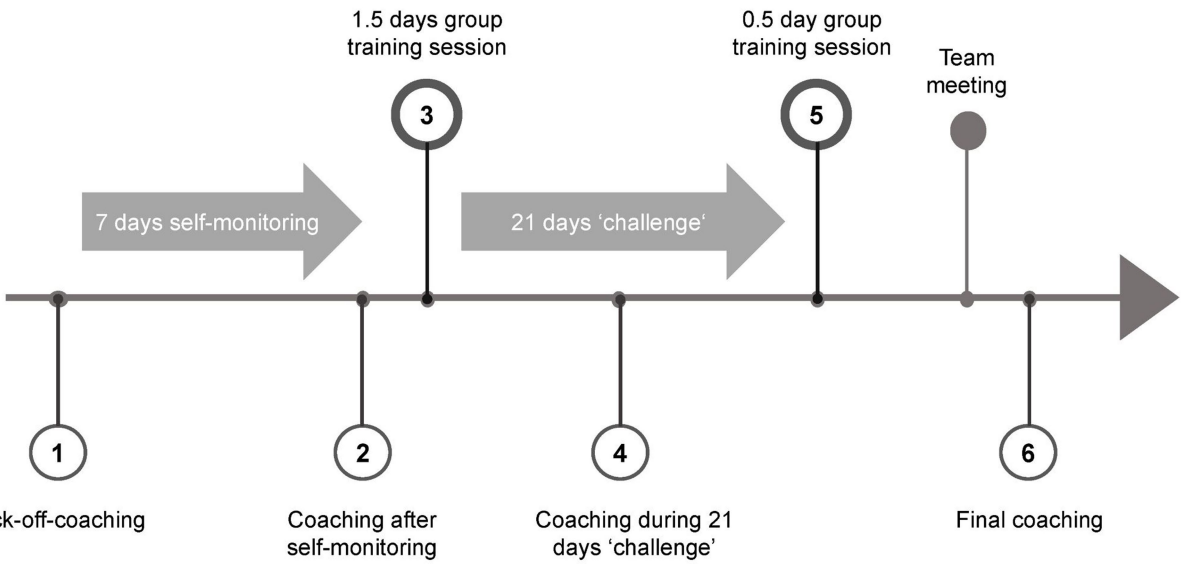

FIGURE 1
Outline of the mindfulness training program.

everyday life in the long term. This 'challenge' was supported by a web app and a peer coaching partnership with a colleague from the same group to support implementation of the acquired knowledge and mindfulness practice into everyday life. The web app comprised audio and video tutorials for mindfulness practices learned in the group session, further mindfulness practices, documents from the group session, a self-monitoring diary and a tracking tool for the '21-days challenge.' Additionally, the coaches conducted a third coaching session with each manager during the first half of the challenge. The purpose of the coaching was helping managers detect and overcome obstacles in the challenge and supporting them in reaching their behavioral goals. In subsequent half-day group training sessions, managers analyzed their personal accomplishments and obstacles during the challenge, refreshed their knowledge of mindfulness and breathing exercises, and decided on further behavioral goals and actions. Afterwards, the managers prepared a team meeting with their direct reports to transfer the acquired knowledge and exercises to their team. This corresponds with step (4) of the training program, planning and taking actions, to promote the role of the manager as a disseminator of knowledge and encourage the manager to actively promote health in their team. Finally, a last coaching session was conducted to analyze each manager's perception of their development in well-being, work performance and health, and to support further plans of behavioral changes.

3.3. Measures

3.3.1. Mindfulness

The German version of the Mindfulness Attention Awareness Scale (MAAS, Brown and Ryan, 2003; Michalak et al., 2008) was used for measuring trait mindfulness. The MAAS measures the frequency of mindfulness states or, more specifically, the awareness of and attention to what is happening in the present. All 15 items are phrased negatively (e.g., "I find it difficult to stay focused on what's happening in the present" or "I rush through activities without being really attentive to them"). Response options ranged from 1 (almost always) to 6 (almost never). Higher values indicate higher levels of mindfulness. The MAAS showed high internal consistency rates (Michalak et al., 2008; Osman et al., 2016). Internal consistency in our sample was Cronbach's $\alpha = 0.9$ ($t2$).

3.3.2. Well-being

The German version of the World Health Organization Well-Being Index (WHO-5) was used for measuring psychological well-being [World Health Organization (WHO), 1998]. The WHO-5 is a positively phrased 5-item measure assessing psychological well-being within the last 2 weeks. Participants are asked how often they felt cheerful, relaxed, active, well-rested upon waking and interested in things in their daily life. Response options ranged from 0 (at no time) to 5 (all the time). The WHO-5 has been used extensively in international research showing adequate validity and high reliability (Topp et al., 2015; Sischka et al., 2020). Internal consistency in our sample was Cronbach's $\alpha = 0.87$ ($t2$).

3.3.3. Health literacy

We used a four-point Likert scale based on Lenartz' (2012) health literacy questionnaire to assess managers' health literacy. Lenartz' underlying questionnaire proved reliable and valid with different samples (Lenartz, 2012; Kuhlmann et al., 2015) and displayed adequate internal consistency in a study exploring the health literacy of managers (Fiedler et al., 2018). Based on the questionnaire, we developed a short scale by choosing and adapting six items worded to fit the health literate behavior of managers (e.g., "I have set clear goals for my physical and mental fitness" or "As far as my health is concerned, I am very much in control of myself and I can manage myself effectively"). Response options ranged from 1 (strongly disagree) to 4 (strongly agree). Internal consistency of the scale in our sample was Cronbach's $\alpha = 0.82$ ($t2$). The scale is provided in Supplementary material S2.

3.3.4. Work performance

After the overall survey was adapted (starting with the fourth training group), the German translation of the World Health Organization Health and Work Performance Questionnaire (HPQ) was added to measure work performance. The HPQ is a self-report questionnaire for measuring "the workplace costs of health problems in terms of reduced job performance, sickness absence, and work-related accidents-injuries" (Kessler et al., 2003). We used the item 'absolute presenteeism' as a measure of work performance which is assessed by the following question: "On a scale from 0 to 10, where 0 is the worst job performance anyone could have at your job and 10 is the performance of a top worker, how would you rate your overall job performance on the days you worked during the past 4 weeks?" The question indicates a person's estimation of their work performance on a scale of 0 (worst performance) to 10 (top performance). The HPQ shows high reliability and validity (Kessler et al., 2004). More specifically, the 'absolute presenteeism' measure in the HPQ was considered a valid approach to quantify work performance loss (Scuffham et al., 2014), suggesting adequate test–retest reliability (Kawakami et al., 2020).

3.3.5. Subjective training benefits at follow-up

At 3-months follow-up, participants were asked whether they still applied the exercises learned in the training and, if not, what kept them from still applying the exercises in an open-ended question. After the survey was adapted (starting with the fourth training group), participants were also asked about the subjective benefits of the training using a Likert scale at 3-months follow-up. The scale comprised five items with response options ranging from 1 (strongly disagree) to 4 (strongly agree). Example items are: "The intervention encouraged me to incorporate small moments of mindfulness into my daily life" and "The measure helped me pay more attention to myself and my health." The internal consistency of the scale was Cronbach's $\alpha = 0.76$. The scale and an exploratory factor analysis are provided in Supplementary material S2.

3.3.6. Sociodemographic and work-related characteristics

Sociodemographic and work-related characteristics of participants were collected at baseline ($t0$). The following data was collected: upper management level (top, middle, low), managerial experience (in years), weekly overtime hours (<2 h, 2–5 h, >5–10 h, >10 h), gender (female, male, diverse) and age groups (<30, 31–40, 41–50, 51–55, and >55 years). Starting with the fourth training group, items for age groups were adapted for the remaining data collection (<18, 18–24,

25–44, 45–64, and >65 years). Furthermore, managers were asked whether they had already participated in a workplace health promotion measure in the past (yes/no).

3.4. Statistical analysis

We used descriptive statistics to report participants' sociodemographic and work-related characteristics. Assumptions for normality of outcome measures were tested. Depending on the measurement level, correlations were computed to examine associations between outcomes, sociodemographic and work-related variables at *t*0. Data of participants was clustered within six joined training groups based on the chronological proximity of the individual training groups (groups 1 to 3 = cluster 1, groups 4 + 5 = cluster 2, groups 6 + 7 = cluster 3, groups 8 + 9 = cluster 4, groups 10 + 11 = cluster 5, groups 12 + 13 = cluster 6). Kruskal–Wallis-tests were conducted to examine mean differences in outcome variables and managerial experience between training clusters (*t*0, *t*1, *t*2) and group session modes (live on-site, hybrid, digital). Kruskal–Wallis-tests were chosen to account for differing distributions in participant numbers between the clustered training groups. Analyses yielded no significant differences in outcome means. Furthermore, fisher's exact test (age groups, gender, management level, overtime hours) was conducted to examine differences between training groups for the remaining demographic and work-related variables. There was a significant difference in the management level distribution between training groups. The remaining analyses yielded no significant differences.

We used repeated measures ANOVAs and Bonferroni-adjusted post-hoc analysis to examine within-subject changes in outcome measures across time points (*t*0, *t*1, *t*2). Deviance from sphericity was tested (Mauchly's sphericity test). Analyses were conducted for matched cases with complete data for all outcome measures. Missing values were not imputed. Due to occasional missing values, the size of the analysis sample in the ANOVAs varied depending on the outcome measure. This resulted in an analysis sample of $n = 54$ for mindfulness and well-being, $n = 55$ for health literacy, and $n = 41$ for work performance. All analyses were performed using SPSS version 28 (IBM, Armonk, NY, United States). Mean scores of outcome measures at the time points (*t*0, *t*1, *t*2), mean differences between time points, *p*-values and effect sizes were estimated. Significance for all analyses was estimated at an alpha of $p < 0.05$. Partial eta squared η^2 was calculated with $\eta^2 = 0.01$ indicating a small effect, $\eta^2 = 0.06$ indicating a medium effect and $\eta^2 = 0.14$ indicating a large effect (Cohen, 1988).

Furthermore, a series of multiple linear regression analyses was conducted to account for the potential impact of the COVID-19 periods on outcome measures. As management level varied significantly between training groups, we included it in the regression analyses and further controlled for age, gender, and outcome values at *t*0 (for outcomes at *t*1) or *t*1 (for outcomes at *t*2). COVID period, management level, age and gender were coded as dummy variables. For regression analyses, the age groups of the training groups 1–3 and 4–13 were merged. The variable 'upper management level' was recoded to exclude one participant reporting an 'unknown' management level. Linear regression analyses were conducted for four outcome variables as dependent variables (mindfulness, well-being, health literacy, work performance) with post and follow-up values each (*t*1, *t*2).

Based on times of COVID-19 waves and lockdown phases in Germany (Schilling et al., 2021), three periods were differentiated in which the trainings were conducted: (1) before the outbreak of COVID-19, (2) summer 2020, and (3) winter 2020. The 'summer plateau' of 2020 (weeks 21–39) was characterized by mild cases of COVID and substantial loosening of social restrictions established during the first COVID wave. In contrast, the second COVID-19 wave started in fall 2020 and peaked at the end of 2020 (week 40 of 2020 to week 8 of 2021). This phase was characterized by severe cases, and a lockdown with strict social restrictions. Based on the assumed differences in the societal impacts due to the epidemiological outcomes and strictness of social restrictions, we assigned the training participants to one of these three conditions. Three groups finished the training before the outbreak of COVID-19 (1), four groups finished the training during the summer plateau 2020 (2), and six groups finished the training during winter 2020 (3).

3.5. Qualitative analysis of open-ended responses

Qualitative methods were used to describe managers' perspectives of the training and to identify perceived barriers and facilitators for applying the learned techniques regularly after the end of the training. Two female authors, LS and KS, with experience in qualitative analyses conducted qualitative content analysis (Kuckartz, 2010). MaxQDA 2022 (VERBI GmbH, Berlin, Germany) was used to code the data. The first coding round was performed by LS, while KS carried out the second round. After a discussion between the two authors and agreeing on a final coding scheme – confirming the transparency of the coding (Helfferich, 2011)– the categories were applied to all qualitative responses by LS. The example responses were translated into English by both authors. The final coding scheme with definitions and example quotations can be found in Supplementary material S1. The coding scheme comprises deductive main categories derived from open-ended questions in the surveys (*t*0, *t*1, *t*2). Main categories included (1) workplace barriers, and (2) workplace facilitators of regular long-term application of mindfulness exercises and (2) facilitators of transferring the knowledge and exercises learned in the training to followers within managers' teams. Further main categories comprised (3) suggested changes to managers' overall workplace conditions to make them more health promoting, and (4) further positive effects of the training that managers perceived. The coding scheme also includes subcategories developed inductively based on the material. This is in line with the qualitative research approach of Kuckartz (2010). Accordingly, this exploratory research is still based on the stated research questions, but allows themes to emerge from the data and reflect participants' experiences. We followed the guidelines of qualitative reporting criteria (COREQ) by Tong et al. (2007) regarding two applicable domains for the provided open answers: We listed personal characteristics of the authors who conducted qualitative analysis and reported the data analysis and findings in detail.

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4. Results

4.1. Sociodemographic and work-related characteristics

The majority of managers in the sample were male (76.8%) and between 45 and 64 years old (62.5%) or older than 51 years (16.8%) (see Table 1). Most managers were in the middle level (66.1%) of upper-level management, followed by the top level (19.6%) and low level (12.5%). The mean managerial experience was 9.6 years (SD = 6.2). Less than half of managers (46.6%) had already participated in a workplace health promotion measure in the past. More than half of managers (53.6%) reported they worked more than 5 up to 10 h overtime weekly, while a third (30.4%) reported working more than 10 h overtime weekly. The ICT-company's human resources department compared the distribution of sociodemographic and work-related variables of participants with in-house data and confirmed the distributions were representative for the company's managerial population.

TABLE 1 Participants' characteristics at baseline (n =56).

Characteristics	All participants
Gender	*n* (%)
Female	13 (23.2)
Male	43 (76.8)
Age group	
25–44 years (groups 4–13)	7 (12.5)
45–64 years (groups 4–13)	35 (62.5)
41–50 years (groups 1–3)	5 (8.9)
> 51 years (groups 1–3)	9 (16.8)
Upper management level	
Top	11 (19.6)
Middle	37 (66.1)
Low	7 (12.5)
Unknown	1 (1.8)
Managerial experience in years	
Mean (SD)	9.6 (6.2)
Minimum	1
Maximum	28
Previous participation in a workplace health promotion measure	
Yes	26 (46.4)
No	28 (50)
Missing	2 (3.6)
Average hours working overtime per week	
Under 2 h	2 (3.6)
2–5 h	7 (12.5)
More than 5 up to 10 h	30 (53.6)
More than 10 h	17 (30.4)

4.2. Mindfulness and well-being

As shown in Table 2, participants had a lower baseline score ($t0$) in mindfulness as measured by the MAAS. The ANOVA indicated a significant improvement of participants' mindfulness [$F(2,106) = 3.376$, $p = 0.038$, $\eta_p^2 = 0.06$, $n = 54$]. More specifically, Bonferroni-adjusted post-hoc analysis revealed a significant improvement of mindfulness between baseline and 3-months follow-up. However, a significant improvement was not observed for mindfulness between t0 and t1 although the MAAS score slightly increased between these two time points. The effect size was moderate ($\eta^2 = 0.060$). Additionally, a slight but statistically insignificant increase from $t1$ to $t2$ was observed for managers' mindfulness (mean difference of 0.1 in the MAAS between $t1$ and $t2$). Furthermore, there was a significant improvement in well-being after the training [$F(2,106) = 73.019$, $p < 0.001$, $\eta_p^2 = 0.17$, $n = 54$]. *Post hoc* analysis showed a significant improvement in well-being scores between baseline ($t0$) and after the training ($t1$) as well as between baseline ($t0$) and 3-months follow-up ($t2$). The effect size indicated a large effect ($\eta^2 = 0.170$). While there was a decrease in well-being from $t1$ to $t2$, well-being remained higher at both $t1$ and $t2$ compared to $t0$.

4.3. Health literacy

Compared to baseline values, participants' health literacy scores significantly improved after the training [$F(2,108) = 9.067$, $p < 0.001$, $\eta_p^2 = 0.14$, $n = 55$]. *Post hoc* analysis showed a significant improvement of participants' health literacy when comparing scores at baseline ($t0$) with scores immediately after the training ($t1$). A significant improvement in health literacy was also observed when comparing scores at baseline ($t1$) with scores at 3-months follow-up ($t2$). The effect size indicated a large effect ($\eta^2 = 0.144$). However, health literacy scores at $t1$ and $t2$ were nearly identical.

4.4. Work performance

Participants estimated their work performance during the past 4 weeks (absolute presenteeism) to a mean of 7.1 on a scale of 1–10 at baseline ($t0$). There was a significant improvement in perceived work performance after the training [$F(2.80) = 7.008$, $p = 0.002$, $\eta_p^2 = 0.15$, $n = 41$]. More specifically, *post hoc* analysis showed a significant improvement of perceived work performance when comparing scores at baseline ($t0$) with scores immediately after the training ($t1$) and with scores at 3-months follow-up ($t2$). The effect size indicated a large effect ($\eta^2 = 0.149$). Work performance scores at $t1$ and $t2$ were nearly identical.

4.5. Results of correlation and regression analyses

Table 3 presents bivariate correlations between managers' sociodemographic variables, work-related variables and outcomes at $t0$, $t1$, and $t2$. Using Pearson correlation, analyses show that mindfulness, well-being, health literacy and the item for work

TABLE 2 Mean outcome scores at baseline (*t*0), after the training (*t*1), and follow-up (*t*2), mean differences between time points and effect sizes.

Scale (Possible range)	Mean (SD) *t*0	Mean (SD) *t*1	Mean (SD) *t*2	Mean difference t0−t1 (SE)	Cohen's *d* of pairwise comparison	Mean difference t0−t2 (SE)	Cohen's *d* of pairwise comparison	Mean difference t1−t2 (SE)	Cohen's *d* of pairwise comparison	Partial eta-squared of overall ANOVA
Mindfulness (MAAS), (1–6) ($n = 54$)	3.9 (0.72)	4.1 (0.59)	4.2 (0.74)	−0.13 (0.08)	−0.216	−0.209* (0.08)	−0.342	−0.09 (0.08)	−0.141	0.060
Well-Being (WHO-5) (0–25), ($n = 54$)	14.0 (4.37)	16.3 (3.80)	15.4 (4.31)	−2.32*** (0.48)	−0.657	−1.35* (0.52)	−0.380	0.96 (0.49)	0.281	0.170
Health literacy (1–4), ($n = 55$)	2.9 (0.61)	3.1 (0.58)	3.09 (0.53)	−0.20*** (0.05)	−0.521	−0.19** (0.06)	−0.485	0.01 (0.05)	0.024	0.144
Absolute presenteeism (HPQ), (0–10), ($n = 41$)	7.1 (1.41)	7.7 (1.23)	7.7 (0.97)	−0.68** (0.19)	−0.573	−0.61* (0.21)	−0.474	0.07 (0.21)	0.055	0.149

P-values were Bonferroni-adjusted for multiple testing of mean differences between time points. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

performance were significantly associated. The significance of correlations differed across time points. More specifically, managers' mindfulness and well-being were significantly associated with each other across all time points (*t*0, *t*1, *t*2). Health literacy was only associated with mindfulness at *t*0 and *t*2, but correlated significantly with well-being at all time points. The work performance item (absolute presenteeism) was significantly associated with mindfulness (*t*0, *t*2), well-being (*t*0, *t*1, *t*2), and health literacy (*t*1) in the respective time points. The work performance item at *t*2 also significantly correlated with managerial experience and the management level. Furthermore, Spearman rho showed a significant association between age group and managerial experience. Lastly, chi-square value showed a significant association between management level and training group cluster.

Furthermore, Table 4 presents a summary of regression analyses with the COVID-19 period as a predictor of mindfulness, well-being, health literacy and work performance. The dummy variables 'before COVID' and 'summer 2020' were compared to the reference 'winter 2020' regarding the impact of the COVID period. Coefficients showed that participants who finished the training before the outbreak of COVID-19 had significantly higher mindfulness at t1 compared to participants who finished the training in winter 2020 [$F(7,46) = 5.975$, $p < 0.001$, with $R^2 = 0.476$, adjusted $R^2 = 0.397$]. In contrast, participants who finished the training in summer 2020 had significantly lower well-being at *t*1 compared to the 'winter 2020' group [$F(7,45) = 7.467$, $p < 0.001$, with $R^2 = 0.537$, adjusted $R^2 = 0.465$], but higher well-being at *t*2 [$F(7,46) = 6.066$, $p < 0.001$, with $R^2 = 0.480$, adjusted $R^2 = 0.401$]. Additionally, participants in the high management level had significantly lower well-being at *t*1 compared to middle management level. In contrast, participants in the low management level had significantly higher well-being at *t*2 compared to the middle management level. Due to missing cases, the dummy variable 'before COVID-19' was excluded in the models predicting work performance. Participants who finished the training in summer 2020 rated their work performance at *t*1 significantly higher compared to the 'winter 2020' group [$F(6,33) = 6.097$, $p < 0.001$, with $R^2 = 0.526$, adjusted $R^2 = 0.439$]. With the exception of work performance at *t*2, all regression models were significant (adjusted for *t*0 or *t*1 values, age, gender, and management level). Aside from *t*0 and *t*1 values, no significant associations were observed for mindfulness at *t*2 [$F(7,45) = 4.874$, $p < 0.001$, with $R^2 = 0.431$, adjusted $R^2 = 0.343$] or for health literacy at both *t*1 and *t*2 [*t*1: $F(7,46) = 12.186$, $p < 0.001$, with $R^2 = 0.650$, adjusted $R^2 = 0.596$; *t*2: $F(7,46) = 10.551$, $p < 0.001$, with $R^2 = 0.616$, adjusted $R^2 = 0.558$].

4.6. Subjective training benefits at follow-up

At 3-months follow-up, 47 out of 56 participants (84%) confirmed they still practiced the mindfulness exercises learned in the training. These participants agreed that they still perceived training benefits at 3-months follow-up by having integrated healthy behavior into everyday life with a mean agreement of 3.3 on a scale of 1–4 (minimum value of 2.6, maximum value of 4.0, $n = 42$).

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TABLE 3 Associations between variables (correlation coefficients and chi-square values).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
(1) Managerial experience (in years)																
(2) Management level	0.02															
(3) Gender	0.05	4.05														
(4) Age group (training groups 4–13)	**0.43****	0.02	0.42													
(5) Training group cluster	0.30	**28.77***	0.34	4.56												
Outcomes at *t*0																
(6) Mindfulness (MAAS)	0.13	−0.10	0.03	−0.24	0.17											
(7) Well-being (WHO-5)	0.06	−0.10	0.08	0.16	0.33	**0.45****										
(8) Health literacy	0.11	−0.05	0.00	0.02	0.19	**0.38****	**0.37****									
(9) Absolute presenteeism	0.23	0.08	0.23	0.06	0.40	**0.34***	**0.5****	0.28								
Outcomes at *t*1																
(10) Mindfulness (MAAS)	−0.06	−0.15	0.03	−0.09	0.31	**0.62****	**0.41****	0.13	0.25							
(11) Well-being (WHO-5)	−0.21	−0.01	0.16	0.10	0.34	**0.27***	**0.64****	0.22	**0.40****	**0.36****						
(12) Health literacy	−0.14	−0.04	0.16	0.07	0.32	0.11	**0.34***	**0.79****	0.17	0.12	**0.34***					
(13) Absolute presenteeism	0.08	−0.05	0.06	−0.06	0.35	0.21	**0.32***	**0.32***	**0.60****	0.24	0.21	0.13				
Outcomes at *t*2																
(14) Mindfulness (MAAS)	0.09	0.02	0.02	0.20	0.17	**0.66****	**0.51****	**0.36****	0.31	**0.62****	**0.43****	0.26	0.10			
(15) Well-being (WHO-5)	−0.03	0.06	0.04	0.01	0.33	**0.37****	**0.57****	0.12	0.23	**0.41****	**0.60****	0.20	0.23	**0.68****		
(16) Health literacy	−0.05	−0.03	0.13	0.17	0.25	0.24	**0.40****	**0.75****	0.13	0.09	**0.38****	**0.76****	0.14	**0.45****	**0.46****	
(17) Absolute presenteeism	**0.44****	**0.38***	0.06	0.20	0.46	0.16	**0.42****	0.28	**0.44****	0.20	0.19	0.25	0.28	**0.46****	**0.43****	0.23

Correlations between continuous variables (managerial experience, mindfulness, well-being, health literacy and absolute presenteeism) were calculated using Pearson correlation coefficient. Correlations between ordinal variables (age group and management level) were calculated using Spearman rank correlation coefficient (rho). Correlations between categorial variables (gender and training group cluster) were calculated using Pearson contingency coefficient. Correlations between continuous variables and categorial variables were calculated using Eta coefficient (with continuous variables as dependent variables). Correlations between continuous variables and ordinal variables were calculated using Spearman rank correlation coefficient (rho). Associations between categorial and ordinal variables were calculated using Pearson chi-square value. $^{*}P < 0.05$, $^{**}P < 0.01$. Significant correlations (two-tailed) are bold.

TABLE 4 Summary of linear regression analyses with the COVID-19 period predicting mindfulness, well-being, health literacy, and work performance.

	T1					*T2*				
	B	SE	*β*	*t*	*p*	B	SE	*β*	*t*	*p*
Mindfulness (MAAS)										
MAAS at *t*0/*t*1	0.51	0.09	0.63	5.67	0.001***	0.83	0.15	0.65	5.45	0.001***
Before COVID-19[a]	0.49	0.17	0.38	2.93	0.005**	−0.13	0.24	−0.08	−0.56	0.58
Summer 2020[a]	0.21	0.14	0.18	1.46	0.15	0.02	0.20	0.01	0.10	0.92
High management level[b]	−0.06	0.18	−0.04	−0.30	0.76	0.01	0.24	0.01	0.05	0.96
Low management level[b]	−0.02	0.19	−0.01	−0.11	0.91	0.31	0.25	0.14	1.23	0.23
Age group: 25–44 years[c]	−0.17	0.16	−0.13	−1.12	0.27	−0.28	0.20	−0.16	−1.36	0.18
Gender: female[d]	−0.02	0.15	−0.01	−0.12	0.91	−0.02	0.20	−0.01	−0.08	0.94
Well-being (WHO-5)										
WHO-5 at *t*0/*t*1	0.51	0.09	0.60	5.90	0.001***	0.82	0.13	0.72	6.10	0.001***
Before COVID-19[a]	0.79	1.02	0.10	0.77	0.45	−0.20	1.24	−0.02	−0.16	0.88
Summer 2020[a]	−2.22	0.90	−0.29	−2.47	0.017*	2.49	1.11	0.28	2.24	0.030*
High management level[b]	−3.02	1.15	−0.32	−2.62	0.012*	1.61	1.45	0.15	1.11	0.27
Low management level[b]	−1.17	1.13	−0.11	−1.04	0.30	3.58	1.38	0.29	2.59	0.013*
Age group: 25–44 years[c]	−0.29	0.95	−0.03	−0.31	0.76	−0.74	1.16	−0.07	−0.64	0.53
Gender: female[d]	−0.78	0.97	−0.09	−0.80	0.43	−0.18	1.13	−0.02	−0.16	0.87
Health literacy										
Health literacy at *t*0/*t*1	0.74	0.09	0.78	8.71	0.001***	0.70	0.09	0.76	8.00	0.001***
Before COVID-19[a]	−0.02	0.14	−0.02	−0.16	0.88	−0.07	0.14	−0.06	−0.54	0.59
Summer 2020[a]	−0.14	0.12	−0.12	−1.17	0.25	0.10	0.11	0.10	0.92	0.36
High management level[b]	0.01	0.15	0.003	0.03	0.98	0.10	0.14	0.08	0.71	0.48
Low management level[b]	−0.01	0.15	−0.008	−0.09	0.93	0.13	0.15	0.09	0.92	0.36
Age group: 25–44 years[c]	0.04	0.12	0.03	0.36	0.72	−0.22	0.12	−0.18	−1.86	0.07
Gender: female[d]	−0.18	0.12	−0.13	−1.42	0.16	−0.06	0.12	−0.05	−0.53	0.60
Absolute presenteeism										
Absolute presenteeism at *t*0/*t*1	0.68	0.12	0.78	5.86	0.001***	0.25	0.12	0.31	2.09	0.04*
Before COVID-19[a]	–	–	–	–	–	–	–	–	–	–
Summer 2020[a]	0.76	0.31	0.31	2.43	0.021*	0.09	0.30	0.05	0.31	0.76
High management level[b]	1.09	0.54	0.27	2.03	0.050	−0.99	0.49	−0.31	−2.02	0.052
Low management level[b]	0.10	0.45	0.03	0.23	0.82	0.28	0.43	0.10	0.64	0.53
Age group: 25–44 years[c]	0.68	0.40	0.21	1.71	0.10	−0.64	0.38	−0.26	−1.71	0.10
Gender: female[d]	0.08	0.36	0.03	0.23	0.82	0.27	0.34	0.12	0.78	0.44

Models adjusted for age, gender, and *t*0 (for *t*1 outcomes) or *t*1 (for *t*2 outcomes). COVID period, management level, age and gender were coded as dummy variables. [a]Reference category: Winter 2020. [b]Reference category: Middle management level. [c]Reference category: Age group 45–64 years. [d]Reference category: Male. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

4.7. Qualitative findings

For qualitative analyses, we used all available open responses (including drop-outs). Thus, the qualitative sample contains all of the provided answers regardless of whether participants were excluded in the quantitative analysis due to missing answers. In total, 57 participants answered at least two open-ended questions, while not all of them completed every single question. In sum, 175 questions were content analyzed. Table 5 presents an overview of categories and first level sub-categories. In Supplementary material S1, a more detailed overview of all categories and number of coded answers for each category is provided.

4.7.1. Barriers of daily mindfulness practice

Reported barriers to daily application of the learned mindfulness exercises involved a perceived lack of follow-up measures or lack of repetition, motivation and energy. One participant stated:

> *"[I am] working from home, which means that I sit at the computer early in the morning until late in the evening and have no energy for other topics."*

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Managers mostly stated a lack of a workplace culture, where mindfulness is commonly accepted. Another aspect was the lack of prioritization by supervisors regarding themes such as mindfulness, since daily work routines already filled the day and left no focus and time for mindfulness. One manager stated:

> *"I need a visible and clear commitment, at least for our entire department, that mindfulness and health stand above all else. Then the processes will also work."*

High workload, time pressure, and work-related reachability were also mentioned as barriers to daily mindfulness practice. Additionally, a lack of suitable rooms and the noise level at the workplace prevented managers from daily practice, while other managers reported no barriers exist.

4.7.2. Facilitators of daily mindfulness practice

Managers were asked to name three factors, that would enable them to practice mindfulness daily. Regarding their work environment, managers named budget, autonomy (especially time and breaks) and rooms as necessary requirements. Other factors included a workplace culture that accepts mindfulness and role models who practice mindfulness themselves. This is accompanied by acceptance and support of mindfulness from other colleagues and supervisors:

> "*It is also important that - especially the professional - environment practices individual and mutual mindfulness.*"

According to managers' statements, communicating mindfulness practice to all employees on a broad scale and establishing mindfulness networks could lead to more motivation for practice among staff. Furthermore, personal skills, attitude, learning material and apps were named for facilitating mindfulness practice at the workplace. Other ideas included more training offers in an online or on-site format with a trainer or coach. Four participants expressed their desire for an organizational roll-out of the training. Integration of training practices in daily work routines, training reminders and frequent repetition could be a key component:

> *"Without a reminder, current topics will have high potential to eclipse this very positive, but short impulse."*

4.7.3. Suggested change of workplace conditions

Managers suggested changes to their workplace conditions regarding different topics to make them more health promoting. They mostly named retreats and free space as enablers for a health-promoting workplace. One manager answered:

> *"Personally, I don't see any promotion of mindfulness in terms of spatial arrangements or regulations yet."*

Furthermore, a positive attitude toward mindfulness in the whole organization and the support of supervisors and management were mentioned. Additional suggestions addressed less workload, less time pressure, a permanent workplace and a strict separation of work and leisure.

TABLE 5 Overview of categories and first level sub-categories.

Category	Sub-category
Change of work conditions\increasing job resources	Increasing autonomy
	Demarcation between work and leisure
	Fixed workplace and work environment
	Attitude regarding mindfulness
	Retreat spaces
	Regulations
	Role of supervisor
	Sharing of information
	Other
Facilitators of daily mindfulness practice	Contextual factors work environment
	Means and gadgets
	Culture and attitude
	Other
Barriers of daily mindfulness practice	Lack of rooms
	Lack of repetition
	Complexity
	Lack of culture (and acceptance)
	Distributed team
	Lack of prioritization by supervisors
	Time pressure
	Noise level
	Work-related reachability
	High work load
	Nothing
	Lack of time
	Lack of motivation
	Working from home
Positive training effects	More conversation about mindfulness
	More conscious perception
	More reflection
	Acceptance for mindfulness practice increased
	Follow up activities
	Behaviors integrated in everyday life due to mindfulness training
Feedback regarding effectiveness	Increase of well-being
Desire for roll-out	

4.7.4. Positive training effects at follow-up

Eleven managers openly reported further positive training effects they observed. The responses involved topics such as the effectiveness of breathing and mindfulness practices, integration of healthy behavior into daily life and communication about mindfulness with colleagues:

> "*The measure also ensured that I was able to integrate other behaviors into my everyday life using the methods taught, e.g. adjusting my eating habits or sports exercises.*"

> "*Conversations about mindfulness and small mindfulness exercises in the team and with peers [were] increased.*"

Furthermore, managers reported to have initiated follow-up activities such as mindfulness exercises together with their team:

> "*The handout after the training to report to [our] teams was a good incentive to initiate follow-up activities, e.g. by scheduling […] 5-minute breaks before the next appointment, by practicing guided mindfulness exercises before team meetings together, acceptance for mindfulness exercises has greatly increased.*"

The open responses demonstrate that respondents had an overall positive perception about the workplace mindfulness training. According to these statements, the training increased a more conscious awareness in daily life and the acceptance of mindfulness trainings:

> "*[As positive training effects]: More reflection and awareness of the thoughts that occupy me.*"

Moreover, participants commented that the COVID-19 pandemic impacted the positive effects of the mindfulness training in a negative way. The COVID-19 measures lead to increased strain for managers because of social restrictions and a doubled burden if they worked from home and had to take care of their children at the same time.

5. Discussion

The present study found significant increases in measures of mindfulness, psychological well-being, health literacy and work performance immediately after and 3 months after a 2-months mindfulness training. However, the limitations of the study design and the potential impact of the COVID-19 pandemic must be considered when interpreting these findings. Aside from the experiential group sessions and surveys that had to switch to a digital format, managers experienced the training before or during different phases of COVID-19. Managers who completed the training before the outbreak of the pandemic had significantly higher mindfulness scores at *t*1 compared to managers who finished the training in winter 2020. The second COVID-19 wave peaked at the end of 2020 and resulted in a lockdown with strict social restrictions in Germany. For the managers participating in the training in winter 2020, the social impacts of the pandemic may have been a distraction, resulting in lower mindfulness after the training. Furthermore, managers who finished the training in summer 2020 had lower well-being at *t*1 but higher well-being at *t*2 compared to the winter 2020 group. A potential reason for the winter group's lower well-being at *t*2 could be due to the longer experienced lockdown time, while there may have been other confounders for the difference in well-being at *t*1. Additionally, the summer 2020 group rated their work performance better at *t*1 compared to the winter 2020 group. Seasonal differences and fewer social restrictions during summer may have led to a better performance rating of the summer training groups. One subsequent assumption would be that the effects of the training on mindfulness might have turned out stronger without the presence of COVID-19. Some managers also stated a negative impact of COVID-19 in open responses. Still, the increase in mindfulness, psychological well-being, health literacy and work performance in our study aligns with evidence from previous workplace mindfulness intervention studies. A significant increase in mindfulness (MAAS) was only found at 3-months follow-up. Based on significant differences in outcome means between *t*0, *t*1, and *t*2, the exploratory hypotheses can be accepted with the exception of H1a. A possible explanation for this interesting finding is the implied opposite of the Dunning-Kruger effect (Dunning, 2011): After learning what mindfulness is and how to practice it, participants might have underestimated their own abilities immediately after the training. Underestimating one's own mindfulness skill as a consequence of becoming sensitive toward mindlessness may apply to mindfulness practitioners (Sauer et al., 2015). At 3-months follow-up, managers may have become more confident in their abilities after implementing mindfulness practices into their daily life for a longer amount of time. This finding concurs with long-term studies suggesting that beneficial outcomes of mindfulness interventions are maintained by continuous mindfulness practice (Solhaug et al., 2019; Galante et al., 2021). Another possible explanation for the significant difference in mindfulness at *t*2 (and not at *t*1) is that the MAAS measures trait mindfulness since personality traits take a longer amount of time to change. Furthermore, previous studies did not focus on health literacy as an outcome of mindfulness interventions. Health literacy is considered a precondition for self-care behavior (Bohanny et al., 2013) and some qualitative studies found managers' self-care improved through mindfulness practice (Lychnell, 2017; Rupprecht et al., 2019). As mindfulness interventions aim at increasing awareness of one's own thoughts and feelings, the increase in health literacy scores in our sample is not a surprising, but interesting finding.

Regarding the JD-R model, employee strain should be monitored on a continuous basis, since strain depends on the daily combination of job demands and resources. Therefore, supervisors need to provide support and communicate their vision in an ongoing manner (Bakker and de Vries, 2021). We argue that supervisor support and autonomy can be viewed as resources for mindfulness practice. The open-ended answers showed this is crucial since managers wished for their company and supervisors to clearly communicate a commitment to mindfulness. A workplace culture leaving enough autonomy for practicing mindfulness has to be established first so managers can be role models for mindful and health-promoting behavior. Possible spill-over effects to colleagues (Rupprecht et al., 2019), e.g., through implementing joint mindfulness practice into working routines, face barriers that need to be countered. Perceived available time is a well-known pragmatic barrier to engaging in practices such as meditation (Hunt et al., 2020). Such barriers can be considered as job demands since time pressure and workload were mentioned as hindering working conditions. However, managers also mentioned facilitators that can be considered as job resources. In accordance with the JD-R model, job autonomy was named as one of the distinct requirements for daily mindfulness practice. Furthermore, there were suggestions to increase job resources in order to strengthen health promoting workplace conditions such as retreats or support from supervisors and colleagues regarding mindfulness. This idea involves an organizational culture, where mindfulness is commonly accepted.

Investigating managers' transformative impact areas such as inner growth and relationships as well as interpersonal organizational outcomes such as the working culture and team performance may follow up on the present study (Urrila, 2021). Moreover, research shows a trend toward self-administered, technology-supported mindfulness interventions for busy managers. Albeit this study revealed no significant differences in outcome measures between different group session modes, there is a need to examine the role of continuous technological support embedded into such interventions to support regular mindfulness practice. Regarding practical implications, the qualitative insights show that especially the working conditions and context must be suitable for mindfulness trainings to have a long-lasting effect. The combination of job demands and job resources must allow enough autonomy and freedom to practice mindfulness, while a supporting organizational culture (including the direct leader) can be the common ground for prioritizing health topics and acceptance of mindfulness practice.

Various limitations to this study need to be acknowledged when interpreting the findings. This study used a one-group pre-post design without a control group or randomization. Thus, we cannot derive causal relationships between participation in the training, time effects and changes in the analyzed outcomes. It was important for the managers in charge of the project at the ICT-company to start the trainings in a relatively short amount of time. A control group and randomization could not be implemented due to practical and organizational restraints such as insufficient time for a pre-intervention phase. Therefore, an explorative one-group pre-post design was considered most appropriate for the setting and situation. As participation in the training and the surveys was voluntary, we face a selection bias in the sample. Self-report surveys may yield socially desired responses, thus participants could have been inclined to rate the training outcomes more positively. Drop-outs occurred due to practical obstacles and data availability: The training provider reported that managers, who were originally admitted to the training, dropped out short-term due to sickness or work schedule conflicts. Hence, these managers did not participate in certain training components or data gathering. Missing data may also have resulted from managers who participated in the training but did not fill out the survey, even though coaches emphasized the importance of responding to the surveys. Making participation in such trainings a higher priority in managers' schedules may prevent future drop-outs. Nonetheless, analysis of matched cases across a long amount of time can be considered a strength of this study. While the training was conducted in one ICT company and generalizing the findings to different branches may be limited, the investigated company was fairly large and participants worked at various departments. Additionally, according to the company's human resources department, the distribution of sociodemographic and work-related variables of participants was representative for the company's managerial population. Still, we face the problem that training participants could generally have a higher health awareness compared to non-participating managers (Ludwig et al., 2020).

The analyses were of an exploratory nature. Due to missing data for work performance and a lacking validation of the health literacy and subjective training benefits scales, the statistical findings should be interpreted with caution. Nonetheless, the present study suggests intrapersonal outcome changes in the essential impact areas of individual leadership capacity. Furthermore, our approach combining quantitative findings with ICT-managers qualitative answers adds value with insights on the effectiveness of mindfulness trainings at the workplace.

While it is possible that coaches could have influenced training outcomes, they did not use the developed surveys as guidance for coaching and training. Rather, we assume the coaches had a professional interest in ensuring that managers reach their training goals, reflect upon their individual experiences, and develop a plan for sustainable behavioral change afterwards. As the data collection at *t*1 took place after the last half-day experiential group session, the temporal proximity might have influenced the reported outcomes. However, data analysis was conducted independent of the coaches and a potential influence of coaches' actions on training outcomes is more unlikely at data collection 3 months after the training. Due to the study design, we could not discern the effect of specific elements of the training. Future studies could investigate how certain components of mindfulness interventions affect and match the measured outcomes (e.g., items of the MAAS). Still, the outcomes suggest that the applied combination of training elements may have been effective in the training program (Lacerenza et al., 2017). This includes a needs analysis (i.e., clarification of managers' expectations toward the training in the kick-off coaching), personal feedback in the group sessions, in the subsequent coaching and in peer partnerships, spaced group sessions that took place twice, and multiple delivery methods (e.g., personal conversation, text book, web app). Despite the change of group sessions to a digital format during the COVID-19 pandemic, the overall training structure remained the same. Embedding coaching, learning media such as apps, and peer support within such a structured training program can facilitate transfer and behavioral impact in managers' daily life, which is supported by the qualitative findings. Transfer into daily life is particularly important since managers have high work demands that compete or interfere with mindfulness practice and habituation of healthy behavior.

6. Conclusion

Our exploratory findings suggest the mindfulness training may improve mindfulness, psychological well-being, health literacy and work performance among upper-level ICT-managers. In contrast to the other outcomes, a significant increase in mindfulness was found only at follow-up. Managers who finished the training before the outbreak of COVID-19 had a higher mindfulness score at *t*1 compared to those who finished the training in winter 2020. Qualitative findings suggested managers perceived the integration of mindfulness into daily life as a positive effect following the training. Workplace-related barriers and facilitators for the subsequent daily application of learned mindfulness practices emerged from the findings. In subsequent studies, the shortcomings of the present study should be improved by applying a randomized controlled design, uniform validated scales, and larger samples from different organizations. Collecting employee ratings on managers' behavior and accounting for mechanisms between outcome variables in analyses could generate more rigorous findings. On a practical level, the responsibility and high workload coming with a managerial position substantiates promoting managers' self-development capabilities through participation in mindfulness

trainings. Conducting such trainings is crucial since managers act as role models and can have a substantial positive impact on employees and organizations.

Data availability statement

The datasets presented in this article are not readily available because the ICT-company did not agree to make the data available in an accessible repository as the data sets contain sensitive company data. Requests to access the datasets should be directed to KS, kristina.schubin@uni-koeln.de.

Ethics statement

The study involving human participants was reviewed and approved by the Ethics Committee of the Medical Faculty of the University of Cologne (project identification code: 19-1476). The participants provided their written informed consent to participate in this study.

Author contributions

KS, HP, and SZ designed and planned the study. SZ and KS collected the data and conducted the statistical analyses. LS and KS conducted the qualitative analyses. KS drafted the manuscript. KS and LS edited the manuscript. SZ, HP, and LS provided substantive suggestions for revisions. All authors contributed to the manuscript, and reviewed and approved the final manuscript.

Funding

The authors declare that this secondary data analysis study received funding from vivalue GmbH and the University of Cologne. For the purpose of this article, the secondary data analysis, data interpretation and writing were financed by own funds of the University of Cologne. The research group of KS, LS, and HP is funded by the University of Cologne. We acknowledge support for the Article Processing Charge from the DFG (German Research Foundation, 491454339).

Acknowledgments

We thank the cooperation partners in the ICT-company, the health insurance, and the training provider for giving valuable advice regarding study conduction. We also extend our sincere thanks to all managers who kindly agreed to participate in the study.

Conflict of interest

SZ was employed by vivalue GmbH. HP is a shareholder of vivalue GmbH. The authors declare that this secondary data analysis study received funding from vivalue GmbH. vivalue GmbH was involved in the development of the study design, data collection and conduction of the initial pragmatic evaluation. vivalue GmbH was not involved in the interpretation of data for this article, the writing, or the decision to submit it for publication.

The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2023.994959/full#supplementary-material

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Schubin, K., Pfaff, H. & Zeike, S. (2021). How Managers Perceive and (Do Not) Participate in Health Promotion Measures - Results from a Cross-Sectional Mixed-Methods Survey in a Large ICT Company. *International journal of environmental research and public health*, *18*(18), 9708. https://doi.org/10.3390/ijerph18189708

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